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STATE-OWNED ENTERPRISE REFORM IN CHINA TO 1994:

ISSUES OF PERFORMANCE, BEHAVIOUR AND EMPLOYEE COMPENSATION

A thesis submitted for the degree of Doctor of Philosophy

of The Australian National University

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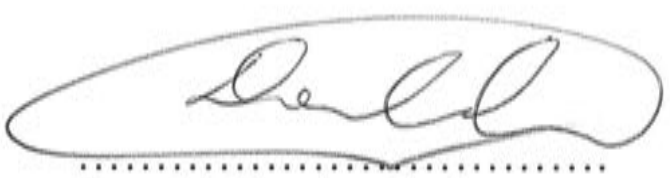
In compliance with the rules of the Degree of Doctor of Philosophy of the Australian National University, it is affirmed that, except where otherwise stated, all work presented in this thesis is my own work



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For all the Grahams.

Abstract

At the outset of China's reform period in 1978, the industrial sector was dominated by State-Owned Enterprises (SOEs), which accounted for 77.6 per cent of gross industrial output. By 1997 this share had shrunk to 25.5 per cent. Over this twenty-year period China emerged as one of the fastest-growing economies in the world. This thesis is motivated by questions as to whether the continued existence and gradual reform of the SOE sector helped or hindered the growth of the Chinese economy under reform, and whether the sector can survive under state ownership for another two decades or whether more fundamental changes are needed.

The thesis reviews the reforms that have been carried out, focusing on the period up to 1994. Reforms took the sector away from planned allocation of resources under state ownership, towards competitive market allocation, still under state ownership. In general, faster progress was made in the reform of SOE output markets than of their input markets. The dynamics of the reform process may have given rise to firm behaviour that sought to maximise employee remuneration rather than maximising profits. SOE output grew strongly, though not as quickly as in the non-state sector, and growth was extensive in nature. Total Factor Productivity growth was probably positive but very low, especially in comparison with the non-state sector. Financial performance declined alarmingly, to the extent that by the mid-1990s, there appeared to be a risk that accumulated SOE liabilities could trigger a financial crisis. Assessments of SOE performance tended to divide into two schools. The convergence or 'pessimistic' school assessed productivity and financial performance as poor and advocated more fundamental reform including privatisation. They attributed poor financial performance to poor productivity and over-compensation of SOE employees. The experimental or 'optimistic' school assessed productivity performance as positive and tended to advocate continued gradualist reform. They attributed the poor financial performance to competition from the non-state sector.

The thesis seeks to advance the debate over SOE reform by producing more insightful evidence on the question of over-compensation. The theoretical framework is carefully considered, drawing on the work of Sicular (1995) and the theory of the labour-managed firm (LMF). It is determined that the best available empirical test is a comparison of the output elasticity of labour with the labour share of income. Such tests are carried out on a sample of Chinese state-owned manufacturing firms covering the years 1980 to 1994. Estimates of over-compensation are generated for the full data set, for five industrial sectors and for the large, medium and small categories of firms. Under the preferred measurement techniques, substantial overcompensation is revealed by the mid-1990s, both for the overall sample and for all five sectors. Small and medium-sized forms are found to over-compensate their employees to greater extent than do large firms.

The findings can be interpreted as endorsing the Chinese government's reform strategy as pursued from the late 1990s, of accelerating reform by privatizing the small and medium-sized state-owned firms while strengthening the internal governance of large SOEs.

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China's state-owned enterprises: to be or not to be?

At the outset of the economic reform period in 1978, China's industrial sector was dominated by State-Owned Enterprises (SOEs), which accounted for 77.6 per cent of gross industrial output.[1] At that time, the only other significant ownership category of industrial firms was Collectively Owned Enterprises (COEs), which accounted for 22.4 per cent of gross industrial output. Over the following two decades, economic reforms brought far-reaching changes both inside and outside the SOE sector. As the centrally planned system of resource allocation gradually gave way to market-oriented systems, SOEs were steadily granted the autonomy to make their own production, pricing and marketing decisions and the incentives facing SOEs and their employees were improved. Outside the state sector, new entrants in the form of foreign-invested and individually-owned firms flourished, as did the collectively-owned sector including the rural township and village enterprises (TVEs).[2] By 1997, the SOE share of gross output had shrunk to 28.2 per cent, as Table 1.1 shows. Over the same period in which the relative presence of SOEs contracted so significantly, the Chinese economy emerged as one of the fastest growing economies in the world. From 1980 to 2000, real GDP grew by an average of 9.6 per cent per annum, and per capita real GDP grew by 8.3 per cent per annum; these figures amount to cumulative growth factors of 6.3 times and 4.9 times respectively.[3]

The dramatic contraction in the presence of SOEs in the Chinese economy relative to other ownership sectors, against a background of strong economic growth, raises questions with important implications for the future course of the still-reforming Chinese economy. Have the SOEs, which have clearly grown more slowly than the non-state enterprises, acted as a drag on overall economic performance? Would the Chinese economy have grown even

faster if the state sector had been rapidly privatised? Or alternatively, has the continued existence and gradual reform of the SOEs enhanced the overall reform process by providing it with a stable base upon which to experiment with the development of alternative ownership forms? Can the SOEs be expected to survive the next two decades of economic development and, indeed, is it desirable that they should? Should SOE reform initiatives continue to be gradualist in design, or are more fundamental changes needed?[4]

Table 1.1 **Value of gross industrial output by type of ownership** (percentage shares)

Year	State [(a)]	Collective	Individual	Other
1978	77.6	22.4	--	--
1979	78.5	21.5	--	--
1980	76.0	23.5	--	0.5
1981	74.8	24.6	--	0.6
1982	74.4	24.8	0.1	0.7
1983	73.4	25.7	0.1	0.8
1984	69.1	29.7	0.2	1.0
1985	64.9	32.1	1.8	1.2
1986	62.3	33.5	2.8	1.5
1987	59.7	34.6	3.6	2.0
1988	56.8	36.1	4.3	2.7
1989	56.1	35.7	4.8	3.4
1990	54.6	35.6	5.4	4.4
1991	56.2	33.0	4.8	6.0
1992	51.5	35.1	5.8	7.6
1993	47.0	34.0	8.0	11.1
1994	37.3	37.7	10.1	14.8
1995	34.0	36.6	12.9	16.6
1996	36.3	39.4	15.5	16.6
1997	31.6	38.1	17.9	18.4
1998	28.2	38.4	17.1	22.9
1999	28.2	35.4	18.2	26.1

[(a)] Includes state-controlled shareholding enterprises.

Notes: Data before 1984 are not comparable because of definitional changes.
Data for 1991–1994 was adjusted (by SSB) in accordance with data of the 1995 Industrial Census, and therefore differs from the data in previous editions of the *China Statistical Yearbook*.
Adjustment was made (by SSB) on data since 1998 for compatibility with previous years.

Sources: State Statistical Bureau, *China Statistical Yearbook 2001* and previous issues. This data also appears in the *China Industrial Economy Statistical Yearbook*.

Such questions relating to the SOE reform agenda have been at the forefront of economic policy debate in China. The next steps in SOE reform will be crucial in enabling China to continue on the favourable economic growth path of the past two decades. For the most part, this thesis concerns itself with questions of considerably narrower focus than that of the very survival of the Chinese SOE sector. Nevertheless, it is the author's hope that that the analysis conducted herein will in some modest way advance the debate in relation to such big questions, which we shall address directly in the concluding chapter.

This chapter has two main sections. The first section presents an overview of the issue of SOE reform and its importance to the economic policy debate both within China and further afield. The second section presents an overview of each of the ensuing chapters, and in so doing outlines the specific questions addressed by the thesis and the approaches taken to address them.

1.1 The SOE issue and the reform agenda

SOE reform in the Chinese policy agenda

The importance of the Chinese economy is readily apparent from the country's size. As a schoolboy, I was taught that three-quarters of the human race lived in general poverty, at living standards far below those of the affluent quarter. While perhaps simplistic, this statement was basically true and remains so, and within the field of economics there can surely be no issue more worthy of address. It was also true that the Chinese people alone virtually accounted for one of those three quarters; in 2000 China's population exceeded 1.26 billion and was growing by over 10 million per year (SSB 2001a). However, the growth that China has achieved over the past quarter-century raises the prospect that she may follow Japan and the Asian Tigers as the next 'growth miracle', joining the ranks of the world's developed economies within our lifetimes (Garnaut 2002).[5] If the whole of China could succeed in promoting itself from the impoverished to the

affluent category of humanity, then the overall scale of human poverty, while still appalling, would by this single development be much reduced.

Sheer size also motivates the study of the Chinese SOE sector, since it still occupies a very significant fraction of that massive country's economy. In 2000, SOEs provided a livelihood for some 20.96 million regular full-time employees, a figure that (even without including the dependents of SOE employees) exceeds the population of Australia. In fact, this figure had been over 40 million as recently as 1997 (SSB 2001a: 402). Moreover, the SOE sector still occupies crucial tracts of the Chinese industrial landscape. Although no longer enjoying the overwhelming dominance of the pre-reform period, SOEs still dominate the markets for a number of key commodities, particularly in heavy industry and infra-structure sectors. For example, the State still has monopolies in posts and communications, civil aviation and railways, and has majority shares in the coal, petroleum, gas, metallurgy, chemical and transport equipment industries (see Table 1.2). Although now producing less than 30 per cent of gross industrial output, SOEs enjoy disproportionate access to various industrial resources. In the year 2000 SOEs employed 51.1 per cent of the industrial labour force (66.4 per cent in 1995), carried out 50.1 per cent of industrial investment (54.4 per cent in 1995) and absorbed 61.8 per cent of domestic credits (61.4 per cent in 1995).[6] Such is their continuing weight that no comprehensive understanding of the contemporary Chinese economy or the reform process can be had without due consideration of the particular issues of SOEs.

Table 1.2 **SOE share of gross output in selected sectors**
(billion yuan, percentage)

	1995 [a]		1999 [b]	
	SOE gross output	SOE share of total	SOE gross output	SOE share of total
Coal Mining & Processing	100.0	80.9	89.7	77.7
Petroleum & Natural Gas Extraction	208.1	99.8	136.3	95.4
Petroleum Processing & Coking	239.8	88.6	178.9	88.2
Chemical Raw Materials & Products	260.5	52.9	214.1	56.0
Ferrous Metals Smelting & Pressing	303.5	74.1	252.3	68.9
Non-Ferrous Metals Smelting & Pressing	93.0	51.9	76.1	55.4
Ordinary Machinery	115.1	42.7	94.8	40.1
Transport Equipment	316.5	67.9	170.1	51.5
Electricity, Steam & Hot Water	342.4	85.7	189.5	77.6
Gas Production and Supply	10.4	79.2	6.8	89.7

Notes: [a] SOE figure for 1995 represents state-owned industrial enterprises with independent accounting systems. Total represents all industrial enterprises with independent accounting systems.
[b] SOE figure for 1999 represents state-owned and state majority shareholding industrial enterprises. Total represents all state-owned industrial enterprises and non-state-owned industrial enterprises above designated size.
Sources: State Statistical Bureau, *China Statistical Yearbook 2000* and *China Statistical Yearbook 1996*.

Considering the scale and urgency of various socio-economic issues in China, it is probably the case that the SOE sector is, to borrow a phrase from another context, 'too big to fail'. By this I do not mean that SOEs cannot be allowed to go bankrupt, but that the sector cannot be allowed to become a dead weight for the rest of the economy to carry. The pressures of China's massive population are creating various problems that will require a flourishing industrial sector if China is to address them. The rapid ageing of the population means that China's productive-age workforce in coming years will be required to maintain a large elderly population in relative terms. This makes it vital to raise the per capita productivity of that

workforce as quickly as possible. China's rural population of over 800 million persons subsists on substantially lower incomes than their urban counterparts[7] and endures extensive underemployment. This makes it vital to expand as quickly as possible the employment base of the urban manufacturing and service sectors so as to absorb the rural labour overhang. The environmental damage caused by rapid industrial growth has given rise to serious problems of water, soil and air quality that imperil the very habitability of some regions. This makes it vital for China to undertake substantial environmental investments in coming years while at the same time restricting or closing some high-polluting manufacturing enterprises. All of these pressing socio-economic objectives could be seriously hindered if the still-large SOE sector were to stagnate, slowing the overall economy's growth, generating financial losses and draining the country's fiscal resources.[8]

Wider implications: issues of economic transition

The lessons from China's experience in SOE reform are important not only for China but for all economies in transition from central planning. China is a unique and valuable case study in the field of transitional economics, both in its approach to reform and in the results achieved. No other country from the former 'communist bloc' has achieved the high growth rates that China has in its reform period, and numerous examples of sharp negative growth and painful dislocation litter the field (Kaser and Allsopp 1992). A detailed understanding of the issues of Chinese SOE reform can contribute much to our understanding of related issues in other economies. For example, many researchers have contrasted the gradualist reform strategy of the PRC with the 'big bang' or 'shock therapy' approach adopted by transitional economies in Eastern Europe (McMillan and Naughton 1992). McKinnon (1993) argues that the initial Soviet reforms from 1985 to 1991 were unsuccessful, leading to hyperinflation and macroeconomic instability because the reforming Soviet authorities 'got the order of liberalisation

Table 1.3 **Macroeconomic indicators for various transforming economies**

(percentages)

	GDP growth			Inflation			Unemp
	1990	1991	90-99	1990	1991	90-99	1991
China	3.8	9.3	10.7	5.6	6.7	8.2	2.3
Bulgaria	-12	-23	-2.7	19	550	111.8	11
Czech.[(a)]	-2	-16	0.9	10	60	13.7	7
Ex-GDR	-14	-19	--	-3	14	--	12
Hungary	-4	-8	1.0	29	36	20.7	8
Poland	-12	-9	4.7	585	60	24.5	11
USSR / Russia [(b)]	-2	-17	-6.1	5	86	189.6	3

Notes: [(a)] Czechoslovakia in 1990 and 1991. Czech Republic thereafter, not for the full 1990-99 period.
[(b)] USSR/CIS in 1990 and 1991. Russian Federation thereafter.

Sources: 1990-99 growth and inflation data from World Bank *World Development Report 2000/2001*.
1990 and 1991 East European data from Kaser and Allsopp (1992) quoting various original sources.
Other China data from State Statistical Bureau, *China Statistical Yearbook*, various years.

wrong', whereas Chinese reforms followed a more appropriate sequence.[9] China's experience in SOE reform may be very instructive for example for a country like Vietnam, which is commencing its reforms under fairly similar conditions. Besides the sequencing of reforms, another issue affecting all transitional economies concerns the end-point of market-oriented reform. Should formerly centrally planned economies seek to evolve all the way to fully-fledged market economies after the model of Western countries or is there a workable 'third way' combining features of socialism and free enterprise? Is China's formula of substantial state ownership within competitive markets just such an alternative, a feasible end-point? Or have Chinese authorities merely succeeded in postponing the inevitable pain of fundamental ownership reform that other transitional economies have already confronted?

Performance, behaviour and options for reform

So, is the SOE sector a dead weight on China's economic growth capacity? This question remains contentious, and therefore an important topic for continuing research. Some might assert that the simple fact that SOEs have been outgrown by NSEs implies the failure of SOE reform. Others, such as Lin, Cai and Li (1996) and Naughton (1995) present more integrated views, stressing roles that the SOE sector played in supporting the overall reform strategy that are not necessarily reflected in the trading results of SOEs themselves. Lin *et al.* note that the pre-reform centrally planned system distorted the prices of inputs and outputs so as to advantage the development of heavy industry over labour-intensive light industry and agriculture. As controls were steadily lifted, new non-state firms were free to grow within the light industrial sectors while many SOEs remained hog-tied to heavy industry. Naughton emphasises the role of the dual-track approach to reform, wherein planned quotas and prices remained in place for SOEs while above-plan output could be sold at market-clearing prices. The relative magnitude of non-plan output thus grew steadily, a process described as 'growing out of the plan'. While the lingering planned component of economic activity continued to disadvantage SOEs in relation to their non-state competitors, the overall strategy was successful in creating an economy responsive to market prices, without the shocks that may have accompanied any alternative strategies such as their sudden mass privatisation. Some scholars such as Woo (1993, 1994a) offer less sanguine views of SOE reform under the gradualist strategy, criticising the sector's efficiency and poor financial performance. Lardy (1998) stresses the excessive accumulated liabilities of the sector to the state-owned banks that service it, and warns of an impending financial crisis. One China-watching economist of the author's acquaintance is fond of declaring the term 'SOE reform' to be an oxymoron. These competing views are discussed in more detail in Chapter 3. This thesis seeks to produce further evidence on SOE performance that advances the debate. Specifically, it investigates the issue

of employee over-compensation as a possible explanation of the sector's poor profit performance up to the mid-1990s.

Questions of industrial performance are intimately linked with questions of governance and behaviour. If Chinese SOEs have under-performed, what model of firm behaviour can explain that under-performance? Sicular (1995) has put forward the hypothesis that SOEs behave somewhat in the manner of the labour-managed firm model and seek to maximise net remuneration (wages, benefits and retained profits, net of taxes) per employee rather than profits. An alternative hypothesis would be that SOEs do genuinely seek to maximise profits, but tend to perform poorly in this area because of various policy-mandated financial burdens and stiff competition from the non-state sector. Evidence that SOEs do in fact behave in the manner of labour-managed firms would not only go far to explain why profitability performance has been less impressive than productivity performance, but would also have specific implications for appropriate policy choices. It would imply, for example, that the removal of unequal policy burdens would not be enough to rescue the sector, and that the incentive structure surrounding SOEs would need to fundamentally change so as to reinstate true profit-maximising behaviour.

Whether or not SOE managers can ever be made to pursue true profit-maximising behaviour under state ownership where the profits from their efforts must be remitted to the state is a matter of further controversy. A substantial body of scholars argues that they cannot, and that the only governance structures that can reliably pursue profits and efficiency are those commonly found in market economies. Such scholars argue for 'ownership reform', or rapid privatisation, and reject the formula of gradualist reform under state ownership. However, other scholars argue that reforming the institutional structure and corporate governance of SOE firms could be sufficient to enable them to compete on an equal footing with the non-state sector, as some state-owned firms do in market economies (Lin, Cai and Li 1998).

From the mid-1990s, amid growing concern over the financial performance of the SOE sector, the government commenced an acceleration of the pace of SOE reform, under the banner of 'holding the big and releasing the small' (*Zhuada Fangxiao)*. Under this policy, the state would allow small and medium-sized SOEs to change their ownership structure in a variety of ways, while a core of large firms would remain in government hands. While this policy change represented a partial victory for the advocates of ownership reform, the principle that the state must retain a significant role in the direct ownership of industry remains intact, both ideologically and in practice. Partly for reasons of data availability, the core chapters of this thesis focus upon the reform period up until the time of the announcement of the *Zhuada Fangxiao* policy. The empirical analysis is conducted on a data set covering the years 1980 to 1994. A review of events since 1995 is conducted in the final chapter to provide further context for our consideration of the policy implications of the findings of the thesis.

1.2 Structure of the thesis

The present chapter establishes the importance of SOEs in the Chinese economy and the economic policy debate in China about their importance and role.

Chapter 2 reviews the character of the SOE reform process. It first reviews the economic system that prevailed in China prior to the reform period, including the deep economic problems that initially motivated new policy directions. The chapter then proceeds with a roughly chronological view of reform measures that have affected state-owned enterprises. It examines particular aspects of economic organisation, such as labour and capital markets, price reform and competition, facilitating a fairly detailed understanding of the operating environment into which SOEs have been placed as the developments of the period have unfolded. The chief concerns of this chapter are the directions of reform, the extent of progress that was made, and some new problems that seem to have arisen as unintended consequences of the reform process. These problems include the pursuit by

SOE management of objectives other than profit maximisation (what I call the 'behavioural issue'), and the related overcompensation of SOE employees. This chapter, along with Chapters 3, 4 and 5, mainly concerns itself with developments up to the mid-1990s, which point marked a change in the nature of SOE reform. Subsequent developments are reflected upon in the concluding chapter.

Chapter 3 presents a review of SOE performance. It commences with an empirical examination under the following topics: output and output growth; productivity; and profitability and financial performance. In short, we find that SOEs enjoyed rapid output growth, mainly through the expanded use of resources rather than improvements in productive efficiency. The Total Factor Productivity (TFP) growth of the sector was probably at low positive levels through the period, and fell well short of the TFP growth achieved by the non-state sector. The profitability of the sector declined alarmingly over the period, creating a severe debt problem with dangerous macroeconomic consequences. We review the literature surrounding SOE reforms and performance, and find that views are generally split between an 'Optimistic' camp that views the existing gradualist strategy as a success and a 'Pessimistic' camp that urges more fundamental reform. A dispute over the evidence regarding employee overcompensation is an integral part of this debate; the 'Pessimistic' camp argues that overcompensation was a prime reason for SOEs' poor profit performance. Therefore, the remainder of the thesis seeks to advance the debate via an analysis of the overcompensation issue and the related behavioural issue.

Chapter 4 conducts a theoretical analysis of the behavioural and overcompensation issues with a view to designing appropriate empirical tests. Two alternative models of firm behaviour are proposed; the orthodox Profit-Maximising Firm (PMF) and the Labour-Managed Firm (LMF) which seeks to maximise the remuneration of its own employees. A version of the LMF model has been advanced to explain the poor profit performance of SOEs in the presence of positive TFP growth. The chapter examines the

characteristics of the PMF and of three versions of the LMF in some detail. We then search for an empirical test to determine whether an observed group of firms engages in PMF or LMF behaviour, and conclude that the best test for our purposes is a comparison of the output elasticity of labour with the labour share of value added. This also happens to be a standard test for overcompensation, so we are able to investigate both the behavioural issue and the overcompensation issue simultaneously.

Chapter 5 carries out the empirical tests proposed in Chapter 4 to test the hypothesis of overcompensation. We use a data set covering 840 state-owned firms from 1980 to 1994. The output elasticity of labour and the labour share of value added are each estimated annually, for the entire data set and also for five individual manufacturing sectors. Any excess of the former estimate over the latter represents overcompensation. Using a similar methodology to Raiser (1997b) strong and consistent evidence is found to show that overcompensation was occurring by the early to mid-1990s, both in manufacturing industry overall and in each of the five individual sectors examined. It is also found that the extent of overcompensation was greater in the small and medium-sized firm sectors than in large firms.

Chapter 6 reflects on the conclusions of the empirical analysis and discusses their implications for the debate over SOE reform. In this context, we consider the new reform developments that have occurred since the mid-1990s, centring on the policy of *Zhuada Fangxiao* ('hold the big and release the small'). This policy is largely motivated by the view that state monitoring is more effectively carried out with a small number of large firms than a large number of small firms. The empirical findings of the thesis are found to broadly endorse the *Zhuada Fangxiao* policy direction. The findings are also broadly consistent with Derong Chen's (1995) assertion that state controls and monitoring were withdrawn more rapidly from light industrial sectors than from heavy industry. We discuss the future prospects for the SOE sector, the optimal pace of future reform, and its likely endpoint. Finally, potential avenues for further research are suggested.

Endnotes

[1] Gross Industrial Output, a measure reported in official Chinese statistics, is defined as 'the total volume of industrial products sold or available for sale in value terms which reflects the total achievements and overall scale of industrial production during a given period' (SSB 2001a: 461).

[2] For descriptions of these various ownership types see Section 2.7 in Chapter 2.

[3] Calculated from SSB (2001a: 52), using geometric mean. While there are widespread suspicions that official statistics may overstate Chinese growth rates somewhat, it is universally agreed that Chinese growth in the reform period has been rapid by any international comparison. For example, Maddison (1995) generated adjusted data that indicates real GDP growth of 7.7 per cent from 1978 to 1992. On the other hand, the World Bank's *World Development Report 2000/2001* reports Chinese GDP growth of 10.1 per cent from 1980 to 1990 and 10.7 per cent fro 1990 to 1999.

[4] From 1994 onwards the pace of SOE reform quickened considerably. Smaller SOEs were privatized and surplus labour was being shed on an unprecedented large scale. Yet even these more radical reforms should be described as 'gradualist' if considered in comparison with the 'shock therapy' policies of other transforming economies. Crucially, Chinese policy still stresses the maintenance of a significant state-owned industrial sector at the end-point of reform.

[5] Garnaut (2002) regards as feasible the prospect of China maintaining a 4.5 per cent growth differential over the United States over coming decades. Under this scenario, China would catch up with average incomes in the US within about 50 years. Note, however, that China's attainment of developed country status does not require catching up fully with the US; a number of countries have somewhat lower per capita incomes than the US but are also classified as 'developed'.

[6] Percentages calculated from various data entries in SSB (2001a: 157-162, 402) and SSB (1996a: 412).

[7] In 2000, average net income per capita (that is, net of business expenditures, purchases of fixed assets and taxes) of rural households was 2253 yuan, while the average disposable income per capita of urban households was 6280 yuan, approximately 2.8 times higher.

[8] A number of publications discuss the various socio-economic problems mentioned in this paragraph. They include Lardy (1998: 187–193) and various specific studies published by the World Bank.

[9] For specific comment on the Soviet Union and China respectively, see McKinnon (1993), p. 120 and Chapter 13.

2

Enterprise reform in review

China's state-owned enterprises have been undergoing various processes of change and reform almost continuously since the commencement of the reform period in 1978. As a result of these reforms, the Chinese SOE sector by 1994 differed starkly from that of the standard Stalinist-style command economy, while remaining distinct from the industrial sectors of market economies. This chapter provides background for subsequent chapters by reviewing the reforms that occurred in the sector and in key aspects of its external environment, focusing on the period from 1978 to 1994.

The chapter begins with a description of the centrally planned system that prevailed prior to reform, identifying the various systemic weaknesses that the reforms sought to address. Reforms carried out from 1978 are then reviewed under the following categories in Sections 2.2 to 2.7: general directions, incentives and autonomy, price reform and the dual-track system, capital and investment, labour, and the development of competition both within the SOE sector and from the non-state sector. Section 2.8 spotlights two closely related issues that arose as unintended consequences of the reform process. I refer to these as the 'behavioural issue' and the 'over-compensation issue' and they form the key focus of the later chapters of the thesis. Section 2.9 summarises the chapter.

In this chapter as with the thesis overall, the primary concern is with events over the period from 1978 until approximately 1994. Over this period as the chapter will show, reform was a roughly linear process characterised by increasing incentives and autonomy, gradual domination by market mechanisms over planning mechanisms, and exposure of SOEs to competition from the non-state sector. The commitment to state ownership remained a constant, and budget constraints remained 'soft' in several respects, despite efforts to harden them. From around 1994, a number of new reform initiatives arose, some of which were radical departures from the policies that prevailed in the 1980s and early 1990s. Measures included

corporatisation, diluted public ownership and a more ready acceptance of bankruptcy and labour redundancy. While these more recent developments are clearly important, there remain (as Chapter 3 shows) unresolved questions regarding SOE conduct and performance up to the mid-1990s. This thesis seeks to make its contribution by providing more evidence on these questions. We will then briefly consider events post-1994 in the concluding chapter in light of the insights thus generated.

Table 2.1 presents a chronological summary of major reform measures affecting the SOE sector up to 1994. The various developments referred to in that table are mentioned within the text of this chapter.

2.1 The pre-reform SOE system

Prior to 1978, China shared with other socialist countries the centrally planned system of economic organisation patterned after that in the USSR. The construction of this system commenced shortly after the establishment of the People's Republic of China in 1949, and was essentially completed by the early 1950s. Under the Stalinist system, state planners sought to control the allocation of resources directly so as to build up a modern heavy industrial sector as quickly as possible. In other words, the state imposed its own strong preference for the development of heavy industry, as this was regarded both as the hallmark of a developed socialist economy, and as the basis for the military power that would support the attainment of China's geopolitical goals (Naughton 1995: 28). The Stalinist approach to economic development contrasts with the neoclassical or market-based approach, which relies on market prices to allocate resources on the basis of relative scarcity, thus allowing the country's comparative advantage to determine the industrial structure.

In China's case, a strategy based on comparative advantage would not have satisfied the Communist Party's preference for the early development of heavy industry, since the country was labour-abundant and capital-poor. Natural comparative advantages would have favoured the growth of labour-intensive light industries rather than capital-intensive heavy industry.

Therefore, a comprehensive set of controls was established over all aspects of the economy so as to push development in the desired direction. All manufacturing industry was nationalised to give the state direct control over all significant productive resources. Production was predominantly carried out on the basis of the central state plan, which stipulated what each firm was to produce, what productive inputs it was to employ, who it was to buy from and sell to, and at what prices. The qualifier 'predominantly' is used here because China, being less developed including in institutional capacity, never achieved the degree of planning control that was attained in Eastern Europe (Naughton 1995: 41). The prices set by the planning mechanism for all commodities were designed to tax the agricultural and light industrial sectors in effect and to stimulate the growth of heavy industry (Lin *et al.* 1996). Low prices were set for industrial raw materials and fuels, grain and other basic agricultural products, and interest rates and urban wages were repressed. Prices for manufactured consumer goods on the other hand were set artificially high. Heavy industry was therefore able to generate large surpluses; according to Naughton (1992) total profit and taxes generated by the sector amounted to 25 per cent of GDP in 1978. These surpluses were remitted to the central government as its primary source of budget revenue, and then largely returned to the manufacturing sector as budgetary grants for capital investment. The state-owned manufacturing sector thus formed the main locus of material balance between savings and investment in the economy (Naughton 1995).

Table 2.1	**Chronology of reform measures**
Year	Measures
1978	• (October) First experiments in SOE incentives and autonomy, Sichuan. • Worker bonus system reintroduced, virtually universal by 1979. Preliminary price reform commenced — administrative prices adjusted in favour of agriculture.
1979	• 'Monobank' system ends with creation of Bank of China, Agricultural Bank of China and People's Construction Bank of China, creating competition in banking.
1980	• (August) Official press announces profit-sharing scheme or 'economic responsibility system' to become the new national model, to be adopted in all firms by end of 1981.
1983	• Tax-for-profit scheme (*li gai shui*) introduced. • People's Bank of China's commercial banking functions transferred to the new Industrial and Commercial Bank of China. • Labour contracts for regular employees first introduced in SOEs.
1984	• (May) Enterprise 'Bill of Rights' introduced, specifying areas of firm autonomy. • (Oct) Adjustment tax introduced to address anomalies in Tax-for-Profit scheme. • First experiment in shareholding. • Above-quota output prices allowed to float to 20 per cent above plan prices.
1985	• Above-quota output allowed to be sold at market prices — commencement of the dual price system. • Experiments with 'Floating Wage' system commenced.
1986	• Approximate commencement of the Contract Management Responsibility System. • First issuance of corporate bonds. • (October) Labour reforms: new SOE hires to be on contract, free SOE labour recruitment, regulations on dismissal issued, social security and unemployment funds.
1988	• Coverage of the Contract Management Responsibility System reaches 90 per cent. • Price controls temporarily tightened in response to inflationary outburst.
1989	• (Nov) '39 Points' issued, signalling the conservative ascendancy post-Tiananmen.
1990	• Consensus turns against the conservative faction. • (Dec) Shanghai Stock Exchange opened.
1991	• (Apr) Shenzhen Stock Exchange opened.
1992	• Price controls again temporarily imposed in response to inflationary outburst. • Deng tours Southern China, signaling post-Tiananmen victory of the reform faction. • Production and allocation plan coverage cut back for the first time.
1993	• Corporate tax rates unified at 33%. • Grain prices substantially de-controlled. Controls now cover only 5% of retail sales and 15% of industrial goods sales.
Note:	See the text of this chapter for further details and references on these various reform measures.

The system could be argued as a success in terms of its original goals. The economy did grow; net material product for the economy overall grew by 6 per cent annually between 1952 and 1978, equating to 4 per cent growth in per capita terms. Moreover, industrial output expanded even more rapidly, by 9.7 per cent annually between 1957 and 1978 according to official statistics (Naughton 1995: 52). Moreover, social welfare increased by a number of measures. Life expectancy increased to 65 years by 1978, and literacy and health levels were high by developing country standards. In terms of its military development goals the PRC was fairly successful, building the world's largest military force by numbers of personnel and equipping it by the late 1970s with approximately 10,000 tanks, roughly the same number as maintained by the United States, although far short of the 50,000 possessed by the Soviet Union (Chant 1979; see Table 2.2 for more details). However, living standards as measured by household consumption spending hardly rose, as much of the increase in production was channelled into heavy industrial, capital and military goods rather than consumer goods. As in other command economies, there was considerable misallocation and waste of resources via the excess accumulation of inventories, incomplete investment projects, and misallocated labour. Total factor productivity (TFP) growth was low; the growth in output was predominantly achieved extensively, via the quantitative expansion of inputs, notably labour and capital. Under standard neoclassical growth theory, extensive growth with static TFP levels cannot achieve sustained growth in per capita output and incomes since the marginal return to capital declines as the capital/labour ratio increases (Wells 1995: Chapter 14). Therefore the rate of per capita growth achieved solely by capital accumulation perpetually diminishes unless there is efficiency improvement or technical advancement that raises factor returns. The realisation by the late 1970s that growth in output and especially in living standards was lagging badly behind the export-oriented 'Asian tigers', encouraged new approaches to development strategy. In the military sphere also there was concern that the People's Liberation Army, despite its size, was falling behind technologically and becoming increasingly vulnerable to the then perceived Soviet threat (Bonds 1979a).

This military factor can only have added to the policy imperative to improve efficiency, technological progress and economic growth.

Table 2.2 **Comparison of major armaments, 1979**

	China	**USSR**	**USA**
Tanks	10,000	50,000	10,500 medium, 1,600 light
Armoured personnel carriers	3,500	..	22,000
Artillery pieces	18,000	20,000	5,500
Mortars	20,000	7,200	3,000
Combat aircraft	5,000	5,000	5,000

Source: Chant (1979).

The poor efficiency performance of the pre-reform economy can be traced to the organisation of production and distribution at the micro level (Huang and Duncan 1998, Hay *et al.* 1994, Zhao 1994). Under the centrally planned system, firms had almost no autonomy to make decisions, and little incentive to improve performance. Moreover, facing a heavily distorted price structure, they also lacked information in the form of prices to make economically efficient decisions. Production and distribution were governed not by the market but by the central plan. The plan mandated what outputs each firm was to produce and where that output was to be distributed, what inputs they were to use, and the prices of all goods. Firm managers had virtually no important decisions to make; they were merely required to achieve the output quotas set for them by the central plan. All profits were remitted to the state as the representative of the whole people, and any losses were compensated for by the state. Profitability could serve no real function as an indicator of the performance of firms. So long as firms' production activity adhered to the plan's input and output quotas, their profits were predetermined by the artificial plan prices. These prices often bore little relation to the relative scarcity of goods.

Capital was distributed to each enterprise primarily in the form of state grants. The banking system served as little more than a conduit for budgetary outlays. Indeed, until 1979 there was only one bank, the People's Bank of China. Its largely passive role in credit allocation mirrored the role of SOEs in the industrial sectors; it mechanically distributed capital grants and working capital in accordance with the central credit plan much as industrial firms obeyed production plans, without the mandate, the incentive or the autonomy to raise efficiency or maximise profits. Credit responded to material flows, not the other way around (Naughton 1995). A feature of the standard command economy capital allocation system is that it encouraged what Kornai (1980) refers to as 'investment drive' behaviour. Since the capacity to invest generated prestige, power and other benefits upon enterprise managers and yet imposed no real costs, the natural tendency of enterprises, if unconstrained, was to invest without limit. This tended to lead to a situation of chronic scarcity of goods, the 'shortage economy'.

The labour 'market' was similarly tightly controlled, with state labour bureaus allocating labour directly to enterprises, and most workers effectively on lifetime contracts. Naughton (1992: 44) reports that during 1979 only 22,000 employees in the state system were fired or quit their jobs, only 0.03 per cent of the labour force, with death accounting for seven times as many departures from the work force. Restrictions on labour mobility were extreme. Internal migration was virtually prohibited via a system of household registration.[1] The 'iron rice bowl' philosophy in which work units effectively guaranteed the basic necessities of employees, provided considerable economic security to those in the urban industrial sector. However, it provided little else; wage and salary scales were very flat, implying little material reward for achievement or advancement. There was also very little penalty for shirking or poor performance, as workers were almost impossible to dismiss for any reason short of criminal conviction. Workers' bonus systems, common in other socialist economies, were a feature in the 1950s and early 1960s but were abolished in 1966 amid the radicalism of the Cultural Revolution period. The labour system in China

was markedly more rigid even than that in the USSR, where a labour market existed, job transfer was not infrequent, and 88 per cent of workers received bonuses and/or piece rates.

The appointment, monitoring and reward of managers was governed at least as much by political considerations as by their performance, which in any case was judged by the attainment of output targets rather than profitability. The Communist Party Secretary at each firm was typically as influential if not more so than the actual manager of the enterprise. Party organisations would directly assume many of the responsibilities of managing factories, and retained formal powers to interfere in the management of the firm (Walder 1989). Industrial management formed part of the party hierarchy, and successful managers could aspire to other political or bureaucratic postings as part of their careers.[2]

SOEs in China, as in other command economies, suffered from what Kornai (1980) identifies as the 'soft budget constraint' syndrome. In basic terms, a firm's budget constraint is regarded as 'soft' if the firm is not strictly required to cover the cost of its inputs from the proceeds of its sales. Firms that face hard budget constraints hold the *ex ante* expectation that failure to operate within the budget constraint will lead to severe consequences such as bankruptcy. Firms facing soft budget constraints by contrast hold the expectation that loss-making would not imperil the survival of the firm, for example because the state can be expected to step in and provide subsidies. Kornai (page 306–308) lists the following five characteristic conditions and five consequences pertaining to soft budget constraints (Kornai's own wording abridged):

> *Condition 1: Price-making.* The majority of firms are not price-takers but price-makers. Price is not exogenous for most firms.
>
> *Condition 2: The tax system is soft.* For example, (a) the formulation of tax rules may be influenced by the firm, (b) the firm may be granted exemption or postponement as an individual favour, or (c) taxes may not be gathered strictly.

Condition 3: Free state grants. These may take the form of (a) free contributions to investment expenditures, (b) regular subsidies to compensate for recurring losses or to encourage a particular activity over a long period, or (c) *ad hoc* subsidies to cover an occasional loss or encourage a special activity.

Condition 4: The credit system is soft. Credit is not extended on a commercial basis. The firm is granted credit even if there is no guarantee of repayment from earnings. The firm is permitted to fail to fulfil its contracted repayment obligations. Moreover, when purchasing inputs, the firm is allowed arbitrarily to postpone payment without previous agreement with the seller.

Condition 5: External financial investment at soft conditions. Kornai notes that for state-owned firms, this condition is indistinguishable from free state grants. However, for private firms it is instanced by owners investing money from their own resources to help the firm out of financial difficulties.

Consequence 1: Survival. Survival of the firm does not depend on its capacity to fund inputs from the proceeds of its sales. Losses may be covered by tax exemptions, grants, soft credit, etc. Profit is *'not a question of life and death'* for the firm (emphasis by Kornai 1980).

Consequence 2: Growth. The growth of the firm need not depend on investments funded by the firms own earnings (either accumulated past earnings or hard credit to be repaid from future earnings). The needed resources can be provided by the state in the form of grants and soft credit.

Consequence 3: Adjustment to prices. The firm is not necessarily compelled to adjust to prices (by which Kornai seems to mean changes in the relative prices of inputs), for two reasons. First, the firm may be a price-taker and able to pass on any cost increases. Second, even if it disregards prices and suffers losses as a consequence, these may be compensated for as noted above.

Consequence 4: Uncertainty. The firm does not bear risk alone but shares it with the state. If circumstances were to develop favourably, the additional profit would likely be 'skimmed off' by state agencies. However, if the firm were to suffer from 'bad luck' of some kind, it would probably be able to shift the consequences onto someone else: perhaps buyers or creditors, but primarily the state.

Consequence 5: Demand of the firm. As a result of the other consequences, the demand of the firm for inputs is almost insatiable. It is not constrained by the price of inputs or the income of the firm. At the macro level, this consequence manifests itself in the chronic shortage condition typical of command economies. Firms in an economy marked by soft budget constraints also exhibit chronic disposition towards investment since they have much to gain from expansion but need not fear the consequences of unprofitable investments.

One of the inevitable effects of the soft budget syndrome was the erosion of incentives, especially what might be called 'negative incentives'. By this term is meant the fear of adverse consequences for poor performance. Since a state firm was unlikely ever to face bankruptcy, managers faced only weak penalties for poor financial performance. This poor incentive structure filtered down to the labour force, who faced little disincentive for inefficient or counterproductive work practices. As has already been noted, positive incentives for both managers and workers, such as via bonuses and wage and salary rises, were also weak or non-existent.

Another consequence of soft budgets is the undermining of the financial system as a means for controlling and monitoring the allocation of resources. Under a market system, capital is allocated (in the form of debt or equity) in the expectation that it will generate positive returns. If a recipient of capital consistently fails to make profits, such returns will not be forthcoming and further capital will not be allocated. In a soft-budget economy however, capital continues to be allocated even if resources are wasted and economic losses are chronic. Therefore, the financial system

essentially does not serve to maintain the efficiency of economic activity by seeking out the most profitable investments and terminating enterprises whose economic outputs are of lesser value than the inputs burnt up in their production.

Attempts at reform of the economic system prior to 1978 were limited to programs of decentralisation in which some responsibilities were devolved from the central government organs to the regions. The most recent of these was in the 1970s. These programs did not alter the basic fact of rigid official control over resource allocation and prices (Lin *et al.* 1996). A relative degree of decentralisation was appropriate for China's circumstances, being a large, diverse country with a lower level of development and larger rural sector than other socialist countries. However, due to poor and incomplete implementation, one of the main lasting effects of Chinese decentralisation was to confuse the boundaries between central and lower-level authorities, such that enterprises often had to report to multiple agencies at different levels of government (Naughton 1995: Ch 1). Naughton (1992: 47) goes so far as to assert that 'no stable or effective system for dividing responsibility between governmental levels was ever developed'.

2.2 SOE reform — general directions

SOE reform commenced without a clearly identifiable strategy as to how to proceed. There was at the outset little more than a general aim to improve the efficiency and performance of enterprises. Reform unfolded as an ad hoc process in which various initiatives were experimented with, and the seemingly more successful ones were implemented more broadly. Implementation of initiatives across the SOE sector was often far from even however, with the result that different firms were operating under quite different systems at any one point in time. Key reform policies would be officially announced, but effective implementation might not occur until some years later. Some of the significant developments in the process arose as unintended consequences of policy measures and of firms' reactions to those measures. There were setbacks, failures, instances of backtracking,

and conflicts between authorities at different levels of government. Across this overall landscape of considerable flux, a number of overarching themes can be identified that characterised the general direction of the reform process.

First, the overall process of SOE reform can be described as one of transformation from the command economy, characterised by public ownership with planned allocation of resources at state-determined prices, to a 'socialist market economy', characterised by public ownership with market allocation of resources at market-determined prices. Reforms sought to transform the internal conditions of firms by improving incentives, increasing firm autonomy, and by making firms responsible for their own performance. External conditions were transformed by making transactions subject to market allocation and prices rather than the planning process, and by making firms subject to greater competition. Over time, it was accepted that not only factory outputs but also productive factors such as capital and labour should be allocated via markets, although the process of developing such markets has proved more challenging. The overall objective, to this point at least, has never been to replace the previous system with an orthodox market economy dominated by private ownership. The reason is political and obvious; such a significant departure from Marxist orthodoxy would have been ideologically unacceptable and would have called into question the legitimacy of a political system dominated by the Chinese Communist Party (CCP). There exists a significant debate as to whether the socialist market economy formula is tenable in the long run, that is, whether enterprise reform and economic reform more broadly can succeed without privatisation. This broad debate is one that this thesis seeks in part to inform, and is taken up in the concluding chapter.

The second theme of reform has been gradualism. In this respect, the Chinese approach to SOE reform, and to economic reform in general, has frequently been contrasted with the approach taken in the former Soviet Union and other eastern European transitional economies. The contrast made has often been favourable to the Chinese approach (for example

McKinnon 1993). The gradualist approach involved initial retention of some of the features of the planned economy while market institutions were introduced and allowed to develop. This tended to imply a period of simultaneous coexistence of new and old mechanisms. For example, the system of plan prices was not immediately done away with, but retained for transactions carried out under the central plan, while firms were permitted to sell above-quota output at market prices (see Section 2.4). But the scope of the plan was not expanded during the reform period; rather it was frozen in place until 1993 when its coverage began to be cut back. Over time, growth in non-plan outputs plus shrinking plan coverage after 1993 combined to ensure that market prices eventually came to govern the majority of SOE transactions, a process that Naughton (1995) refers to as 'growing out of the plan'.

The third identifiable theme concerns the interrelated dynamics of reform changes. Rarely could any reform measure be considered in isolation. Reforms in one area generally led to significant pressures for further reforms in other areas. Over time this meant that the entire reform process gathered substantial momentum as the planned-economy system unraveled like tightly woven yarn. At times policymakers responded by attempting to slow or wind back reforms, most notably in 1989 when conservative leaders seized the ascendancy following the Tiananmen Square protests. However, such attempts to re-regulate the economy inevitably failed to achieve their goals and were followed by reinvigorated reform. Reform events also interacted with cycles of economic activity. Liberalisation typically led to accelerated growth and investment, but also to disorder and outbursts of inflation, such as in 1980, 1985, 1988 and 1994. In such instances, the contractionary monetary policy response was sometimes accompanied by a tightening of the reform leash, again most notably in 1989.

Specific aspects of reform are now examined in some detail, commencing in the following section with initiatives to improve incentives and autonomy.

2.3 Incentives and autonomy

The lack of positive incentives for firms, their managers and employees in the pre-reform period was identified from the outset of reform as a prime deficiency of the existing SOE system. A series of initiatives was therefore implemented to provide firms with the opportunity to retain a greater percentage of the returns from their operations, and in conjunction with this, to increase their decision-making autonomy. At least for the first decade or so of the reform period, such initiatives, along with price reform, set the pattern of SOE reform. The success of the household responsibility system in agriculture gave early encouragement and impetus to reform in SOE incentives. This system shifted the focus of production responsibility in agriculture from the collective level to the household level, allowed rural households to retain all the proceeds from their production after payment of a fixed land rent, and resulted in dramatic productivity improvements (Findlay *et al.* 1993). However, the introduction of effective incentive structures in large industrial firms was to prove a much more difficult and complex process than was the case for the agricultural sector. Indeed, by the late 1980s a policy consensus would emerge to the effect that improved incentives alone would not be sufficient to revive the SOE sector, and that a complex mix of interrelated reform measures, many of them highly challenging, would be necessary (Byrd 1992: 11, Hay *et al.* 1994: 10).

The most significant developments in incentive-autonomy reform over the first decade and a half of reform can be classified into three stages; (1) profit-sharing schemes, (2) the Tax-for-Profit reform, and (3) the Contract Responsibility System (CRS). Profit-sharing schemes, referred to by some as the Economic Responsibility System (Chen 1995), began on an experimental basis with six firms in Sichuan in October 1978. The initial experiment was steadily expanded, the central government extending it in May 1979 to eight selected SOEs in Beijing, Tianjin and Shanghai. Around 4,200 enterprises were participating by the end of 1979 and 6,600 by June 1980. These experiments typically included an incentive element in which firms retained a portion of plan and above plan profit (the profit retention

rate typically being higher for above-plan profit) and an autonomy element in which firms were permitted to independently sell above-quota output and internally appoint middle-level management. The profit retention rates were quite modest in these early experiments. In the initial six pilot enterprises retention rates were 3 to 5 per cent on quota output and 15 to 25 per cent on above-quota output, and conditional on fulfilling a range of economic and technical goals (Zhao 1994). Byrd (1992: 3) reports the retention rates as 10 to 30 per cent of above-quota profits in the case of the national system. The retention rates set were not at all uniform but were determined in a form of negotiation between the firms and state agencies. This was because, after decades under a system in which profitability was virtually irrelevant, it was quickly found that under the existing policy environment, SOEs differed very widely in their opportunities to make profits. State plan prices for inputs and outputs either advantaged or disadvantaged particular firms, and firms' endowments of capital as of the implementation of the scheme also varied considerably. Profitability could also naturally be expected to vary across regions and industrial sectors. State agencies therefore sought to 'handicap' firms, setting higher retention rates for less favourably placed firms and lower rates for more readily profitable firms. Chen (1995) notes that the system had sought to establish profit as the basic indicator of performance from the beginning, but additional indicators had to be employed in the early period, since price controls made profit an inefficient indicator. The profit-sharing scheme effectively became the standard SOE model with the National People's Congress's announcement that the scheme would be adopted in all SOEs by the end of 1981 (*Renmin Ribao* 20 August 1980, page 1).

Some writers describe the profit-sharing schemes as having evolved by 1981 into an early form of the contract system (variously labeled the Profit Contract System (Otsuka *et al.* 1998), and the Economic Responsibility System (Byrd 1992), a term that other writers reserve to describe the round of initiatives from 1986. From 1981 to 1983 when the system was widespread, it had become heavily based on negotiation. Firms were often

able to raise their marginal retention rates substantially. For example, they could negotiate to pay a lump-sum profit 'target', with retention rates on above-target profits set high, sometimes even 100 per cent. The system became somewhat chaotic, with contracts being adjusted from year to year or even within a year. Revenue-maximising state agencies might seek to adjust the terms in their favour as profits grew (the ratchet effect), or in the case of regional government agencies to collude with firms to reduce the share accruing to central state revenue. The terms of profit retention became dependent on firm bargaining power and skill rather than any rational economic basis, and incentives arose for firms to devote managerial resources towards bargaining efforts rather than productive operations. It appears that in these bargaining contests, SOE firms had the upper hand, as central government revenue declined significantly.

While profit-sharing was an important step forward in that it gave SOE management and employees some positive incentives for improving their performance, the system carried a number of serious weaknesses. First, the retention rates were typically modest, even miniscule, proportions of the residuals of firms (Zhao 1994: Chapter 4). Second, the setting of retention rates via negotiation rather than on the basis of consistent rules weakened the positive incentive effects and became a new manifestation of the soft budget constraint problem. Firm managers could often improve their circumstances more readily by bargaining with authorities to increase their retention rates than by putting the same effort into improving their firms' operations. Third, although managerial autonomy was increased to some extent, most notably by the freedom to market above-plan output independently, managers still faced considerable constraints over their operations and were subject to extensive interference by officials.

The second major phase of incentive reform dates from around 1983 with the introduction of the Tax-for-Profit scheme (*li gai shui).* This was an attempt to regularise the financial relationship between enterprises and the state by replacing the system of profit remittances with a system of enterprise income taxes. It sought to restore order to the situation and to

stem the haemorrhaging of state revenues that had occurred under the profit-sharing system (see the fiscal data presented in Chapter 3, Section 3.3. Experiments with a tax-based system had begun in 1979 in Hubei province and by 1982 over 400 enterprises were subject to the system (Zhao 1994). The establishment of the tax system as the standard for the SOE sector was advocated in the official press at the end of 1982 and implemented in July 1983.

The system initially featured a uniform 55 per cent tax on enterprise profits, in addition to the industrial-commercial tax which continued in place. However, the system soon ran afoul of the same problem that had confronted the profit-sharing system — divergent profitability among enterprises. The response was to again make the parameters of the system flexible and negotiable on a firm-by-firm basis. This was done in October 1984 by the introduction of an adjustment tax. This tax was intended to take account of factors that might give any firm an unfair advantage, such as favourable price settings, capital or resource endowments, or location.

In practice however, it was difficult for state agencies to distinguish objectively between good performance and unfair advantage. As a result the system again degenerated into one based upon negotiation between firms and agencies as had been the case under the profit-sharing phase, except that this time the focus of negotiation was on the rates of adjustment tax instead of profit retention rates. A uniform enterprise tax regime was not successfully introduced until 1994.

Another shortcoming of the tax-for-profit reform is that it led to very high effective marginal tax rates, since rates of adjustment tax were set higher for the more profitable firms (Otsuka *et al.* 1998: 32). In other words, the 'ratchet effect' was still endemic. Proper data on marginal tax rates is difficult to obtain, as most Chinese data surveys collect only enough information to compute average tax rates. Even if firm-level data on marginal rates were available, by its nature it would be difficult to aggregate from, since each firm's tax rates were calculated by a different formula. A

1985 survey estimated that enterprises retained an average of 22 per cent of gross profits, and distributed 37 per cent of this in the form of bonuses (Walder 1989: 243 quoting Xia and Li 1987). This suggests an average tax rate as high as 78 per cent, if we treat profits remitted to the state as being analogous to taxes. Since tax rates were progressive, marginal rates are likely to have been even higher.

The period of the Tax-for-Profit reform coincided with a major step in the expansion of SOE autonomy. May 1984 saw the promulgation by the State Council of the '*Provisional Regulations on Further Extending the Decision-Making Power of the State Industrial Enterprises*', a document described by Naughton (1995) as an enterprise 'Bill of Rights', also referred to as the 'Ten Articles'. This document, in theory at least, conferred the following autonomous rights upon enterprises (the following wording is reproduced from Laaksonen (1988):

1. *Production*: Businesses have the right to produce whatever is needed or is in short supply, after fulfilling their state plans and orders.
2. *Sales*: With certain exceptions, firms have the right to sell products thy retain for themselves, products in excess of state quotas, their own trial-produced or overstocked items, and those refused by state purchasing agencies. They must keep special accounts for the products they sell themselves and pay tax according to regulations.
3. *Pricing*: For the means of industrial production which they sell themselves and the products exceeding state quotas, businesses have the right to set prices within a 20 per cent range of the state price, or to negotiate the prices with buyers. They must abide by the state prices for the means of livelihood and the means of farm production.
4. *Purchase of materials*: Businesses have the right to choose their suppliers when they order state-distributed raw materials. Businesses may also obtain raw materials directly from producers without going through state monopoly suppliers.

5. *Use of funds*: Enterprises have the right to decide whether their share of profits goes into expanding production, trial production of new products, a reserve fund, the workers' welfare fund, or bonuses. They also have the right to use other funds for the first three items, together with funds for depreciation and large-scale repair.

6. *Handling of assets*: Businesses have the right to lease or transfer with compensation unneeded machinery or other fixed assets, but the income must be used to upgrade or renew their own facilities.

7. *Structural establishment*: Businesses have the right to decide on the setting-up of organisations and to assign their staff according to their needs as long as they stay within their authorised size.

8. *Personnel and labour*: The factory manager or director has the right to appoint or dismiss cadres under him. His deputies, however, are subject to approval from above. The director or manager and the party secretary are to be appointed by the higher competent departments concerned. The factory director has the right to reward or punish his workers and staff, with promotions, wage hikes, or even disciplinary dismissal. Directors have the right to employ workers on the basis of examinations under the guidance of the state labour-recruiting agencies. They also have the right to reject forced assignment from higher agencies or individuals.

9. *Wages and bonuses*: Businesses have the right to adopt any wage system, in line with state standards. Factory directors may promote 3 per cent of their workers each year, with the increased wages counted as a cost of production.

10. *Inter-unit operations*: Enterprises have the right to enter into joint projects which cut across official divisions, as long as they maintain their present system of ownership, finances, and subordinate relationships.

In practice firms did not immediately enjoy full autonomy in all these areas but moved in that direction over time. The 'Bill of Rights' indicated the overall intentions of policy, the actual transfer of genuine autonomy took

place over a number of years. Naughton (1995) identifies 1984 as a year in which the pace and determination of reform was significantly stepped up, and notes four particular measures that were important in cementing enterprise autonomy. These four are (1) the Factory Manager Responsibility System; (2) the authority to draw up the overall production plan within the enterprises; (3) the system that linked total wage bill to profit; and (4) long-term contracting over profit remittances between firms and their supervisory agencies. The first three of these were introduced in 1984 and the fourth in 1986, but it was not until 1988 that all four had been adopted in a majority of enterprises. Also commencing in 1984, the remuneration of enterprise managers began to be linked to enterprise profits (Groves *et al.* 1994).

The Factory Management Responsibility System was intended to separate industrial management from politics. As noted by Walder (1989), factory-level Party secretaries held considerable power over enterprise activities under the pre-reform system and in the early part of the reform period. Walder adds that rank and file workers also had considerable power to influence managers, since their lack of effective disciplinary tools left managers vulnerable to campaigns of non-cooperation by workers. Furthermore, disgruntled workers could make common cause with antagonistic Party secretaries. Under the new system, the Party committee no longer held the dominant position over SOE managers, and in the case of disagreement between the two, firm management was empowered to override the committee (Zhao 1994). An earlier attempt to institute a Factory Manager Responsibility System had been made in 1980 but was temporarily abandoned. The system was introduced again on an experimental basis in May 1984 and the October Reform declaration later that year called for nationwide adoption. Some reformers saw the development of a strong managerial class as a positive development that would help to resist excessive worker demands, although this viewpoint was opposed by conservatives and also by a particular group of reformers. Such political resistance was overcome and the system had become nearly universal by 1988 (Naughton 1995: 206). One can perceive the Factory Management

Responsibility System as driving a long-term process whereby managers' personal welfare came to be dependent increasingly on their own management performance rather than on the interests and influences of their employees, government officials and enterprise Party secretaries.

The failure of the tax-for-profit scheme to achieve its objective of regularising financial relations between SOEs and the state led to the third major phase in incentive reform. This commenced in approximately 1986 with the implementation of the Contract Management Responsibility System (CMRS). Experiments with this system had begun in 1984, and by 1988 it was being used by over 90 per cent of large and medium-sized SOEs (Zhao 1994: 84). The development of this system owed something to the Household Responsibility System in agriculture, which in turn echoed the contract-based tax-farming systems that were used during the Five Dynasties and Yuan dynasty periods (Chen 1995: 57). The CMRS was based on the signing of individual contracts between enterprises and state supervisory agencies. These contracts typically ran between three and five years and sought to define clearly the respective rights and responsibilities of enterprises and state bodies, including the terms of profit retention by firms. One of the intentions behind the CMRS reform was that this clear delineation of rights and responsibilities should act against arbitrary bureaucratic interference in firm operations and improve firm autonomy. It was also expected that by fixing retention rates for a number of years in the contracts, the 'ratchet effect' would be greatly ameliorated.

The contracts stipulated profit and other objectives as well as the distribution of earnings between the firm and the state. Typically, the amount remitted to the state in the year prior to the creation of the contract served as the benchmark or target for remittances under the contract, with the contract then specifying the distribution of profits achieved in excess of the target. The most common format for profit distribution specified a fixed profit target for each year of the contract, with above-target profits shared in an agreed ratio, the government's share typically being less than 55 per cent. Another method, effectively a variation of the first, entitled the enterprises to

100 per cent of profits earned above the fixed target. A third method involved a stepped target, which would increase in specified amounts over the life of the contract, with the firms retaining 100 per cent of profits in excess of the target for each year. Miscellaneous other formulae were also used. According to guidelines, 60 per cent of retained profits were to be spent on capital investment, 20 per cent on employee welfare services, and 20 per cent on bonuses and other employee benefits. In practice however, the majority portion of retained profit came to be allocated to bonuses (Otsuka *et al.* 1998).

As a response to the challenges facing incentive reform at the time, and given the difficulties inherent in adopting a uniform regime for all SOEs the CMRS was a coherent forward step, and appears to have functioned fairly well in its first few years of operation. Effective marginal retention rates were higher than they had been under the tax-for-profit reform (Otsuka *et al.* 1998: 32) and the ratchet effect was less prevalent. One drawback however was a tendency towards short-termism, as managers tended to be unconcerned about the welfare of their firms beyond the lifetimes of their own contracts (Parker and Pan 1995).

The CMRS broke down in the policy environment that prevailed in the period from late 1989 (Naughton 1995: Chapter 8). After Tiananmen, the conservative faction in the CCP gained control not only of the political apparatus but also of economic policy. This faction sought for a time to reverse such policy trends as marketisation, SOE autonomy and the fostering of the non-state sector. In seeking to reassert the primacy of the central planning system, the conservatives fostered a significant increase in official interference in the commercial activities of SOEs. This coincided with a policy of macroeconomic austerity to rein in inflation. SOEs in capital goods-producing sectors for example were forced to maintain production even as investment demand fell sharply. As a result, SOE profitability deteriorated significantly. In the majority of state firms, long-term contracts expired at the end of 1990 and had to be renegotiated. However, the circumstances were highly unfavourable. The incumbent conservatives had

been stressing increased contributions to government, while SOE managers had their own incentives to understate profits ahead of the contracting negotiations. Extensive state interference had undermined the integrity of the contract system, and the morale of SOE managers with it. Managers' willingness to honestly report profits and comply with regulations accordingly deteriorated. Derong Chen (1995: 124) relates a 1991 interview with an SOE director who declared: 'My job, to some extent, can be interpreted as struggling with government policy. If they [the government] increase sales tax and add other taxes in such an arbitrary way, we would try to reduce the gross profits before income tax as much as possible'. This firm admitted to under-reporting 1990 profit by over one-third. While in the immediate term there was little alternative but to proceed with a new round of contract renegotiations, when the political pendulum swung in due course back to the reformists, a fresh drive towards more thoroughgoing market-oriented reforms commenced including the achievement finally of a uniform profit tax rate of 33 per cent at the end of 1993. This next set of reforms dates from around 1994 and is briefly discussed in the concluding chapter.

Over the 1978 to 1994 period with which this thesis is chiefly concerned, the overall assessment of enterprise reform with respect to incentives and autonomy is somewhat mixed. Certainly the reforms were successful in installing profit maximisation as a primary goal of SOE management, in place of the previous goals of plan fulfillment and output maximisation. Byrd and Tidrick, writing in 1987 when the reforms were less than a decade old, identified five main motives of SOEs: (1) family (maximising family income and benefits), (2) expansion (through investment and sometimes mergers), (3) engineering (the drive to produce highly-regarded products and win product-quality awards), (4) compliance (the desire to be a good bureaucratic citizen), and (5) profit. These writers argue that the right of profit retention gave all firms an incentive to increase profits whatever their other motives may have been. Firms that sought to maximise family benefits could do so by earning profits and distributing them as bonuses. Engineering-minded managers would not be able to indulge the engineering

motive if poor market conditions threatened profits. It is likely that the importance of the profit motive strengthened over time as the reforms progressed. Zhao (1994:100) reports 1989 survey data in which SOE managers were asked to rank the importance of six managerial objectives: raising output, increasing profit, increasing workers' incomes, expanding production, developing new products, and upgrading technology. Overall, increasing profit rated as the most important objective, ranked as the number one priority of 49.5 per cent of managers, and as number two or three priority by another 39.4 per cent.

On the negative side, the manner in which incentive and autonomy-related reforms were carried out was somewhat chaotic and led to inconsistent treatment of firms. At the heart of the problem was the difficulty of objectively evaluating the earnings performance of individual firms in a system in which profitability traditionally did not much matter and in which true earnings performance was masked by a range of 'handicapping' factors. In both the original profit-sharing schemes and the tax-for-profit scheme, reformers' original designs degenerated into systems dominated by bargaining between firms and their state overseers. Bargaining-based systems by their nature encouraged rent-seeking activity and perpetuated soft budgets, as firms that under-performed could seek to redress their losses by bargaining over tax or profit retention rates. The Contract Management Responsibility System was largely successful in replacing the bargaining process with more consistent treatment, until the CMRS itself was undermined by the policy regime of 1989 and 1990.

Although China's Bankruptcy Law was enacted in 1986, for the first eight years of its existence barely 100 bankruptcies were implemented, due to inadequacies in the legislation and official reticence over redundancies. The number of bankruptcies gradually increased from 1994 but as of 1997 was still only a few thousand out of 100,000 SOEs. It was possible nonetheless to shut down firms by means other than formal bankruptcy; *Reform* (1992: 228) reports that in 1991 just over 1000 SOEs were closed through managed

proceedings or taken over by other firms, of which only two cases involved declarations of bankruptcy.

The progress made in improving positive incentives for firms, their managers and employees was marred by relatively slow progress in strengthening negative incentives such as implementation of the Bankruptcy Law, and in otherwise firming up soft budget constraints. Autonomy reforms, while slow to enjoy full implementation, no doubt raised the efficiency of the SOE sector. However, they also may have led to an excessive weakening of control in areas where official control was still needed. For example, anecdotal evidence strongly suggests that poor monitoring of the activities and accounts of SOEs enabled them to manipulate their results and retain much of the profits that they were formally required to remit to the state.[3]

2.4 Price reform

Price reform proved to be one of the most successful aspects of the industrial reform process in the first decade and a half of reform. By the mid-1990s the transition from plan-determined to market-determined prices was complete in most sectors.

There was a clear appreciation from the beginning of reforms in 1978 that rationalisation of the distorted price structure must form one of the main objectives of reform. In the first few years however, price reform followed a rather conservative path, with the staged adjustment of administrative prices. In other words, authorities sought to realign prices within the familiar framework of central planning. In this period, the distortions against agriculture and consumption goods in the economy started to be alleviated. Among those goods whose prices were raised significantly by the early 1980s were electronic goods, iron ore, and semi-finished steel products. An indication of the early attachment to administrative prices was the setting up of the Price Research Center in 1981 to calculate 'optimal' prices for planning authorities. This body laboured for two years, produced a 253-sector input–output table and delivered several variant sets of prices in mid-

1983. However, ultimately it was not able to convincingly argue for any of the variant prices it had computed and the project was disbanded (Naughton 1995).

By the mid-1980s, the early successes of reform, notably in stimulating the growth of agriculture and rural industry, had engendered support for further price reform on a more market-oriented basis. Amidst a general view that price realignment had not made sufficient progress, reformists were split into two camps, identified by Naughton (1995) as the 'price reformers' and the 'enterprise reformers'. The price reform camp advocated the rapid rationalisation of prices and taxes. Enterprise reformers, partly on political grounds, argued for more gradual reform via a 'dual-track' system in which plan prices were retained but above-quota output could be sold at market prices. This group argued that the dual-track system could gradually accustom enterprise managers to operating under market prices, and would create among the urban managerial class a further constituency in favour of reform (in addition to peasant smallholders and rural entrepreneurs. Premier Zhao Ziyang ultimately endorsed the view of the enterprise reform group, and the dual-track system was implemented. Zhao himself saw price reform as part of a transition to 'primarily indirect management' in which 'the state adjusts the market, and the market guides the enterprise' (Naughton 1995: 203).

The gradualist strategy that underlay the dual-track approach to price reform is well illustrated by the following quote from the 'Suggestions of the Party Center on Drawing up the Seventh Five Year Plan' (CCP 1985):

> State management of enterprises should be gradually converted from direct control to indirect control as the main form, primarily employing economic and legal measures – while retaining necessary administrative measures — to control and regulate economic activity. … As for the price of consumer goods, except for an extremely small minority of crucial products that will remain under state price controls, the price of ordinary products will be gradually decontrolled as market conditions permit. The proportion of

producer goods for which the central government determines the price will progressively shrink, and the proportion determined by the market will increase. At the same time, we will gradually adjust planned prices, in order to shrink the gap between plan and market prices.

From May 1984, above-quota output was permitted to be sold at prices up to 20 per cent above plan prices. In February 1985, this restriction was abolished and ex-plan prices became essentially market-determined. The coverage of market prices relative to plan prices steadily rose as growth expanded the non-plan portion of production while the scope of the plan was held frozen, and as various commodities were progressively removed from the central planning system. The number of commodities subject to planned allocation fell from 256 to 23 in 1986, and the portion of retail sales transacted at plan prices fell from 97 per cent in 1979 to 47 per cent in 1986. Plan prices themselves were progressively adjusted in the direction of market prices. Price reform was temporarily halted by the inflationary outbursts of 1988 and 1992, each of which led to the tightening of price controls as an anti-inflationary measure. Nevertheless, price reform and the rolling back of planned allocation resumed in earnest in 1993, by the end of which only eighteen industrial commodities remained on the plan, and much of their production was being transacted at market prices. The areas where price reform tended to lag was largely in commodities that were unusually politically sensitive such as coal and grain, but even these were being tackled seriously by the mid-1990s (Naughton 1995: 290–291). By the end of the 1990s, the State Planning and Development Commission) was able to report in its *List of State-Priced Commodities* that fewer than 20 commodities and services were still subject to central government prices (ChinaOnline.com, 9 October 2000). The same report noted that by the end of 1998, market prices governed 94.7 per cent of retail goods, 83.8 per cent of agricultural products and 86 per cent of production inputs. Even the prices of such strategic and public-type goods and services as electric power, petroleum, medicine and rail transport had become market-determined.

The dual-track strategy of price reform held a number of advantages, and also a number of drawbacks. It allowed immediate efficiency gains to be generated, since market prices served as the effective marginal prices and therefore directed production decisions. (Byrd 1992) This facilitated the resolution of shortages in the Chinese economy, providing incentives for producers to expand the production of goods in demand and to economise on the use of inputs. Moreover, these gains could be had while minimising the risks of reform by allowing gradual adjustment over a period of time. As McKinnon (1993) notes, China's gradual price adjustment allowed the inflationary pressure arising from monetary overhang to be released slowly, allowing a relatively stable price level for most of the reform period. In Russia by contrast, the sudden decontrol of prices in the presence of monetary overhang triggered a hyperinflation; consumer prices rose 874 per cent in 1993 (the first year for which the IMF's *International Financial Statistics* published Russian data).

The negative features of the dual-track strategy included the inducement that it gave to corruption, speculation and dishonesty. Since market prices typically exceeded plan prices, managers and officials were frequently able to exploit their positions to acquire goods at plan prices and sell them at market prices. In some reported cases firms even derived the bulk of their revenues from the re-sale of state-supplied inputs. Public resentment against such corrupt behaviour was a significant motivation of the 1989 protests. The system also had the effect of favouring those firms that were granted relatively large input quotas and small output quotas. This created a further incentive for bureaucratic bargaining and rent-seeking behaviour, and also led to some allocative inefficiencies in cases where more technically efficient producers were treated relatively unfavourably. For example, the most modern large-scale plants sometimes stood idle while less efficient small-scale enterprises with the freedom to charge market prices were able to continue production. The system was also somewhat chaotic. As Hay *et al.* (1994) report, there was frequently not a single plan price but mandatory, indicative, regional, protective, break-even, and negotiated prices.

2.5 Capital and investment

Reforms in the area of capital and investment sought to replace the allocation of free capital grants via the budgetary system, with the distribution of credit via interest-bearing bank loans. This transformation was intended to create a sense of the economic cost of capital and to 'raise the efficiency of capital utilisation by introducing more caution and cost consciousness into managers' calculations about the acquisition and use of capital' (White 1988: 11). The general intention complemented, at least in theory, the other arms of reform that took economic activity out of the realm of central planning and placed it in an environment characterised by markets. While the specific transformation from state grants to bank credit represented a substantial institutional change and was, over a period of time, essentially carried out, capital market reform by the mid-1990s was far from complete in that credit continued to be allocated on a 'soft' rather than a commercial basis. As a result, by the mid-1990s the level of non-performing loans to SOEs in the state bank sector had risen to such levels that, as Lardy (1998) asserts, the net worth of each of the four main state banks would probably come to a negative figure under accurate accounting.

Bank sector reform

At the eve of reform in 1978 China still operated a standard command economy 'monobank' system with the People's Bank of China (PBOC) serving as both the central bank and the main commercial bank. While the financial landscape also featured the Bank of China, the People's Construction Bank of China, and rural credit cooperatives, none of these functioned as an independent commercial bank (Lardy 1998: 61). The Bank of China was subordinate to the PBOC, the Construction Bank was a subsidiary of the Ministry of Finance on behalf of whom it distributed state budgetary investment funds, and rural credit cooperatives collected deposits from rural residents but had no significant lending role. As banking reform proceeded, lending arms of the PBOC and MOF were split away to create four new state-owned 'commercial' banks, each with its own specialised

business domain. The Bank of China was separated from the PBOC in March 1979 and was allowed to expand upon its traditional role as a specialised bank for foreign exchange and international payments. The Construction Bank was made independent of the MOF in November 1979 and specialised in long-term capital and construction lending for new investment projects, including in the SOE sector. Two new state banks were formed out of the rural and urban branch networks of the PBOC. These were respectively the Agricultural Bank of China in February 1979 and the Industrial and Commercial Bank of China in January 1984. The Agricultural Bank was to specialise in rural deposits and lending. The Industrial and Commercial Bank, which upon its formation was immediately the largest of the commercial banks, collected the deposits of urban residents and undertook working capital and medium-term loans to SOEs. With the separation of the four specialised state commercial banks, the role of the PBOC evolved into one more resembling a market-economy central bank, managing the macroeconomy and supervising the operations of the commercial banks.

In the early to mid-1980s the four specialised state banks exercised virtually monopolistic dominance of their respective core businesses. However as time progressed financial competition gradually increased, in two ways. First, the boundaries between the big four blurred, and they started to compete with each other in their respective core businesses. Second, various other new banks and non-bank financial institutions (NBFIs) entered the financial sector. The new banks included five national commercial banks and a number of regional banks (see Table 2.3 for detail of some of these institutions). Foreign banks entered the Chinese market predominantly servicing foreign-invested enterprises and conducting foreign-currency business, but were heavily restricted in both business and geographic scope. In particular, they were excluded from RMB business. However, their market access will expand substantially under the terms of China's WTO accession. Trust and investment corporations (TICs), free of some of the regulative restrictions on state banks, offered higher interest rates and lent to

a variety of enterprises. The first TIC, China International Trust and Investment Corporation (CITIC), was formed in 1979 and by 1989 TICs accounted for 6.3 per cent of total financial assets (Hasenstab 1999). Rural credit cooperatives initially implemented lending programmes of the Agricultural Bank of China, also engaging in their own deposit-taking and lending. There were 55,000 of these in 1996 when they were released from the guidance of the ABC. This NBFI sector had its counterpart in the urban credit cooperatives, although these only emerged in 1987 and had a smaller presence. Two other small categories of NBFI were finance companies and financial leasing companies. Finance companies emerged from 1987, and in most cases were formed to carry out financial transactions within the member companies of industrial groups. Financial leasing companies emerged from the early 1980s, usually in the form of joint ventures with foreign banks. In 1994 the State Council approved the formation of three policy banks, whose role would be to take over policy-directed lending from the specialised banks and thus assist their development into true commercial institutions. Over time, the growth of the new financial institutions exerted considerable competitive pressure and forced the government to liberalise the state bank sector (Hasenstab 1999). Nevertheless, the big four specialised state banks, with the advantages of vast branch networks and an implicit guarantee of state support, continued to dominate the sector. Their collective share of assets of the financial sector (including the PBOC, policy banks, other commercial banks, credit cooperatives, TICs, finance companies and domestic insurance companies, but excluding foreign institutions) stood at 71.2 per cent in 1986, and by 1994 and 1995 had declined only to 63.6 per cent and 61.0 per cent, respectively (Lardy 1998: 224).

Table 2.3 **New Chinese banks formed after 1978**

Name	Opened	Details
China Investment Bank	1981	Initially created to administer disbursement of World Bank funds to China. Converted to a commercial bank in 1994. Operates as a subsidiary of Construction Bank.
Bank of Communications	1987	Originally a private bank, taken over by PBOC in 1958, remaining independent in Hong Kong. Reestablished on mainland as a national joint stock bank with majority state equity. A pioneer in modern banking methods in China.
China International Trust and Investment Company (CITIC) Industrial Bank	1987	Banking arm of the CITIC group. Operates nationally.
Everbright Bank	1992	National bank. Initially owned by China Everbright (Group) Co.. Gained approval in 1995 to become a joint stock bank. First Chinese bank to take a foreign shareholder (Asian Development Bank).
Huaxia Bank	1992	Initially owned by Capital Iron and Steel Works (*Shougang*). Converted to a joint stock commercial bank in 1995.
China Minsheng Bank	1996	The first officially designated private bank in China. Formed under All-China Federation of Industry and Commerce to lend to collective and private small businesses.
Shenzhen Development Bank	Approved 1987	Regional bank listed on Shenzhen Stock Exchange. Two-thirds owned by individuals, with the provincial and municipal governments also major shareholders.
Guangdong Development Bank	Approved 1988	Regional commercial bank.

Source: Lardy (1988).

China's system of monetary control

Girardin (1997) has described China's system of monetary control, even in the reform period, as a system of directed credit, with its overall orientation being one of directing credit to priority uses in the state sector rather than of profit maximisation. The system comprises both direct instruments (the credit plan and the cash plan) and potentially at least, the indirect instruments including interest rates, reserve requirements and PBC lending to specialised banks. In the pre-reform period, the state budget, the credit plan and the cash plan formed the three complementary parts of the financial plan, which mirrored the physical plan. Monetary flows were fairly clearly segmented, with households relying on cash and credit being the preserve of enterprises, so that in effect the task of monetary control comprised two separate tasks. Although the physical plan has steadily eroded in importance in the reform period, as of the mid-1990s the credit and cash plans remained in force and to some extent had supplanted the physical plan.

The credit plan is constructed in two stages; a top-down phase followed by a bottom-up phase. The PBOC sets a money supply target based on macroeconomic criteria, and allocates it to banks, which in turn allocate their quotas among their branches. In the bottom-up phase, provincial branches of the PBOC assemble credit plans from the branches of banks in

Table 2.4 **Sources of annual investment funds, 1980 to 1989**
(percentage shares)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total (mil. yuan)	892	648	756.	741	1,006	1,197	1,644	2,074	2,478	3,069
Fiscal grants										
- Central	57.4	19.8	13.4	23.8	28.2	24.1	22.5	16.1	14.3	12.3
- Regional	11.9	20.6	20.4	16.0	13.5	12.4	8.6	7.5	9.5	4.6
Bank credit										
- Domestic	5.6	23.2	30.1	15.2	21.3	24.9	32.4	36.3	34.0	35.1
- Foreign	0.0	0.0	0.3	0.1	0.1	0.5	0.3	4.0	1.0	4.6
Equity fundraising	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bonds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.1	0.7
Inter-firm debt	0.0	0.3	0.6	0.3	0.1	0.0	1.4	0.4	0.4	0.3
Inv't by other firms	0.1	0.9	0.8	0.6	0.3	0.3	0.3	0.5	0.5	0.7
Own funds	25.0	35.2	34.5	44.0	36.9	37.8	34.4	33.9	40.3	41.8

Note: 439 firms in sample after deletion of 330 firms for accounting inconsistency.
Source: Sample data drawn from Chinese Academy of Social Sciences (CASS) 800 Firm Database.

Table 2.5 **Sources of Annual Investment Funds, 1990 to 1994**
(percentage shares)

	1990	1991	1992	1993	1994
Total (million yuan)	3,143	3,466	5,006	4,493	4,583
Fiscal grants	9.0	4.0	1.7	2.0	1.7
Domestic loans	37.6	38.6	54.0	46.8	37.3
Bonds	0.2	0.3	1.0	2.1	1.8
Foreign funds	0.0	0.0	0.0	0.0	4.1
Own funds	53.2	57.1	43.3	49.1	55.1

Notes: Data from CASS 800 Firm Database. Sample is not identical to that for years 1980 to 1989.
657 firms in sample after deletion of 95 firms for accounting inconsistency.
CASS' categorisation of funding sources does not precisely match that for the 1980–1989 survey data.
For example, in 1990–1994, funds from equity issuance are included in firms' own funds.

each province. These are fed back to the PBOC, which revises its plan and issues the final credit plan. In 1988 the coverage of the credit plan was extended to include NBFIs. The cash plan seeks to regulate the growth of cash in circulation based on various measures of consumption activity.

The transformation in SOE financing arrangements towards a predominantly bank-oriented system is chronicled in Tables 2.3a and 2.3b. These show the proportions of investment funds raised from various sources for a sample of state enterprises from 1980 to 1994. The importance of funding from budgetary grants declined steadily over this time, from 69.3 per cent in 1980 to only 1.7 per cent in 1994. By the 1990s, over ninety per cent of investment funds were sourced from domestic loans and enterprises' own funds (from retained earnings, depreciation and maintenance funds, etc.).

While the transformation of SOE capital financing arrangements from a regime based on budgetary allocation to one based on bank finance had basically occurred by the mid-1990s, capital sector reform was far from an unqualified success. This was essentially because bank credit continued to be allocated on a 'soft' rather than a commercial basis. As a result the ultimate financial reform objective raising allocative efficiency, appears not to have been realised. There are several grounds on which the allocation of credit could be described as soft.

First, interest rates have continued to be set by the PBOC in the manner of central plan prices, at levels below the rates that would have cleared the market for loanable funds. As Hay *et al.* (1994) explain, '[interest-charging] mechanisms have generally proved to be ineffective [in restraining investment], because the benefits which decision-makers at all levels can extract from investments substantially exceed the financing costs'. As a result, the investment drive behaviour described by Kornai as characteristic of a command economy, has not been overcome; firms' demand for investment funds has consistently exceeded supply. As must inevitably occur under such a situation, credit therefore has effectively had to be rationed among borrowers, and there is no evidence to suggest that the rationing methods used were able to identify and prioritise those projects with the highest potential returns. The existence of substantial unmet demand for funds for potentially profitable projects is attested to by the emergence of various unauthorised banks that were able to charge interest rates well in excess of rates charged in the official system (Lardy 1988: 126).

Second, policy considerations played a considerable role in the allocation of bank credit. 'Policy loans' (*zhengce daikuan*) is the term used to describe loans extended by banks on the direction of central and local government authorities rather than on the basis of straight commercial considerations. Some policy lending took the form of 'relending' of funds lent by the PBOC to state banks for projects specified by the State Planning Commission. Lardy (1998) estimates that fully one-third of all state bank loans in 1993 were of this category. Even this estimate excludes loans advanced under the advice of local government officials. Lou (1993) reported overall estimates of policy lending by the four specialised state banks at the end of 1991 as 67 per cent for the Bank of China, 51.2 per cent for the Agricultural Bank, 58 per cent for the Construction bank, and 25 per cent for the Industrial and Commercial Bank. It may even be asserted that in the artificially low interest rate environment, all lending is policy lending. One of the consequences of the heavy hand of policy in lending matters was that SOEs received the vast

majority of allocated credit despite the dynamic growth performance exhibited by the non-state sector. Another noted trend was that the workings of the credit quota system effectively redistributed credit from the fastest-growing regions of China, to some of the slowest-growing regions where industry was dominated by state ownership (Lardy 1998: 86–87).

Third, state banks did not play the disciplinary role on non-performing borrowers that banks exercise in market economies. It has already been noted that China's Bankruptcy Law, enacted in 1986, was rarely applied. When this law was applied, it was at the direction of central and local government officials, not the lending banks. When borrowing firms fell behind in interest payments, typical bank behaviour was to extend additional loans to those firms. Moreover, the accounting treatment of such loan rollovers or extensions was highly questionable. The interest due would be regarded as having been collected out of the new loans disbursed, and recorded as income for the bank. A loan would not be classified as non-performing at least until the borrower failed to make a principal payment (Lardy 1998: Chapter 3). The lax enforcement of credit obligations lowers even further the effective interest rate on investment finance for SOEs. Poor enforcement of credit also meant that firms retained their investment drive behaviour and were unresponsive to variations in interest rates. Fan and Woo (1996: 216) quote responses from a 1984–1989 survey of 300 SOEs indicating that 85 per cent of firms would not adjust their investment spending in the face of a 5 per cent rise in interest rates and 65 per cent would not react to a 10 per cent rise.

The inefficiency of the prevalent methods of credit allocation was further exacerbated during periods of monetary tightening, such as in 1985 and 1988. On those occasions when tightening was necessary to slow the economy, the relatively crude quantitative system based on the credit plan performed relatively poorly in rationing the reduced pool of funds in favour of the most productive uses. Blanket tightening led to partially completed projects being suspended in large numbers, without regard to the individual merit of projects (Hay 1994: 11–13). By contrast, under an interest rate

based system firms could potentially pay an interest premium in order to continue projects with high marginal values of completion.

2.6 Labour

As outlined in Section 2.1, the pre-reform labour system suffered from two main defects; (1) a very poor motivational level of the labour force, due to an almost complete lack of positive incentives for effort and of sanctions against shirking and counterproductive behaviour; and (2) an extreme degree of immobility and inflexibility, which gave rise to considerable allocative inefficiencies and compounded the problem of poor motivation. Although reforms carried out in the domain of labour sought to address both these defects, such reforms faced the significant obstacle of socialist ideology, which held that workers were the true owners of enterprises and could not be dismissed. Genuine progress was therefore slow.

Remuneration and worker incentives

The formal remuneration of SOE employees consists of three main components; basic wages, incentive wages (incorporating bonuses, piece rates and sundry allowances) and access to various welfare services directly from the work unit.[4] Basic wages continued initially to be subject to a considerable degree of control from the central and local authorities. Bonus payments were reintroduced early in the reform period and were intended as a primary instrument to improve incentive and the correlation between remuneration and productivity, but the effectiveness of bonus payments in this regard was blunted by the egalitarian bonus-setting procedures of most firms. The 'floating wage' system introduced from the mid-1980s took a variety of forms and linked both basic wages and bonuses to firm financial performance. Many welfare services, including housing, education, health and retirement pensions continued well into the 1990s to be provided predominantly by the work unit rather than by government agencies and represented a considerable fraction of employees' real income. By the mid-1990s this was still true of most social services, although de-linking reforms had commenced, starting with retirement and unemployment insurance.

Some writers have pointed to these non-monetary social services as a particular area in which a rational relationship between productivity and remuneration was not successfully established (Walder 1989, Meng and Perkins 1999).

The setting of basic wages essentially followed the system that was established in 1956, and the changes that have occurred during the reform period can be seen as adjustments to this system rather than replacements of it. In its original form, the basic wage comprised standard wage scales plus wage allowances that allowed for inflation and introduced differentials across industries and regions. Both central and regional government agencies had an influence on the setting of rates. In addition to facing controls at the level of wage rates, firms faced the additional constraint that the total wage bill must not exceed the plan quota approved by the local labour bureau. Each local labour bureau in turn was obliged to allocate firm-level plan quotas to firms out of its allocation from the total plan quota of the wage bill set by the Central Labour Bureau. The setting of each firm's plan quota was effectively negotiated between the firm and the local labour bureau. A prime motive of the government in administering this system was to regulate the strength of consumption spending (Hay *et al.* 1994).

The first and perhaps most significant change to the wage system came from the reintroduction of bonuses. Despite being commonplace in other centrally planned economies, bonuses and piece-rates had been abolished in 1966 during the ideological fervour of the Cultural Revolution. Reintroduction of bonus systems commenced in 1978 and they had again become almost universal by 1979 (Byrd 1992: 9). By the mid to late 1980s the standard upper limit for total bonus payments was the equivalent of four months' basic wages, or one-third of the total wage bill. If bonus payments exceeded this level, the exceeding portion was taxable at increasing rates; 30 per cent up to five months, 100 per cent up to six months, and 300 per cent for payments exceeding six months' basic wages. This constraint applied officially only at the aggregate level – firms were permitted to distribute bonuses among employees in discriminating fashion so as to reward good

performance. However, it became the usual practice to pay the maximum permissible amount of total bonuses and to distribute them individually on an equal basis regardless of performance. Hay *et al.* (1994) referred to 'the strong egalitarian tradition in the state-owned sector, leading to payment of the same absolute level of bonus to all participants in the exercise' (p. 156). Naughton (1995:105) argues that two factors limited the usefulness of bonuses. First, under soft budget constraints firms had no incentive to constrain bonuses, and therefore would seek to set them at the highest level possible, even exceeding the official ceilings where regulatory enforcement was weak. Second, once bonuses were at the upper limit, workers could see that genuinely competing with each other for portions of the bonus pool was a zero-sum game; the workers collectively could be no better off in financial terms but would have to expend greater effort. They therefore would collude and pressure management to follow an egalitarian bonus policy. Such pressure was usually effective in the early reform years due to the permanent employment system; management was highly vulnerable to the possibility of disruption campaigns by workers who could not be dismissed. This vulnerability seems to have decreased through the 1990s as the position of managers strengthened. Although bonuses were meant in theory to be paid out of retained profits, in practice even loss-making firms tended to pay full bonuses. Walder (1989) noted that 'even enterprises whose profit figures fall, or that run a temporary financial deficit are still entitled to four months' wage bonus if the losses are due to "objective factors" like price changes, rises in material costs, and changes in exchange rates or overseas markets'.

Another type of incentive wage was piece rates, which were used to considerable effect in some manufacturing industries and by foreign-invested firms. The feasibility of using a piece rate system depends on the technological characteristics of the workplace, in that management must be able to gauge the output of each individual worker objectively. In a non-academic publication, Purves (1991) describes the effectiveness of piece rates in raising both productivity and worker incomes in a foreign joint-venture cast iron foundry that had only recently been converted from full

state ownership. In this firm in which Purves himself served as General Manager, the majority of workers were paid by the piece, with exceptions for some types of workers such as clerical staff. Purves reports that even the most recalcitrant employees in the foundry could be effectively managed by transferring them to the most arduous furnace jobs that attracted the highest piece rates. Tellingly, workers typically preferred non-piece rate positions where they could earn similar average incomes to piece rate positions without their output being so closely monitored.

In the reform period, a significant proportion of SOE employees' real incomes continued to be provided in the form of in-kind benefits and social services. These included housing provided by the enterprise, health and education services, old age pensions, collective dining facilities and recreational facilities. In some of these categories, firms were officially obliged to meet certain objective service standards. For instance, Purves (1991) reports having to meet a housing standard of 10 square metres of accommodation per employee.[5] At the outset of the reform period, and in the wake of the economic disruption of the Cultural Revolution, housing and other social services appear to have been in serious under-supply. As a result, the early reform years saw a boom in housing investment. Annual urban housing construction had averaged only 30 million square metres before 1978, but by 1981 had risen to 100 million square metres, and remained at that level through the 1980s (*Fixed Investment* 1950–1985, reported by Naughton 1995: 103). Of this expenditure, 60 per cent was financed from enterprise retained funds (*Economic* 1982: V-42, reported by Naughton 1995). Some writers such as Lin *et al.* (1996) have described the welfare obligations of SOEs as 'policy burdens' that have made it difficult for them to compete on an equal basis with the non-state sector. However, an alternative view is that SOEs exploited soft budget constraints and the looseness of official controls to aggressively expand welfare spending for their employees, to an extent beyond what was required under official service standards (Walder 1989, Meng and Perkins 1999). One category of social services that indisputably did create an increasing burden for many

enterprises was that of aged pensions. With a retirement age set at 55 and a rapidly aging population, the requirement upon firms to provide pensions worth 60 per cent of full-time wages created a growing and unavoidable impost. The number of retirees supported by state-owned urban) economic units ballooned from 6.38 million in 1980 to 24.01 million in 1995 and 27.83 million in 1998. The ratio of actively employed to retired workers in the urban sector as a whole (including collectives etc.) fell from 12.8 to 4.8 and 4.0 in the same period (China Labour Statistics Yearbook 1999: page 541). Indeed in some firms, the point was reached where the total bill for retirement pensions was higher than the total wage cost of active workers. While social security funds had been established to cope with the expanding retiree population, since the system was based on pooling firm contributions at the city level, the effect would have been merely to spread pension costs evenly over all SOEs in each city.

Until 1984 despite the reintroduction of bonuses, basic wages continued to be set in the traditional manner. Around 1985 the system started to gradually loosen as enterprises were permitted to experiment with different formulae for what were variously called 'floating wages', 'efficiency wages' or the 'internal wage system'. The essence of the floating wage reform was to link the total wage bill (incorporating bonuses as well as base wages) of the enterprise to some measure of firm performance. The most common measure was total remitted profit and tax, but other measures were allowed, such as profit (or losses in the case of firms operating under 'planned losses'), output, or sales revenue. The elasticity of the permitted wage bill with respect to the productivity indicator was typically around 0.7 (Naughton 1995: 208). The floating wage system brought with it the right to determine the distribution of wages within the enterprise, a move to alter the excessively flat official wage scales. Official wage scales continued to be set as before but were of less relevance as firms moved to the new system. However as Meng and Kidd (1997) show, wage-setting behaviors adjusted only slowly and continued to emphasise worker endowment factors such as seniority and formal education qualifications more than individual work

achievement. Because of the way it operated, the floating wage system influenced bonus payments and profit retention as well as basic wages. For example, some firms reclassified their bonus payments as wages so that they could be accounted for as costs and reduce the firm's taxable profits, rather than draw bonus funds from retained profits.

With the numerous variations of the floating wage system operating and given the vagaries of accounting practices used in China, enterprises were increasingly able to frustrate strict control by official agencies. It is most unlikely for example that all firms reduced their wage bills as required in years when their profits declined. Naughton (1995: 209) notes that officials intervened extensively in 1988 seeking to adjust for the effects of high inflation in that year, but while such efforts had little net effect on wage increases, the integrity of the system was compromised by a proliferation of bargaining activity between firms and officials. Kornai (1990: 143 and 145) criticises China's administration of SOE wage bills so severely as to imply that no controls even existed.[6] Walder (1989) argues that the true objectives of SOE managers were (1) to maximise retained profit and (2) to distribute it without restraint to workers, by illegal means if necessary. If we accept this characterisation, it follows that managers would seek to implement the floating wage system in such a way as to maximise wage growth. Thus, while wage system reforms were positive in the sense of improving incentives, like other reforms they came at a cost in terms of officials' capacity to monitor and control firm activity. The result, according to a number of economists, was widespread overcompensation of SOE employees beyond what was justified by productivity growth. The issue of overcompensation is debated in Chapter 3 and comprises the core focus for Chapters 4 and 5 of this thesis.

Labour force flexibility

At the outset of the reform period, authorities set the employment levels of SOEs in analogous fashion to wages. The Central Labour Bureau would set the overall employment level for the state-owned sector, and allocate it

among the labour bureaus at lower levels, which would in turn allocate their employment quotas among the SOEs under their purview. As with profit retention and tax rates, there was scope for some bargaining between firms and local bureaus over quotas, within the constraints that the bureaus themselves faced. The employees assigned under the traditional system were permanent. They could not be dismissed except for serious misconduct. The officially sanctioned practice of occupational inheritance (*dingti)* whereby a retiring worker could nominate a close relative as a replacement, was a further source of inflexibility and over-manning (Korzec 1992). The inflexibility of the traditional employment system created costs for both individual employees and for firms. Individuals had no say in the firms and jobs to which they were allocated and found it very difficult to quit or be transferred to more satisfying work, leading to considerable demotivation. Firms could not easily dismiss or otherwise deal with unsuitable or non-performing employees, nor reduce their labour costs if overstaffed.

The principal reform measure that sought to address the problem of inflexibility was the introduction of individual contracts between employees and firms. The term 'contract employment' actually refers to a number of different arrangements in China, and it is appropriate here to clarify the terms we will use for various categories of industrial workers in order to avoid confusion. Korzec (1992: 30) distinguishes the categories as follows:

1. Permanent employees *(guding zhigong)*

This group predominated SOEs and urban collectives in the pre-reform period and well into the 1990s. Recruitment, assignment, transfer and dismissal were subject to the approval of the relevant state labour personnel departments under the state labour control plan. In the reform period, the regulations governing inter-firm transfer were loosened.

2. Contract Workers *(hetong zhigong)*

This term was used in the pre-reform system to refer to urban workers assigned under temporary contracts while awaiting job allocation on a permanent basis. The renewal of contracts was virtually automatic and there

was virtually no difference in treatment between these workers and permanent employees. The term now refers to workers employed under the new style of fixed-term contracts. Two key differences between the new-style contract workers and permanent employees are the explicit lack of any commitment to renew contracts, and the contract workers' entitlement to unemployment insurance. Official urban resident status is a mandatory requirement for appointment to an SOE as a contract worker, as it is for a permanent employee.

Terms such as 'real', 'regular' or 'official' workers are used to refer to both permanent employees and old- and new-style contract workers. The term 'temporary workers' ('casual workers' would also be accurate) is used to refer to the following three categories.

3. Seasonal Workers *(jijie gong)*

These are workers employed during seasonal peaks in food agricultural product processing industries. They may be either rural or urban residents.

4. Peasant Workers *(yi gong yi nong)*

This term is applied to four different groups:

(a) Rural residents working in township and village enterprises.

(b) Rural residents employed by county-run enterprises or enterprises leased to peasant collectives.

(c) Peasants employed directly by SOEs, typically for harsh or dangerous work unpopular among regular SOE employees.

(d) Other temporary rural workers, such as individuals or members of rural collectives to whom SOEs increasingly sub-contract production work. (Such contracting had previously been illegal.)

5. Workers Contracted from the Countryside *(nongcun xieyi gong)*

Contracts of this kind, most common in the mining sector but increasingly prevalent elsewhere, were concluded between enterprises and rural communities. At the expiry of an individual worker's term another worker from the same community would replace him.

To illustrate the possible confusion over taxonomy, state publications sometimes use the term 'contract system employees' to refer to employees under category 2 above, and 'contract employees' to refer to most workers in categories 3, 4 and 5. In this thesis I will consistently use the following terms:

> permanent employees (or workers) to refer to category 1;
> contract (or contracted) workers to refer to category 2;
> regular workers to refer to categories 1 and 2 collectively;
> casual workers to refer to SOE employees from categories 3, 4 and 5;
> rural migrant workers to specify casual workers who have rural residency;
> regular contracts and casual contracts to distinguish the contracts of regular workers and casual workers.

The terms 'workers' and 'employees' are used interchangeably. As the subject of the thesis is SOE reform, the context is usually confined to that of SOE employees.

The employment by SOEs of rural migrant workers pre-dated the reform period and as such does not reflect a revolutionary policy reform, with the exception of sub-contracting (part of category 4(d)) which opened up a new avenue for access to the rural workforce. In the pre-reform period, control over rural–urban migration was maintained via the household registration (*hukou*) system, the commune system and food rationing. Although the latter two of these mechanisms ceased to function in the reform period, the household registration system remains in place. It effectively creates an official caste system whereby the opportunities of rural residents within the urban economy are restricted. The barriers thus maintained are not totally impermeable however, and urban economic growth since 1978 (especially in the non-state sector) has led to greatly expanded rural migration. The number of rural migrant workers in the nation's cities at any one time was estimated at 39 million in 1993 (RDI, CASS, 1994), which figure includes a substantial illegal component. These workers appear to be discriminated against not only by official policy but also by those SOEs that employ them;

they tend to be engaged for those jobs that urban residents do not desire and are remunerated differently. Knight *et al.* (1999) find that whereas permanent SOE employees are paid wages in excess of their marginal product, rural migrants are paid less than their marginal product (this paper is discussed in more detail in Chapter 3). It appears therefore that SOEs tend to treat their rural and urban workers more as complements than as substitutes. As part of the analysis of Chapter 4 we consider an Insider–Outsider framework to represent this situation.

From the viewpoint of SOEs, the change from pre-reform to the reform period labour market arrangements essentially meant that the broad types of available labour had expanded from two (permanent employees and rural migrant workers) to three (to include urban-resident contract workers, in the new sense). The old-style contract employees can be effectively classed as permanent employees.

The introduction of regular contracts for urban workers commenced in the familiar experimental fashion in 1983. Those workers who were permanent employees at the time of the introduction of contracts were retained on the existing basis, so that the contract system applied only to newly hired workers. 1986 marked a cluster of initiatives directed at labour flexibility. From 1 October of that year firms were required to hire all new employees on a contract basis, the standard term being five years, although the regulations did not explicitly rule out the upgrading of contracted workers to permanent status (Korzec 1992: 29). In conjunction, firms acquired the right of open recruitment; labour would no longer be administratively allocated but firms could choose new hires freely within the overall constraints of their hiring quotas. Occupational inheritance (*dingti*) began to be phased out at this time; the regulations permitting it were not repealed but authorities expressed consistent disapproval of *dingti* arrangements that went beyond what the regulations permitted. Such efforts had reduced the phenomenon substantially by 1989 according to Korzec (1992: 25). Social security and unemployment funds were established, funded by enterprise and employee contributions and administered at the city level. These funds were mainly

intended for the protection of contract workers given that permanent workers were only expected to be made redundant in cases of firm bankruptcy, which would remain rare.

The labour contract reform was clearly implemented on a gradualist basis. As of 1995, 39 per cent of SOE employees were on contracts (Meng 2000) and contracted employees were not expected to constitute the majority until the turn of the century. [7] However, Naughton (1995: 211) notes that a number of firms did succeed in fully contractualising their work forces. While permanent employment would continue to characterise most of the SOE labour force for well over a decade, the existence of a significant contracted component at least gave firms the option of adjusting their labour forces at the margin.

The administrative measures introduced in 1986 were reinforced by a policy campaign beginning in 1988 to reduce, retrain and reallocate redundant labour, an initiative that was referred to as the 'reoptimisation' of the labour force. Almost no workers were actually dismissed in this process, the more common practice being to 'stand-down' (*xiagang*) employees identified as surplus. Such workers would be placed on reduced wages and retain access to enterprise social services. Naughton (1995) reports that firms engaged in 'reoptimisation' covered 20 per cent of SOE employees in 1988 and 27 per cent in 1989. The majority of affected workers were re-employed elsewhere in the state sector. This particular reform drive, like a number of others, was suspended during the post-Tiananmen period of conservative ascendancy around 1990, as state policy and press organs again stressed the maintenance of the 'iron rice bowl'. However, the drive resumed from 1991, in which year 980,000 workers were made redundant and 880,000 of these reassigned, and similar numbers were recorded in 1992. Naughton (1995: 297) adds that 'large numbers' of workers were simply laid off in 1992 and 1993 but that little information on this was forthcoming from the official press. Korzec cites the early 1990s (the time of this second reoptimisation drive) as marking the first time that workers could be dismissed outright on the grounds of cost-cutting.

In quantifiable terms, the introduction of contracts had only a modest impact on employment flexibility in the first decade-plus of reform, as firms tended to treat contracted employees as if they were permanent employees. Turnover rates increased, but only slowly. Only 1.3 per cent of 99.8 million regular SOE workers left their jobs in 1988 (China Labour and Wage Statistics Yearbook 1989). Meng (2000: Chapter 6) describes SOE management in those years as being in fact reluctant to exercise their what formal rights they had in regard to dismissal. One of the sets of regulations issued in 1986 listed the following grounds for which firms could dismiss workers under the labour contract system (sourced from Korzec 1992: 40):

1. Seriously violating labour discipline, disturbing production and interfering with work order;

2. Violating operating regulations, destroying or damaging equipment, tools, wasting raw and semi-finished materials or energy resources, causing economic losses;

3. Giving poor service, constantly quarreling with customers or harming the consumers' interests;
4. Not obeying normal instructions;
5. Taking bribes, stealing, gambling, practising graft in a way not warranting criminal charges;
6. Stirring up trouble for no reason, fighting, thereby disrupting public order;
7. Committing other grave errors.

The salient feature of this list is that it omits the possibility of dismissing staff on the grounds of overstaffing; managers did not acquire this prerogative until around 1991. Korzec argues that the above list is in fact indistinguishable from a 1982 set of regulations and that it differs from the rules in force from 1957 only by the reference to customer service. Naughton's (1995) reading however is that the new regulations permitted dismissal for more minor offences than had been the case in the past. Firms

did acquire the option of reducing excess labour through the non-renewal of contracts. D.Chen (1995: 125) relates an interview in 1991 with the management of an SOE who had determined a policy of reducing their workforce numbers, but were forced to resort mainly to the non-replacement of retirees as it was 'still difficult to dismiss people'.

In immediately effective terms then, only limited progress was made in terms of increasing labour flexibility up to the mid-1990s, especially in comparison with most other aspects of reform. The prime reason for slow progress was official sensitivity to unemployment. This sensitivity was reinforced by the initial institutional arrangements whereby the social security and welfare system was organised at the level of the work unit, and to a large extent progress in increasing flexibility was required to follow progress in building a new social infrastructure. The gradualist approach to expanding the contract system created long lags until the coverage of contract arrangements was sufficient to enable increased labour turnover. The lag that was required to effect cultural change in favour of flexible labour market practices also appears to have been considerable, as evidenced by the noted reluctance of managers to exercise their formal powers over employees. The sensitivity to unemployment concerns and the related threat to social instability reached its peak in the post-Tiananmen period of policy conservatism. So great were the apparent political and cultural obstacles to reform at this point that in 1992 Korzec, while focusing on labour issues, was writing of the 'failure of reform'. Nevertheless, the measures introduced in the 1980s created at least some initial momentum and laid the foundation for more substantial progress from the mid-1990s, by which time a more favourable environment for meaningful labour reform existed.

The limited progress on labour flexibility is likely to have enhanced the potential for overcompensation of SOE employees in two respects. First, it was difficult for firms plagued by overstaffing to reduce their labour forces to levels in accord with the demand for their output. The boundary between overstaffing and overcompensation is a blurry one; when measured at the firm level the two phenomena can be indistinguishable. Second, by

depriving managers of effective sanctions ('negative incentives') to discipline unproductive employees, the existing arrangements may have forced managers to rely on pay increases even more as a tool to manage employee behaviour.

2.7 Competition with the non-state sector

On the eve of reform, as noted in Chapter 1, the only other significant ownership type of firm that existed in Chinese industry besides SOEs was the collective sector, including both urban and rural collectively owned firms (COEs). Within a few short years however, while existing COEs grew rapidly and were joined by new COE entrants, foreign-invested and privately-owned firms also established themselves in significant numbers.

Whereas state-owned firms are nominally the property of the entire Chinese people, COEs are established and owned by the local government authority in their local domains. Where the local authority is a rural township or village, these enterprises are also known as Township and Village Enterprises (TVEs). COE profits are shared between the relevant local government and their own employees. While the casual observer may argue that such firms merely constitute another type of state-owned firm, their economic characteristics are crucially different in that COEs do not enjoy the soft budget constraints of true SOEs. Being established only under the authority of local and not the central government, they can only be subsidised to the extent of the limited financial resources of the local authority (including its local credit cooperative). Moreover, the smaller the local government district, the more limited are its resources and the more 'hard-budget' are the conditions faced by the firm. In rural areas, it is not unusual for a single COE to serve as the main source of tax revenue for a township or village. Unlike SOEs, COEs do not enjoy the ultimate support of the central fiscal, taxation and monetary authorities. As such, it has always been the case that COEs can be and frequently are sent into bankruptcy. Woo (1994) notes that in the recession of the late 1980s and early 1990s, the number of industrial TVEs fell from 7.7 million to 7.2

million from 1988 to 1990, while the number of industrial SOEs increased from 99,000 to 104,000.

Rural COEs, especially the township and village enterprises (TVEs) enjoyed rapid growth from the beginning of the reform period. TVEs tend to be active in the light industrial sectors, for instance in processing the agricultural products of their own local areas. Therefore the early reforms created ample profitable opportunities for them as price reform shifted the terms of trade in favour of agriculture and light industry. Capital flowed into the sector via both increased profits and the savings of peasants recycled through the rural credit cooperatives. In addition, COEs were able to tap the new markets created by the reforms in the SOE sector, by supplying non-plan inputs to SOEs. The corporate governance mechanisms of COEs were many and varied; some, known as 'red hat' firms, found it convenient to be officially designated as COEs while being managed in practice as private firms. A common practice is the leasing out of management rights over COEs to private individuals. Woo (1994: 301) observes that efforts in Jiangsu province to run TVEs along tight lines of control in accordance with traditional socialist principles ('the Jiangsu Model') led to poor financial results and pseudo-privatisation by 1992.

Foreign-invested enterprises (FIEs) started entering the Chinese market in 1979. Aware of the extent to which it had slipped behind the market economies, the Chinese government encouraged FIEs in order to attract western technology and additional capital into its industrial sector. Specific legislation was passed to provide a legal framework for the operation of FIEs. The first of these was the Equity Joint Venture Law enacted in August 1979. This established Chinese–foreign joint ventures as limited liability legal entities, set down rules for equity contribution, permitted the overseas remittance of profits and foreign employees' earnings, and included provisions tax exemption on the first two or three years of profitable operation. The Foreign Capital Enterprise Law enacted in April 1986 made provision for wholly foreign funded enterprises, aiming in particular to attract large investments from major multinational firms. As with the Equity

Joint Venture Law, firms were encouraged to employ advanced technology and to predominantly serve the export market. The Chinese–Foreign Cooperative Joint-Venture Law was enacted in April 1988 (although approvals were already being issued pursuant to it in the previous year) and contained more flexible provisions regarding such matters as capital contributions, profit distribution. Joint venture FIEs dominated the scene in the early years as foreign managers relied on local partners to navigate the Chinese business and legal environment, but wholly-owned FIEs became more commonplace over time as confidence in that environment grew. Throughout the reform period, the bulk of investment into China has come from Overseas Chinese sources, although an unknown proportion of this is thought to consist of 'round-tripping'; Chinese capital re-entering in foreign guise. Particularly to attract investors from Hong Kong, Macao and Taiwan, four Special Economic Zones (SEZs) were established in 1980 in Guangdong and Fujian provinces in the southeast. This experiment was later expanded to other regions and 'open cities'. China's efforts to attract foreign investment were highly successful; the country became the developing world's leading recipient of FDI, and the second largest recipient in the world after the United States. FIEs played a particularly important role in the internationally traded sector, carrying out 39.1 per cent of China's total trade in 1995. As such their competitive impact on the SOE sector would have been primarily felt by firms that were significant exporters.

Private enterprises, after being suppressed during the pre-reform period, grew rapidly from 1978. This is despite an economic environment that was designed to be conducive to state sector dominance. Private firms faced and still face significant discrimination in areas such as local government taxation, access to finance particularly from the state banks, and access to government resources. However, the importance and further growth potential of the private sector began to be seriously recognized by the authorities during the late 1990s. The 1999 sessions of the National People's Congress gave substance to this, providing a legal basis for private

enterprise and allowing individual enterprises to remove their 'red hats' (Garnaut *et al.* 2001).

2.8 Some unintended consequences: the behavioural issue and the compensation issue

The way in which reform proceeded appears to have had important unintended consequences in terms of the behaviour exhibited by state firms. Prior to the economic reforms, the operational objectives of SOEs could have been defined as 'to achieve or exceed the output quotas specified by the central plan, subject to the various directions of state authorities'. Profit was not an objective of primary concern to firm management; profitability was essentially predetermined by official prices and quotas and thus outside the firm's control. At a formal level, the reforms established profit as the official objective of SOEs, or at least as the dominant element in a 'basket' of different objectives. By instituting profit retention and employee bonuses, the authorities had sought to make profitability compatible with the self-interest of firm managers and employees. However, the extent to which such compatibility was achieved is questionable. A number of scholars have put forward the hypothesis that SOEs sought in practice to maximise the income and benefits of their own managers and employees, even at the expense of profitability and to the extent of falsifying their accounts to convert profits into extra wages and benefits. I shall refer to the debate over this hypothesis as the 'behavioural issue'. It is intimately related to the 'compensation issue', which raises the empirical question as to whether SOEs have paid the workforces more than is merited by their productivity. I regard these two issues are separable because, depending on institutional arrangements in an economy, it is possible for one of them to operate without the other. For example, in China under central planning, some managers may have pursued employee income maximization, but wage and other controls were so tight that in fact workers were massively under-compensated across the SOE sector. As such, the 'behavioural issue' would have been operative but not the 'compensation issue'. Alternatively, in some economies, because of strong trade unions, workers may be over-compensated even though their

managers may in fact be pursuing profit maximization. In such situations, the 'compensation issue' would be operative but not the 'behavioural issue'.

It is likely that SOE managers, even in the pre-reform era, had always sought to advantage their own employees and their families wherever possible. In economics it is fundamental to assume that individuals and groups of people seek to maximise their own income and utility. But SOE managers are the agents of the state; they are charged with maximising the utility of an entity other than themselves. Without effective monitoring and control of their activities, they may be free to pursue other objectives; a classic principal-agent problem. A number of other factors may have intensified the tendency to maximise employee benefits, some of them longstanding, others being products of the reform period. We noted in Section 2.6 Walder's observation that workers exercised disproportionate implicit industrial power relative to their managers. This power would have been reinforced by the socialist concept of workers as the ultimate owners and intended beneficiaries of state enterprises, a concept that was by then entrenched by thirty years of official publicity. The drive to maximise family benefits was also reinforced by the strong family emphasis of Chinese culture. The materialist instinct of traditional China, after being suppressed in the militant pre-reform years, re-emerged with official sanction as exemplified in reform-era slogans such as 'to become rich is glorious'. Finally, the growth and success of non-state enterprises, particularly foreign-invested enterprises that tended to pay higher wages than SOEs, is likely to have created an 'envy effect' raising the material aspirations of SOE employees.

Under the old centrally planned system, by controlling virtually all inputs and outputs and their prices on both the buying and the selling side, the state employed strong, redundant and overlapping controls to minimise the scope for profit-shifting behaviour. As a result of the various reforms of the 1980s such state controls broke down. Moreover, effective market-based controls such as bankruptcy mechanisms were not immediately available to replace them; the persistence of soft budget constraints nullified the disciplines that ensure profit-maximising behaviour in market economies. In the absence of

either effective state control mechanisms or effective market control mechanisms, the scope for diverting resources from the state's purposes may have expanded considerably.

While the state nominally retained a variety of controls over SOE activity through the reform process, its capacity to implement these controls suffered from a dwindling capacity to accurately observe firm activity and performance; the state cannot control what it cannot clearly observe. In the pre-reform period, most transactions could be easily observed by state agencies, since they were carried out by state-owned entities at each end and were required to conform to the central plan. The introduction of above-plan or non-plan production created scope for transactions under the initiative of SOEs themselves, often with non-state suppliers or customers at the other end. Price reform, and especially the dual-track phase of price reform, created confusion as to what prices actually prevailed. SOEs could potentially exploit this confusion by transacting at one price and recording another price in the accounts. If the true prices of inputs and outputs could be masked, true profits would be masked as well. The determination of taxes, interest payments, wages and bonuses all came to be influenced by if not based upon some form of firm-level bargaining, and all such bargaining processes hinged in some way on the perceived profitability of the firm. Moreover, the plethora of bargain-based formulae made the state's monitoring task far more complicated than had been the case in the past. Accounting standards were still based upon planned-economy practices, and were not thoroughly standardised or modern.[8] State banks, although now supplying the bulk of external capital, played no real role in the monitoring of enterprise activity.

Specific state controls over employee wages and benefits essentially concentrated on cash wages and bonuses. Even in these areas wage-fixing formulae were subject to firm-level bargaining and were typically based upon some relationship with firm profits, which makes them problematic for reasons that we have just noted. Benefits outside of cash wages and bonuses,

such as welfare payments, the services from welfare facilities and informal distributions, would have been even more difficult to monitor.

The breakdown of state monitoring and control would not have been an intractable problem if market mechanisms had been able to take their place. Even in a market economy various means both legitimate and illegitimate can be used to 'fungify' profit results, but a firm that consistently diverts profits to other uses ultimately finds that it cannot make payments for interest, dividends or taxes. In a 'hard-budget' environment, disciplining mechanisms are available such as bankruptcy or 'main bank reorganisation' (in Japan). But Chinese SOEs in the reform period continued to face soft budgets, although the way in which the soft budget operated changed. As Section 2.5 shows, the extent of free state grants and explicit subsidies was cut back substantially (Kornai's Condition 3). Also, increasing product market competition reduced the capacity of firms to pass on price increases (Condition 3). But the progress made on these two counts was undone by 'softening' in regard to Kornai's Conditions 2 and 4; soft credit and soft taxes.

A prime reason for the continuation of soft budgets was that the authorities found that profitability, as difficult as it was to report accurately, did not provide a full basis fort the objective comparison of individual firm performance. Some firms were net beneficiaries of plan prices and quotas whilst others were disadvantaged. Firms were burdened to varying degrees by surplus capital and labour that could not be disposed of. Comprehensive social welfare services had to be provided to employees, both active and retired, and their dependents. Some firms were disadvantaged by their geographical locations, away from attractive markets and sources of supply. Managers could take advantage of all these factors in their dealings with supervisory agencies and state banks to rationalise below-par profit performance, and to justify soft tax and credit treatment. Presumably, such rationalisations could be employed even where the true cause of poor performance lay elsewhere, such the conversion of potential profits into extra benefits for employees.

2.9 Summary: directions and progress of reform, 1978 to 1994

The SOE reforms that were begun in the early 1980s took the sector away from planned allocation of resources under state ownership and in the direction of competitive market allocation, still under state ownership. The philosophy of reform was gradualist, seeking to maintain existing economic institutions in place while new ones were constructed or experimented with.

In general, faster progress was made in the reform of SOE output markets than in the reform of their input markets. By the mid-1990s, the majority of commodities were traded free of price controls, in markets where SOEs competed with each other, with domestic and foreign non-state firms, and with imports. On the other hand, the development of markets for financial capital and for labour was limited. While bank lending had supplanted fiscal grants as the main source of investment funds, lending decisions were not being made on a commercial basis, interest rate structures were discriminatory and did not reflect the social cost of funds. Although a contract system of labour recruitment had been introduced, employment in the SOE sector was still seen as essentially a lifelong tenure. The bonus system as it was introduced succeeded only weakly in relating employee compensation to firm performance, and in general did not serve to reward outstanding individual performance. The problem of soft budget constraints remained, with firms now being subsidised predominantly via soft bank credit rather than fiscal subsidies. Redundant labour and capital was not being removed from firms, and financially unviable firms were not being removed from the system. It would have been reasonable to expect that the net impact of this mixed package of reforms on productive efficiency would have been positive, but modestly so. Non-state firms, enjoying substantially free markets for both inputs and outputs (except for discrimination in access to bank finance) might have been expected to show higher Total Factor Productivity growth than the SOE sector (Chapter 3 examines the evidence as to whether this was in fact the case).

The dynamics of the reform process appear to have given rise to some unintended consequences, two of which are of particular interest to this thesis. These I refer to as 'the behavioural issue' and 'the over-compensation issue'. The behavioural issue refers to the contention that SOEs in the reform period may have been seeking to maximise employee remuneration in preference to their official objective of profit maximisation. The over-compensation issue relates to the claim that, perhaps as a result of such remuneration maximising behaviour, the compensation of SOE employees, broadly measured, grew well beyond the extent that would be justified by labour productivity in the sector. The behavioural issue and the overcompensation issue will both have prominence in the discussion of SOE performance that follows in Chapter 3.

Endnotes

[1] Notoriously, even husbands and wives assigned to work units in different, distant cities might take years to obtain permission for a work transfer to reunite them.

[2] Current Chinese President Jiang Zemin is just such an example. He began his career as an engineer at one of China's largest SOEs; First Autoworks in Changchun, Jilin Province. An article on this firm appears in the magazine *Asia Inc*, July 2002.

[3] One answer to the puzzle as to why incentive reform was so much more problematic in industry than in agriculture is that in agriculture it is relatively simple to design a uniform 'tax' (e.g. in bushels of grain per acre) that can be applied consistently to farmers, and to allow them to retain the residual surplus.

[4] Fan and Woo (1996) describe several kinds of 'informal remuneration'. I briefly discuss these in Chapter 3.

[5] This rule was quite inflexible in principle; strictly speaking the same space was to be provided whether to a single person or an employee supporting a large extended family, while a husband and wife both employed at the same factory would be entitled to 20 square metres between them.

[6] In fact Kornai accuses Chinese authorities of ignoring advice directly given by himself, James Tobin and Otmar Emminger (former Bundesbank president) in 1986 to restrain wages administratively.

[7] In fact contracts did comprise the majority (50.7 per cent) of SOE workers just one year later in 1996 (SSB 1998a). In manufacturing the percentage was even higher at 76.0 per cent in 1996 and 77.0 per cent the following year. Chapter 6 briefly discusses the acceleration of labour reform that occurred in the late 1990s.

[8] For example, a common shortcoming of socialist accounting is in its treatment of unsold output. The traditional practice was to credit all finished goods toward the firm's annual production target, no matter how long they subsequently remained unsold. Purves (1991) tells of his difficulties in disposing of rusting, unsold cast-iron products against the resistance of his local-partner colleagues. Common sense demanded that they be melted down to produce new products, but in so doing the firm would be required to charge the difference between the inventory value and the scrap value as 'waste'.

3

State-owned enterprise performance over the reform period

This chapter commences with an evaluation of the performance of the Chinese SOE sector during the reform period. For the purposes of the chapter, 'performance' encompasses three criteria, namely output growth, productivity and efficiency, and profitability performance. Of particular interest for the thesis is the poor profit performance of the SOE sector. Following this review of performance is a discussion of the literature that carries the extant debate over SOE performance. This literature features interconnected debates over the evaluation of performance in general, over the specific reasons proffered for SOEs' poor profit performance, and over overall SOE reform strategy looking forward. This thesis seeks in particular to inform the debate over the reasons for poor SOE profitability. Following a review of the literature in this area, I outline the empirical work of the subsequent chapters and its contribution to the debate.

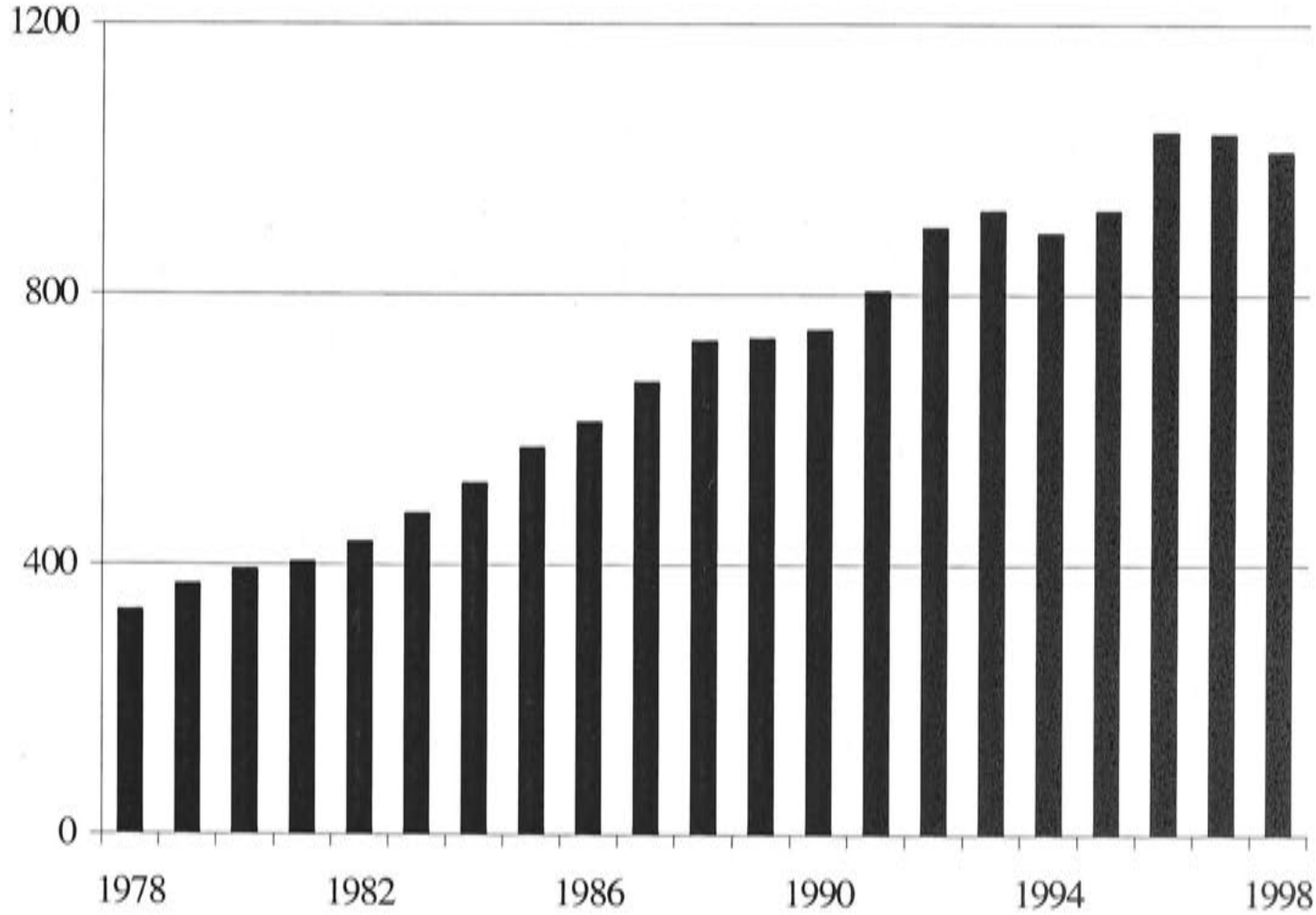
3.1 Output growth

In absolute terms, the SOE sector would appear to have achieved impressive output growth since 1978. However, this growth is less impressive when considered relative to the growth rates achieved by the non-state sectors of the economy. Moreover, it has been extensive in nature, having been achieved on the back of similarly rapid growth in inputs.

The usual statistic used to measure output growth in China's industrial sectors is gross industrial output, published by the State Statistical Bureau. In nominal terms, this measure grew from RMB328.9 billion in 1978 to RMB3362.1 billion in 1998. When deflated by the ex-factory price index of industrial products (general index), this amounts to real growth by a factor of 3.06 times, or an annual geometric average of 5.7 per cent. In the pre-reform period from 1952 to 1978 *nominal* gross industrial output of SOEs grew by an annual average of 12.8 per cent.[1] Figure 3.1 depicts trends in

real gross industrial output of the SOE sector in constant 1980 prices. Temporary dips in growth resulting from the recessions of 1989 (Tiananmen) and 1997 (the Asian Crisis) are apparent. Another factor affecting the growth rate, especially in the latter 1990s, has been the rationalisation of the sector and the re-classification of some (usually the best-performing) SOEs into foreign joint ventures, COEs or joint stock enterprises (see Chapter 6).

Figure 3.1 **SOE real gross industrial output**
(RMB billion, 1980 prices)

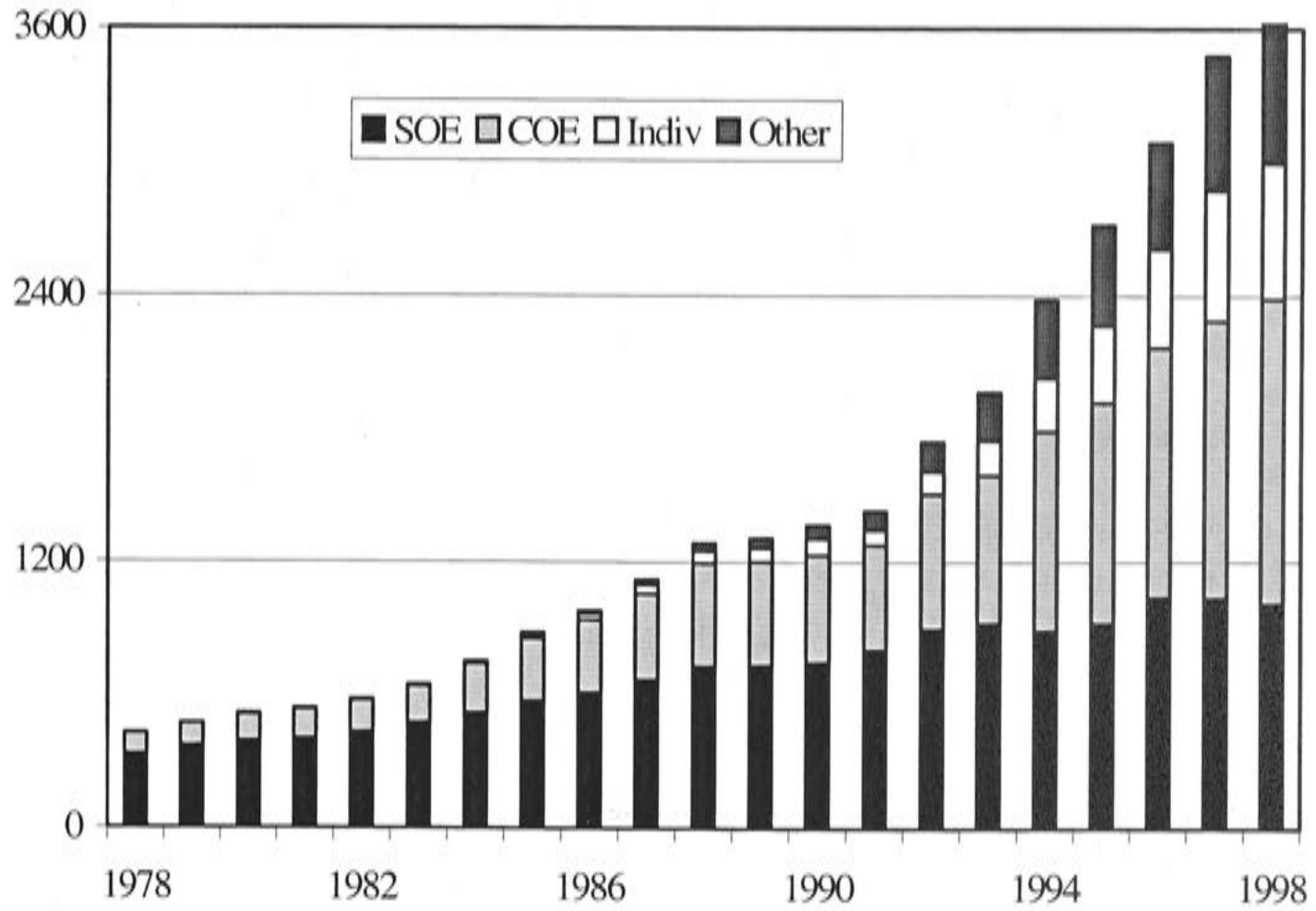


Note: Gross output value deflated using Ex-Factory Price Index of Industrial Products (General Index).
Source: SSB, *China Statistical Yearbook (Zhongguo tongji nianjian)*, various years.

Viewed in comparison with other ownership forms however, output growth was less impressive. As Figure 3.2 shows, most of the growth in China's industrial output over the reform period is attributable to the collective (COE), individual, and 'other' ownership sectors. The data contained in this figure is also presented in Table 1.1 and Table 3.1. Table 3.1 presents the growth rates of real output for the SOE, COE and other ownership categories, and the shares of each category in output, number of employees and gross fixed assets. This table illustrates two points; the superior growth

rates of the non-state sectors relative to SOEs, and the extensive nature of SOE growth. With its slower rate of output growth, the SOE sector's share of urban output declined from close to 80 per cent in 1978 to under 30 per cent in 1999. However, the state sector's shares of labour and fixed asset usage declined much more slowly, both starting the reform period also at around 80 per cent but remaining above 50 per cent as of 1999. It follows that the state sector's growth was more extensive in character than that of the non-state sectors, being driven largely by the accumulation of inputs rather than by improvements in the efficient use of those inputs.

Figure 3.2 **Real gross industrial output by ownership form**
(RMB billion, 1980 prices)



Note: Gross output value deflated using Ex-Factory Price Index of Industrial Products (General Index).
Source: SSB, *China Statistical Yearbook*, various years.

Table 3.1 **Urban output growth and factor usage by ownership type**
(percentage growth rates, percentage shares)

	Output growth			Shares of output			Shares of labour force			Shares of fixed assets		
	SOE	COE	Other	SOE	COE	Other	SOE	COE	Other	SOE	COE	Other
1978	14.4	10.6	..	77.6	22.4	0.0	78.4	27.5	0.0	..	..	..
1979	8.9	8.6	..	78.5	21.5	0.0	77.2	29.6	0.0	..	..	..
1980	5.6	19.2	..	76.0	23.5	0.5	76.8	30.2	0.0	81.9	5.0	13.1
1981	2.5	9.0	34.1	74.8	24.6	0.6	76.5	30.7	0.0	69.5	12.0	18.6
1982	7.1	9.5	30.2	74.4	24.8	0.7	76.5	30.7	0.0	68.7	14.2	17.1
1983	9.4	15.5	39.3	73.4	25.7	0.9	76.2	31.3	0.0	66.6	10.9	22.5
1984	8.9	34.9	61.6	69.1	29.7	1.2	72.6	37.2	1.2	64.7	13.0	22.3
1985	12.9	32.7	46.6	64.9	32.1	3.1	68.7	30.7	0.7	66.1	12.9	21.0
1986	6.2	18.0	53.5	62.3	33.5	4.2	68.3	30.9	0.8	66.6	12.6	20.8
1987	11.3	23.2	59.9	59.7	34.6	5.7	68.4	30.6	1.0	64.6	14.4	21.0
1988	12.6	28.2	52.3	56.8	36.1	7.1	68.7	30.0	1.3	63.5	15.0	21.5
1989	3.9	10.5	30.7	56.1	35.7	8.2	68.6	29.6	1.8	63.7	12.9	23.4
1990	3.0	9.0	28.4	54.6	35.6	9.8	68.4	29.4	2.1	66.1	11.7	22.2
1991	8.6	18.4	35.9	56.2	33.0	10.8	68.3	29.0	2.8	66.4	12.5	21.1
1992	12.4	33.3	56.6	51.5	35.1	13.4	68.3	28.1	3.6	68.1	16.8	15.1
1993	5.7	35.0	80.7	47.0	34.0	19.0	67.9	25.5	6.6	60.6	17.7	21.6
1994	6.5	24.9	66.5	37.3	37.7	24.9	66.4	24.4	9.2	56.4	16.2	27.4
1995	8.2	15.2	42.8	34.0	36.6	29.4	66.5	22.7	10.7	54.4	16.4	29.1
1996	5.1	20.9	22.1	36.3	39.4	32.1	66.3	22.2	11.5	52.4	15.9	31.7
1997	1.0	10.2	22.8	31.6	38.1	36.4	65.0	21.4	13.6	52.5	15.4	32.1
1998	0.1	9.1	20.0	28.2	38.4	40.0	57.2	16.9	25.9	54.1	14.8	31.1
1999	8.8	6.0	21.8	28.2	35.4	44.3	54.5	15.2	30.3	53.4	14.5	32.0

Notes: Data for SOEs include State-Controlled Shareholding Enterprises.
'Other' ownership types include individual ownership, private, foreign invested and joint venture firms.
Figures for labour force share represent total employees in all urban sectors up to 1984 and staff and workers (a narrower definition) in urban industrial sectors from 1985 onward. The latter series is preferred in that it correlates more closely with the gross output data, but is not available prior to 1985.

Source: State Statistical Bureau, *China Statistical Yearbook*, various years to 2000.

3.2 Productivity and efficiency

Trends in output do not in themselves provide a full picture of the performance of enterprises. Output expansion can be achieved through any combination of expansion in the amount of productive inputs and increases in productivity. In the pre-reform period, for example, Chinese SOEs had the advantage of a fiscal saving and investment mechanism that guaranteed rapid accumulation of capital, so that substantial output growth was virtually assured. However, this growth obscured poor productivity performance.

Total factor productivity (TFP) analysis seeks to evaluate economic performance by measuring output growth relative to growth in all types of productive inputs. TFP is a better measure of overall performance than single-factor measures of productivity such as labour productivity, since such single-factor measures are affected by changes in the levels of other factors. For example, labour productivity may be raised by increased allocations of capital, without significant changes in workers' skills, effort or work practices. Productivity studies, especially those seeking to measure total factor productivity (TFP) growth, have been one of the most active areas of scholarship on the Chinese SOE sector, and also an area of considerable contention. This section reviews the Chinese TFP literature with a view to extracting from among its various conflicting claims a clear verdict on the SOE sector's productivity performance, both in absolute terms and relative to the non-state sectors.

A standard method of estimating TFP is as follows, based on a two-factor translog production function:

$$\ln Q = \alpha_0 + \alpha_T T + \alpha_K \ln K + \alpha_L \ln L + \left(\frac{1}{2}\right)\alpha_{KK} (\ln K)^2 + \left(\frac{1}{2}\right)\alpha_{LL} (\ln L)^2 + \left(\frac{1}{2}\right)\alpha_{KL} \ln K \ln L \qquad (3.1)$$

where Q denotes value added, T denotes time, and K and L denote inputs of capital and labour, respectively. The coefficient α_T is the rate of TFP growth. In the case of the Cobb-Douglas specification, $\alpha_{KK} = \alpha_{LL} = \alpha_{KL} = 0$,

and the output elasticities are simply α_K and α_L. An alternative approach is to obtain measures of the output elasticities and calculate the following:

$$T\dot{F}P = \dot{Q} - s_K\dot{K} - s_L\dot{L} \tag{3.2}$$

where s_K and s_L denote the output elasticities of capital and labour respectively and the dots denote proportionate rates of change[2] In some cases (as is noted below) researchers assign values to the output elasticities arbitrarily rather than estimating them from a regression.

Another variation is to regress data for intermediate materials M as well as capital and labour against gross output rather than value added (which equals gross output minus intermediate materials). Regressing only capital and labour on gross output is not a sound technique as it gives rise to a missing explanatory variable problem. All of the input and output data ought to be expressed in real terms, therefore one of the challenges of this type of empirical work lies in obtaining or constructing appropriate deflators. Another source of variation in methodologies in the case of studies on Chinese industry concerns the appropriate treatment of non-industrial inputs, such as the capital and labour devoted to social welfare facilities run by enterprises.

Measurements of TFP and related measures (such as output elasticity of labour, which will be a key focus elsewhere in this thesis) depend on the availability of accurate data for inputs, outputs and their deflators. For enterprise-level studies in China, the reliability of available data has tended to be problematic. Firms may lack the statistical capacity to maintain accurate records, or may perceive an incentive to over- or under-report certain figures. Unsurprisingly therefore, the results obtained by different scholars have shown considerable variations. On some occasions, some of the sources of disagreement can be plausibly conjectured; see for example the discussion below of Woo *et al.* (1994a). On other occasions, we must interpret empirical results with some caution. Fortunately, there is now a considerable body of work from which to draw judgment.

The earliest English-language studies of TFP in SOEs indicated flat or even downward TFP growth in the pre-reform era, with no significant upward change in the late 1970s and early 1980s. Such studies included Chow (1985), World Bank (1983, 1985), Rawski (1980, 1983, 1986), Tidrick (1986), and Lardy (1987), some of which were not published widely. Similar work undertaken in China at the same time, however, painted a more mixed picture. Studies by Shi *et al.* (1984, 1985, 1986) and Qin *et al.* (1986) showed significant TFP growth, while Chen and Sang (1986), Chen (1986) and Pan (1986) presented contrary evidence. The methodologies of all these early studies tended to be relatively unsophisticated. One common practice was to use aggregate output data that covered all of state industry, but to use input data that covered only independent accounting units.[3] Another was the construction of capital stock measures using undeflated annual investment data. Also, some authors used ad hoc weights for capital and labour inputs instead of directly estimating output elasticities. World Bank (1983, 1985), Tidrick (1986), Lardy (1987) and Shi *et al.* (1986) arbitrarily assigned weights for labour ranging from 0.4 to 0.8. Rawski (1980, 1983) and Zheng and Chen (1987) derived weights from the income shares accruing to capital and labour. As Chen *et al.* (1988) argued, such a procedure is only truly valid where perfect competition can be reasonably assumed. As I will show later in this chapter, the question as to whether or not income shares have been closely aligned with output elasticities in China is in itself controversial.

Chen, Wang, Zheng, Jefferson and Rawski (Chen *et al.* 1988) marked the beginning of a significant effort by various researchers to improve upon the methodologies of the earlier studies. This study obtained weights for labour and capital directly from a production function estimation with net industrial output at 1952 prices as the dependent variable. Aggregated data was used covering all independent accounting units in the SOE sector over the period 1953 to 1985. Data for capital stock at constant prices was constructed from official statistics in which each year's fixed asset investment in current prices is added to the previous year's capital stock. These statistics categorised industrial investment as machinery and equipment, non-

residential construction, residential construction and other expenditures. The authors removed residential investment in order to capture purely industrial activity. They also adjusted the data for labour by subtracting from each year's figure a proportion equal to the proportion of residential investment within the capital stock, a relatively crude attempt to proxy the proportion of SOE labour engaged in delivering social services. The dependent variable being net output, a two-factor production was estimated. From the results of the initial translog estimation, the hypothesis of Cobb-Douglas technology could not be rejected. Cobb-Douglas estimation carried out on the adjusted data indicated that the level of TFP rose by 32.2 per cent from 1953 to 1978, an annual geometric average of only 1.1 per cent, with two-thirds of this improvement occurring between 1953 and 1957. During the early reform years from 1978 to 1985 however, TFP was found to have grown a further 39.8 per cent, an annual average of 4.8 per cent. The same analysis carried out on the original data would yield annual TFP growth in the reform years of only 2.9 per cent, indicating the sensitivity of such analysis to different methodologies.

Jefferson *et al.* (1992) differed from Chen *et al.* in the use of gross output as the dependent variable, thus accounting for changes in the use and efficiency of industrial materials (including energy inputs). This is an important improvement since shortages of materials have been frequently observed to constrain Chinese industrial output. The authors use aggregated data for the SOE and COE sectors over the years 1979 to 1988, thus enabling a comparison of TFP growth rates in the two sectors. Capital is deflated using separate deflators for buildings and for equipment, weighted separately for the SOE and COE sectors. Material inputs are deflated using separate series for the shares of plan-sourced and market-sourced materials, ex-factory prices and market price markups. As the available time series was too short for production function estimation, the authors calculated output elasticities from city and county level cross-section data from 1984 and 1987 (just 1984 and 1987 for COEs). They were not able to exclude non-productive inputs, but seek to minimise the impact of this and other potential errors-in-variables problems by carrying out the estimation in

intensive form, dividing all inputs and output by labour, and using an instrumental variable for output. TFP growth in SOEs was found to have averaged 2.40 per cent per annum over 1980–1988; 1.80 per cent up to 1984 and 3.01 per cent thereafter. This acceleration is not surprising as Chapter 2 shows that reforms in general accelerated in the latter 1980s. TFP growth in COE sector was higher; 4.63 per cent for the whole period, 4.63 per cent up to 1984 and 5.86 per cent from 1984–1988. For both sectors, factor accumulation was found to have accounted for almost three-quarters of output growth.

Jefferson *et al.* (1996) used similarly methodologies to the authors' earlier paper, but with a data set extended to 1992. TFP growth in SOEs was found to average 2.50 over 1980–1992; 2.24 per cent to 1984, 3.68 per cent from 1984–1988, and 1.58 from 1988–1992. Thus the estimates were broadly of a range with the 1992 paper, with a marked deceleration in TFP growth found from 1988. COEs were again found to demonstrate higher TFP growth than SOEs, but by a lesser margin; average TFP growth for COEs was 3.43 per cent over the full period. This number represents a revised calculation using the price deflators published for the SOE sector rather than the COE sector. The original calculation was 7.15 per cent, but the authors suspected that COE output was being drastically under-deflated. This paper goes on to take up the debate with Woo *et al.*, discussing various methodological controversies, and also considers the sources of declining TFP growth.

Woo, Hai, Jin and Fan (Woo *et al.* 1994a) challenged the findings of Jefferson *et al.*, generating an ongoing debate that has loomed large in the literature on Chinese TFP. Using survey data on 300 large and medium-sized SOEs over the years 1984–1988, Woo *et al.* carried out their baseline production estimation in two-factor form with gross output as the dependent variable. They argued that the other authors' approach of excluding non-productive capital and labour is inappropriate since, in the absence of markets for housing, medical services etc., the firms could not have operated without providing these services directly to workers. The results of the baseline estimation show TFP growth of negative 4.0 per cent over 1984–88

Table 3.2 **TFP estimation results: Woo *et al.* (1994a)** (percentage growth)

Method	Food Processing	Textiles	Materials	Machinery	Total
I. Baseline: Two-input translog.	-9.6	-10.0	-2.7	1.4	-4.0
II. Non-productive inputs excluded.	-8.1	-8.0	-0.8	2.3	-2.0
III. Period end capital stock.	-8.9	-8.5	-1.4	1.9	-2.5
IV. Cobb-Douglas.	-6.8	-7.7	-0.7	2.0	-1.6
V. Three input Cobb-Douglas.	0.18	2.0	2.5	3.4	2.4

Note: Further details of estimation methods as follows.

I. Two inputs (capital and labour), all inputs included, period average capital stock, modified translog functional form.

II. Two inputs, non-productive inputs excluded, period average capital stock, modified translog.

III. Two inputs, non-productive inputs excluded, period end capital stock, modified translog.

IV. Two inputs, non-productive inputs excluded, period average capital stock, Cobb-Douglas.

V. Three inputs (capital, labour and materials), materials deflated as per Jefferson *et al.* (1992), Cobb-Douglas functional form.

Source: Woo *et al.* (1994a).

for the total sample. Results were also generated for four specific sectors of industry, with TFP declining more severely in the light manufacturing sectors of textiles and food processing than in the materials and machinery industries (see Table 3.2). Excluding non-productive inputs in the manner of Jefferson *et al.* improved the measured estimate of total TFP to 2.0 per cent (Method II in Table 3.2). The robustness of this estimate was tested by using period end capital stock and Cobb-Douglas functional form (Methods III and IV in Table 3.2), with the result little altered at –2.5 and –1.6 per cent. The estimates under Methods II, III and IV were all insignificantly different from zero. Finally, the authors tested a three-input estimation with material inputs deflated using the same deflator as in Jefferson *et al.* The TFP

estimate of positive 2.4 per cent thus obtained is remarkably similar to the results obtained by the other authors, although for a non-identical time period.

Woo *et al.* argue that the relatively flattering TFP estimates obtained by Jefferson *et al.* and in their own 'Method V' estimation are due to the choice of deflators used, which they assert both overdeflate output and underdeflate material inputs. Their principal argument in this regard is that the net effect of such a choice of deflators is to imply that the price index of industrial value-added declined during the 1980s, a surprising phenomenon during a period of considerable general inflation. Over the years 1980 to 1988, Jefferson *et al.*'s deflator of value added declined by 3.3 per cent, while the consumer price index rose by 59.7 per cent. Woo *et al.* allege two particular anomalies regarding this apparent decline in the value added deflator: (1) that it conflicts with what is known about the sequencing of price reforms, particularly in the years 1980 to 1983 when output prices were freed more rapidly than input prices, and (2) that it conflicts with experience in other transforming economies in Eastern Europe, notably Poland and Hungary whose price data they cite. What Woo *et al.* appear to overlook however is the overall structure of price distortions under the centrally planned system prior to 1978. As has already been discussed in Chapter 2 and by writers such as Lin *et al.* (1998) pre-reform structures systematically suppressed raw materials and other industrial input prices while artificially supporting the relative prices of industrial outputs, thus channeling the bulk of the economy's savings into SOE profits. It is therefore not surprising that price decontrol should lead to deflation of industrial value added. This includes the 1980 to 1983 period, which saw the liberalisation of prices for many agricultural commodities (inputs for the food processing, textile and timber processing industries). Moreover, experience in Eastern Europe is not relevant to China since those countries, being more industrialised than China at the onset of socialism, did not need to create a price structure that discriminated so heavily against agriculture. It can be noted that Woo *et al.*, despite their criticism of the deflators used by Jefferson *et al.*, are unable to point to any truly satisfactory data series for material input prices. They do

mention the official industrial value added deflator, which rose 26.1 per cent from 1980 to 1988, but they criticise this also since in the absence of a reliable intermediate-input price index it simply deflates nominal value added with the gross-output price index. The difficulty of obtaining better deflators, particularly ones that account for the mix of intermediate inputs obtained at plan and market prices, makes this debate an awkward one to resolve.

Woo *et al.* also repeated their analysis on a data set covering 200 TVEs in ten provinces over the years 1984 to 1987. TFP growth for these firms over 1984–1987 was estimated at 9.5 per cent when using Jefferson *et al.*'s intermediate deflator (corresponding to Method V for the SOE data set), confirming Jefferson *et al.*'s results of superior TFP performance in COEs. In fact the growth differential as measured by Woo *et al.* is even greater than that found by Jefferson *et al.*, probably because Woo *et al.*'s data solely included the dynamic TVEs, whereas Jefferson *et al.*'s sample included urban collectives.

Lau and Brada (1990) estimated TFP for the SOE sector from 1953 to 1985, using the same national data as Chen *et al.* (1988), revised to remove residential construction and non-productive labour. These authors employed a frontier production function approach, which allows the disaggregation of TFP estimates into technological progress (outward movement of the production possibilities frontier) and technical efficiency (the closeness of firms' actual output to potential output as defined by the estimated frontier). Total TFP growth was found to have risen significantly following the early reforms, from 2.1 per cent in the 1953–1977 period, to 7.2 per cent over 1977–1985. This latter figure comprised annual technological progress of 3.4 per cent and technical efficiency improvement of 3.7 per cent. But whereas annual technological progress remained in a steady narrow of 3.2 to 3.6 per cent, technical efficiency fluctuated dramatically in a range of –4.4 to 12.2 per cent.

Raiser (1997a) measures the TFP of SOEs in three interior provinces as part of a study designed to compare the extent and success of reforms in the

interior with those of the coastal regions. He finds negative TFP growth in his sample over the 1990–1994 period, for both SOEs and non-SOEs. He also finds evidence of significantly greater restrictions on the operations of interior SOEs, particularly with respect to labour.

Li (1997) employs the first (1980–1989) section of the China Academy of Social Science (CASS) 800 firm database covering 769 enterprises, the same database as is used in this thesis. In a very technically thorough paper, he investigates the impact of changes in incentives, factor allocation and product market competition on changes in TFP. Li takes advantage of the price information contained in the database to measure the value of both output and intermediate in market prices rather than mixed market and plan prices. Li's relatively high TFP estimate of 4.68 per cent over 1980–1989 is not surprising when considered in this light. The consistent use of market prices even for goods that were not transacted at those prices should produce a set of price series that shows even greater inflation of intermediate input prices relative to output prices than would the use of mixed prices. The result should be to exaggerate the effect of declining value-added prices that emerged in Jefferson *et al.*'s analysis. The question as to which approach is superior is subjective. I would favour the use of mixed prices as these were the prices that actually confronted SOE managers at the time. A truly consistent study would use market prices to deflate all inputs including capital, but this would be totally unfeasible for China in this period. Li also found that TFP accounted for 73 per cent of output growth over the period, a figure that seems excessively high in the light of rapid capital accumulation and other studies and also leads one to doubt his TFP estimate. It is not likely that his high TFP estimate was due to a biased sample of relatively high-performing firms, as Huang *et al.* (1998) found that the same total sample firms began to record net losses in 1994, two years earlier than was the case nationally. Li also measured changes in marginal returns to factors. Marginal product of labour was found to have risen by 54 per cent over the period and the marginal product of capital to have also risen substantially, while the marginal product of materials changed little. The analysis also

incorporated measurement of price markups, through which market power was estimated to have declined by 15 per cent over the period.

Groves *et al.* (1994) use the same CASS database to analyse the effects of increased enterprise autonomy and incentives on labour productivity and find that productivity increased with increases in bonus payments and use of the contract employment system.

Perkins (1995) estimated the TFP growth of a sample of 300 enterprises in four ownership categories from Guangzhou, Xiamen, Shanghai and Fujian. Her study used gross output as the dependent variable and labour, capital and materials as the explanatory variables. She used capital and materials deflators specially developed by Zheng Yuxin of CASS. Average annual TFP growth over 1980–1992 was found to be 2.72 per cent for SOEs, 4.09 per cent for (urban) COEs, 3.17 per cent for TVEs and 6.14 per cent for foreign-invested enterprises. This is in line with the findings of Jefferson *et al.* both with respect to the magnitude of SOE TFP growth and the superior TFP growth of non-state ownership categories. Nevertheless, this sample may actually bias upward the productivity estimates as it consists entirely of firms from the more progressive coastal areas. TFP growth in SOEs was found to average 2.6 per cent over 1980–1984, accelerating to 4.6 per cent over 1984–1988, and then slowing to 1.1 per cent over 1988–1992, again confirming the pattern found by Jefferson *et al.*.

Huang *et al.* (1998) uses a stochastic varying coefficient production frontier framework to measure TFP growth over 1980–1994 and to decompose it into growth in inputs, technological progress and technical efficiency. They employed both (1980–1989 and 1990–1994) sections of the CASS '800 firm' database employed in this thesis, covering 681 firms in six industries after deletions. Their results are summarised in Table 3.3. Annual TFP growth for the overall sample was estimated at 0.3 per cent. No sector's TFP grew more than 1.3 per cent on an annual average, and two of the four sectors were negative. The table also shows clearly that factor input growth was the dominant driver of output growth. A correlation can be seen

between output growth and TFP growth at the sectoral level; the fastest-growing sectors also evidenced the highest TFP growth.

Table 3.3 **Decomposition of output growth: Huang *et al.* (1998)** (percentage growth)

Sector	Output increase 1980-94	Due to changes in			Implied annual TFP growth
		= Factor inputs +	Technical efficiency +	Technol. Progress	
Food processing	38.2	31.0	7.2	0.0	0.5
Textiles	27.8	43.4	-15.6	0.0	-1.2
Chemicals	140.5	120.7	11.1	8.7	1.3
Building materials	19	33.3	-14.3	0.0	-1.1
Machinery	110.5	106.2	1.0	3.3	0.3
Electronics	156.8	143.4	13.4	0.0	0.9

Note: Calculations based on frontier coefficient estimates and industrial variable means, imposing the restriction that technological progress is non-negative. The change rates reported in this table are all relative to year 1980 output.

Source: Huang *et al.* (1998).

Huang and Meng (1997) took the innovative and revealing approach of treating skilled and unskilled labour as two separate inputs in their comparison of SOE and TVE productivity between 1986 and 1990. They found TFP growth of –2.2 per cent in SOEs and 5.2 per cent in TVEs.

Kong, Marks and Wan (1999) estimate stochastic production functions for SOEs in four industrial sectors over the period 1990 to 1994. Average annual TFP growth is estimated at –0.6 per cent in building materials, –3.3 per cent in chemicals and –3.8 per cent in textiles. Only the machinery industry shows positive growth at 1.5 per cent. As the authors noted, their findings reinforce the impression from a number of studies that TFP performance deteriorated in the 1990s relative to the 1980s. Other stochastic production function studies in this literature include Kalirajan and Cao (1993), Wu (1993, 1996), Chen (1994) and Liu and Liu (1996). As Kong *et al.* (1991) note, all of these studies were based on data prior to 1990. They all find very low efficiency levels in the early 1980s and continuing

improvement throughout the 1980s, with a number of reform measures found to be significant in raising efficiency.

Tables 3.4 and 3.5 summarise the findings of a number of studies on Chinese TFP. Besides those already mentioned here, these include Xiao (1991), Dollar (1990) and McGuckin *et al.* (1992).

Summary

Published estimates of TFP growth in Chinese SOEs under reform show a considerable range, from negative 2.2 per cent in the case of Huang and Meng (1997) to positive 7.2 per cent in the case of Lau and Brada (1990). Some of the variation in results across these studies can be attributed to specific causes such as sample bias, the time period to which the data pertains, or choice of statistical method. However, as noted above, problems in obtaining reliable data are also likely to have contributed to the variability of results. On balance, the bulk of the evidence seems to indicate that TFP growth was positive, at least during the 1980s, but only modestly so. This conclusion is based on the following considerations:

1. The number of studies that indicate TFP growth in excess of zero appears to exceed the number indicating zero or negative growth.
2. A low positive figure would lie approximately in the middle of the range of published estimates. Jefferson and Rawski (1994) identified some thirteen studies dating through the 1980s, finding that the majority of them (nine) showed TFP growth of between 2 and 4 per cent. My own more updated list of studies suggests a lower consensus band of between zero and 2 per cent (Table 3.4).
3. Those studies that find negative TFP growth tend to use the gross-output approach, which probably understates TFP growth via the inappropriate deflation of intermediate inputs.
4. Those studies that compare the pre-reform and post-reform periods all find an improvement in TFP from 1978 onwards, and there is no strong evidence that TFP growth was negative in the pre-reform period as a whole (as distinct from certain periods of economic dislocation).

5. Those studies that have econometrically measured the direct effects of enterprise reforms on TFP have consistently found positive effects.
6. Some of the studies that have found negative overall TFP growth, have nevertheless found positive growth in particular sectors.

Table 3.4 **Selected studies on TFP growth in China's SOEs**

Study	Period	Data Set	TFP growth (per cent)
Lau and Brada (1990)	1977–85	National industry aggregate	7.2
Chen *et al.* (1988)	1978–85	National industry aggregate	4.8
Li (1997)	1980–89	272 SOEs survey data	4.7
Perkins (1995)	1980–92	300 enterprises survey data	2.7
Jefferson *et al.* (1992)	1980–88	SOE/COE aggregate data	2.4
Jefferson *et al.* (1996)	1980–92	SOE/COE aggregate data	2.5
Raiser (1997a)	1990–94	3 interior provinces	<0
Dollar (1990)	1979–82	20 SOEs survey data	1.2
Huang *et al.* (1998)	1980–94	800 SOEs survey data	0.3
Xiao (1991)	1985–87	City aggregate data	0.0
McGuckin *et al.* (1992)	1980–84	National industrial census	-0.45 (1980-84) 0.44 (1984–85
Woo *et al.* (1994a)	1984–88	300 SOEs survey data	-1.6 to -4.0
Huang and Meng (1997)	1986–90	967 SOEs survey data	-2.2

Source: Adapted from Huang (1999).

Table 3.5 **Comparative studies of state and non-state sector TFP** (annual percentage growth)

Study	Period	SOE TFP	NSE estimate(s)
Perkins (1995)	1980–92	2.7	4.1 (COE), 3.2 (TVE), 6.1 (FIE)
Jefferson *et al.* (1992)	1980–88	2.4	4.6 (COE)
Jefferson *et al.* (1996)	1980–92	2.5	3.4 (COE)
Xiao (1991)	1985–87	0.0	4.5 (COE)
Woo *et al.* (1994a)	1984–88	2.4[a]	9.5 (TVE)[a]
Raiser (1997a)	1990–94	<0	<0
McGuckin *et al.* (1992)	1980–84	-0.45	0.78 (COE);0.12 (Other)
	1984–85	0.44	2.14 (COE);3.39 (Other)
Huang and Meng (1997)	1986–90	-2.2	5.2 (TVE)

Note: [a]These two estimates both use an approach similar to Jefferson *et al.* (1992). Woo *et al.* actually prefer a different method.

It should be stressed that this is a very weak acclamation of SOE performance, bearing in mind the following factors:

1. There have been enough studies finding zero or negative TFP growth to keep the issue in some doubt.
2. A number of the studies finding positive TFP growth exclude 'non-productive' inputs from the analysis. This is a valid technique from one viewpoint as it shows the efficiency of factors actually employed. From another viewpoint however it is more desirable to include all inputs. In particular, if we are to assess productivity performance and financial performance on a parallel basis, it is preferable to include all inputs for which the firm pays.
3. Bearing the above point in mind, TFP growth in the 1980s is likely to have been quite modest, lower than 2 per cent.
4. TFP growth appears to have fallen during the early 1990s, possibly to zero or even negative levels.

5. All studies comparing the TFP performance of state and non-state enterprises have consistently found NSEs to have superior performance (see Table 3.5). The extent of out-performance found ranges from 0.9 growth percentage points (Jefferson *et al.* 1996) to 7.1 percentage points (Woo *et al.* 1994a), leaving aside Raiser (1997a) for its particular geographic focus. These comparative results are very useful in that they help to cut through the arguments over methodologies and data problems by applying the same methods to SOE and NSE data.

Despite the clear divisions between the two principal sides in the debate over TFP in the state sector, there is degree of consensus. Sachs and Woo (1997) assert general agreement that (1) SOE productivity growth has been lower than non-state productivity growth, and (2) improvements in state sector TFP, if any, have been modest. They quote Walder (1995): 'the dispute so far appears to be inconclusive, *especially given the small productivity increases under dispute'*. Jefferson *et al.* (1996: 171) play down the importance of their findings of positive TFP, arguing that the TFP debate has 'diverted attention from more fundamental matters'. They continue: 'Even the highest estimates of TFP growth in China's state industry cannot obscure the presence of massive potential for additional productivity gains'. Bai *et al.* (1997) go a step further, constructing a model to show that in the case of firms who are not profit maximisers, higher productivity may actually lead to greater allocative distortion, lower profits and lower economic efficiency.

For a clearer picture of SOE performance it is necessary also to examine financial performance and profitability.

3.3 Profitability

While the interpretation of SOE productivity results is subject to some dispute, there is essentially no argument over the fact that the SOE sector has suffered a very significant decline in profitability over the reform period.

The reporting and interpretation of SOE profit data require some care. Even leaving to one side the submission of inaccurate data by firms to statistical authorities, there are classification issues to be negotiated. What may be reported simply as 'SOE profits' can be divided into a number of segments, most notably those profits remitted to the state, profits retained by the enterprise, and moneys from which income (profit) tax and adjustment tax must be paid. The boundaries between these categories have been blurred by the various institutional arrangements that have been introduced in the reform period. For example, some funds that would have been classified as remitted profits up to 1984 would have corresponded to funds classified as profit taxes after the tax-for-profit reform. Also, the mechanisms by which remitted profits are distinguished from retained profits have differed widely as firms negotiated firm-specific arrangements under the CMRS. In this section I basically regard the distinction between remitted profits and SOE profit taxes as merely definitional, and rely on pretax profits (*lirun he shuijin zong'e*) as the preferred absolute measure of profitability.

Table 3.6 shows trends in pre-tax and after-tax profits from 1978 to 1997, as well as profit to total assets (net fixed assets plus working capital) and profits to gross output. While pre-tax profit continued to grow on an absolute nominal basis over the reform period (with just one backward step, in 1995), this growth paled in comparison with the growth in output or the SOE capital stock. Accordingly, the State's rate of return on total assets has fallen by approximately three-quarters over the reform period, while the profit margin on SOE gross output has fallen by about 60 per cent. Some writers such as Keidel (1998) and Perkins (1998) have drawn attention to the fact that the rate of total after-tax profits have fallen almost to zero, and to the fact that after-tax profits for the entire SOE sector did turn slightly negative on a quarterly basis during the first quarter of 1997.[4] While the decline in profitability was certainly significant, as I have alluded to above, a reliance upon the after-tax measures of profit overlooks the effective reclassification of some remitted profits into profit taxes, and therefore overstates the extent of the decline in state income from SOEs.

Table 3.6 **SOE Financial Performance Indicators** (RMB million, percentage shares)

Year	Pre-Tax Profit	Pre-Tax Profit / Fixed Assets	Pre-Tax Profit / Gross Output	After-Tax Profit	After-Tax Profit / Fixed Assets	After-Tax Profit / Gross Output	Losses of Loss-Making SOEs
1978	79,070	24.8	24.9	50,880	15.5	24.9	4,206
1979	86,440	24.9	24.5	56,280	16.1	24.5	3,638
1980	90,710	24.3	24.1	58,540	16.0	24.1	3,430
1981	92,330	22.9	23.9	57,970	15.0	23.9	4,596
1982	97,220	22.2	23.5	59,770	14.4	23.5	4,757
1983	103,280	21.7	22.8	64,090	14.4	22.8	3,211
1984	115,280	22.3	22.8	70,620	14.9	22.8	2,661
1985	133,410	22.4	21.8	73,820	13.2	21.8	3,244
1986	134,140	19.9	19.9	68,990	10.6	19.9	5,449
1987	151,410	19.7	18.9	78,700	10.6	18.9	6,104
1988	177,490	20.2	17.8	89,190	10.4	17.8	8,192
1989	177,314	17.5	14.9	74,301	7.2	14.9	18,019
1990	150,314	12.9	12.0	38,811	3.2	12.0	34,876
1991	166,115	12.3	11.6	40,217	2.9	11.6	36,700
1992	194,412	12.4	11.4	53,510	2.7	11.4	36,927
1993	245,470	12.9	11.1	81,726	3.2	11.1	45,264
1994	287,625	12.5	11.4	82,901	2.8	11.4	48,259
1995	287,420	9.3	9.2	66,560	1.9	9.2	63,957
1996	273,713	7.9	10.0	41,264	1.0	10.0	79,068
1997	290,722	7.6	10.4	42,783	0.9	10.4	83,095

Notes: The unit of measure for Pre-tax Profit and After-Tax Profit is RMB million. The figures in the other four columns are all percentage ratios.
Fixed Asset data from which the above ratios are calculated, is in original value terms.

Source: State Statistical Bureau, *China Statistical Yearbook*, various years.

Nevertheless the negative quarterly profit result of early 1997 provided an important 'wake-up call' to policy-makers as to the condition of the state sector. Considering the massive resources that the PRC had poured into the state sector since the 1950s, and the sacrifices that had been imposed upon industrial workers and the rural sector to generate those resources, it gave

great pause to reflect that the state's return from its SOE investments had dwindled to a negative, even if only on this inappropriate measure.

The profit figures presented in Table 3.6 are net figures for the entire SOE sector. Within these totals, the profits of some firms offset the losses of others. Viewed in isolation, figures on SOE losses reveal another aspect of deterioration in financial performance. The right-hand column of Table 3.6 shows that SOE losses multiplied more than ten-fold from the mid-1980s to the mid-1990s.

As Raiser (1997b) has argued however, the decline in SOE profitability has not been without parallel in the non-state sector. Table 3.7 is reproduced from this paper. It shows that then profit rates (defined as pre-tax profits / net fixed assets plus working capital) of state and urban collective firms trended quite closely together from 1985 to 1995. Moreover, while the profit rates of 'other' non-state enterprises (TVEs, joint ventures and individual-owned firms) were generally higher than those for SOEs and urban COEs, these rates also declined by half over the same period.

Table 3.7 **Selected indicators for SOEs, Urban COEs and other NSEs: 1983 to 1995** (percentages)

	Output Growth			Profit Rate			Share of Enterprises Making Losses		
Year	SOEs	Urban COEs	TVEs	SOEs	Urban COEs	Others	SOEs	Urban COEs	Others
1983	9.4	15.5	31.5	--	--	--	--	--	-
1984	8.9	34.9	61.7	--	--	--	--	--	--
1985	12.9	32.7	38.9	23.5	24.6	28.2	9.5	11.7	10.2
1986	6.2	17.9	28.0	20.7	19.4	23.3	13.1	13.2	15.8
1987	11.3	23.2	27.7	20.3	18.2	24.9	13.0	15.7	15.5
1988	12.6	28.2	28.0	20.6	19.8	24.7	10.9	11.7	17.2
1989	3.9	10.5	2.8	17.2	15.4	16.2	16.0	15.7	26.7
1990	2.9	9.0	14.5	12.4	11.5	11.3	27.6	19.4	32.6
1991	8.6	18.4	27.8	11.8	11.9	12.9	25.8	16.7	31.7
1992	12.4	39.3	51.6	9.7	10.1	11.1	23.4	13.7	27.9
1993	5.7	35.9	54.9	9.7	10.0	11.3	30.3	--	--
1994	6.5	29.8	11.0	8.0	9.2	14.8	--	--	--
1995	8.2	15.2	41.0	6.5	7.7	14.07	--	--	--

Notes: Output growth calculated from State Statistical Bureau, *China Statistical Yearbook*, 1994.
Profit rate calculated as Pre-Tax Profits / (net fixed assets + working capital)
Other NSEs include TVEs, joint ventures and individual businesses.

Source: Reproduced from Raiser (1997b). Original sources: Zheng (1994), Morduch and Sicular (1994), State Statistical Bureau, *China Statistical Yearbook*, various years.

Even as the number of loss-making firms and the total of their losses mounted, the central government managed to keep its annual expenditures on direct fiscal subsidies to SOEs at roughly steady levels in nominal terms. This means that, expressed as ratios to budget expenditure or to GDP, the scale of spending on loss subsidies declined considerably (see Table 3.8). However, these trends are entirely misleading as an indicator of SOE financial performance. The reason is that explicit subsidisation of SOE losses via the fiscal system was replaced by implicit subsidisation via the predominantly state-owned banking system. The consequent deterioration in SOE balance sheets is best represented via liability to asset ratios. The right-hand column of Table 3.8 presents some estimates of such ratios as compiled by Lardy (1998). At the outset of reform, liability to asset ratios were very low relative to the norm in market economies, as SOEs relied

primarily on fiscal capital grants with only limited recourse to bank loans. By around 1988 ratios had reached roughly half, which is typical in market economies, but continued to climb annually from there, to 85 per cent by 1995. Moreover, Lardy identifies several factors to suggest that these figures are probably under-estimated. First, they do not include triangular debt; that is, debts owed by industrial SOEs to other firms, including those in the non-state sector. (Debts owed by one SOE to another do not affect the liability to asset ratio of the SOE sector as a whole.) Second, assets are overstated because the depreciation rates typically charged by SOEs are too low. Third, assets are further overstated due to the practice of carrying unsold inventory on enterprise books at full price.

In the light of the accumulation of SOE losses and debts, scholars such as Lardy and Woo have pointed to a significant weakening of China's financial system and macroeconomic fundamentals. Lardy (1998: 92) surmises that 'all measures (of banking system soundness) confirm the view that the first two decades of economic transition have left China's financial institutions, particularly here of its four largest state-owned banks, in a precarious position'. Woo (1994: 278) asserts that 'the financial weakness of SOEs destabilised the economy by leading to excessive reserve money growth. The decline in SOE revenue and subsidisation through bank channels

led to significant expansion of the consolidated budget deficit (measured as the open deficit plus the hidden deficit, that is the government borrowing requirement plus the expansion of reserve money in excess of the deficit lending to government) to over 10 per cent of GDP in 1990 and 1991.' This represents a dramatic turnaround from the pre-reform situation whereby SOE profits served as the mainstay of fiscal revenue.

Table 3.8 **SOE Loss Subsidies and Liability-to-Asset Ratios** (RMB millions, percentages)

Year	Loss Subsidies	Subsidies / Budget Expenditure	Subsidies / GDP	Liabilities / Assets
1978	--	--	--	11
1980	--	--	--	19
1985	50,702	25.3	5.6	--
1986	32,478	14.7	3.2	--
1987	37,643	16.6	3.1	--
1988	44,646	17.9	3.0	45
1989	59,888	21.2	3.5	55
1990	57,888	18.8	3.1	58
1991	51,024	15.1	2.4	61
1992	44,496	11.9	1.7	62
1993	41,129	8.9	1.2	72
1994	36,622	6.3	0.8	75
1995	32,777	4.8	0.6	85

Notes: Liability / Asset ratios for 1978, 1980 and 1988 are for industrial SOEs only. Ratios for all other years are for all SOEs.

Sources: Loss subsidy data from State Statistical Bureau, *China Statistical Yearbook*, various years. Liability/Asset ratios compiled by Lardy (1998) from various original sources.

3.4 SOE performance and the policy debate

There is a considerable and growing body of English-language literature that assesses the performance of China's SOEs and the implications of that performance for reform policy in China. Much of this literature can be identified into two leading schools, identified by Sachs and Woo (1997) as the experimentalists and the convergence school. Sachs and Woo themselves belong to the convergence school (the 'pessimists') while the experimental or 'optimistic' school include among their number Gary Jefferson, Thomas Rawski, Barry Naughton, and Peter Nolan. The experimentalists also claim to reflect the dominant view of Chinese economists and officials.

Sachs and Woo (1997) represent the contrasting views of the two schools as follows. The optimistic group proposes that:

1. China's state enterprise reforms have improved productivity growth (particularly TFP growth) in the SOEs;
2. China's state enterprise reforms have improved the sectoral allocation of production and investment; and
3. China may be able to avoid privatisation of the SOEs in the future.

The pessimistic school meanwhile holds that:

1. China's state enterprise reforms have failed to improve productivity performance;
2. China's state enterprise reforms have failed to improve the financial performance of the SOEs;
3. China's state enterprise reforms have failed to improve the sectoral allocation of production and investment; and
4. China will need to pursue a strategy of privatisation in the future, both for the purposes of fiscal balance and allocative efficiency.

While the optimists also accept that the profitability and financial performance of SOEs has declined over the reform period, they differ with the pessimists in their evaluation of both the causes and the significance of profit decline. According to Sachs and Woo, debate over causes centre around the relative weights to be assigned to the following three principal explanations for profit underperformance: (1) intensifying competition and the entry of non-state firms into formerly quasi-monopolistic markets; (2) the failure (according to the convergence school) of SOEs to improve their efficiency despite the reforms; and (3) the over-compensation of SOE personnel and stripping of SOE assets by employees and managers. The convergence school stresses the second and third of these explanations. The experimentalist school places most emphasis on competition, disputes the failure to improve efficiency gains and tends to be sceptical of the case for over-compensation and asset-stripping. This concise characterisation of the experimentalist position by Sachs and Woo should not exclude the consideration by the experimentalists of other possible causes of financial underperformance. Jefferson and Singh (1999) for example list the following four explanations in addition to the competition factor (1)

limitations to the exit of the poorest-performing SOEs; (2) the conversion of the best SOE performers into non-state forms such as shareholding firms and foreign joint ventures; (3) the continued concentration of subsidised housing and social services in the SOE sector; and (4) over-investment in state industry due to low interest rates and poor financial discipline.

A resolution of the debate between the 'convergence' and 'experimentalist' schools over the causes of SOE loss-making, is likely to be instructive in terms of the wider debate between the two schools over the assessment of SOE reform to date, and over the appropriate reform strategy going forward.

Other assessments of SOE performance

The East Asian Analytical Unit (1997) sides with the convergence school in this debate, attributing the poor profitability to inefficiency and over-compensation. This publication also lists (p. 341) the principal causes of inefficiency as: (1) ambiguous property rights to SOE assets; (2) inappropriate incentives for enterprises including subsidies to loss makers and the absence of bankruptcy provisions; (3) barriers to non-state firms entering certain industries; (4) inappropriate incentives for managers and workers; (5) the expensive social benefits provided to SOE workers; (6) redundant labour; and (7) government interference in enterprise decision-making, including some residual price controls.

Chai (1994) also tends to side with the convergence ('pessimistic') school. He rejects the assertion that China's transition path has been superior to that taken by Eastern European transitional economies. He assesses the progress of reform up to the mid-1990s as only mixed, criticising the failure to establish indirect macroeconomic control measures, the failure to 'start comprehensive structural reforms' in the large and medium-sized SOE sector, and the failure to tighten SOE budget constraints. In other words, it is in areas related to SOE reform that he sees reform as inadequate. Although acknowledging that short-term transition costs had been less than in other transforming economies, he attributes this to slower progress and to favourable initial and international conditions. He argues that China had

merely postponed some of the transition costs of reform, and in the process undermined the conditions for long-run sustainable growth.

The views of some other researchers on SOE performance do not fit neatly into either the convergence or the experimentalist camp. For example, Lin *et al.* (1996) argue that fair assessment of the performance of individual SOEs is obscured by three main factors: (1) continuing price controls; (2) policy burdens including interference and social welfare obligations; and (3) the interest costs on capital that had originally been granted on interest-free terms. They advocate the removal of these unequal policy burdens, the placing of SOEs on a level competitive playing field with NSEs and the creation of hard budget constraints including bankruptcy for loss-making firms. Lin *et al.* do not believe *a priori* that SOEs need be permanently uncompetitive (citing some examples of successful state-owned companies in market economies, such as Singapore Airlines) and in this sense they side with the experimentalists. However, their policy proposals leave the fate of the SOE sector dependent on its own performance — if they were to make losses, they would be 'weeded out' of the economy.

Steinfeld (1998) and Lardy (1998) tend to side with the convergence school in their assessment of performance, since they stress the danger of an impending financial collapse. Steinfeld (1998) however parts company with the convergence school somewhat in his policy prescription. He holds that the argument over state versus private ownership is not the crucial issue since the real problem is the absence of an effective system of ownership at all. Steinfeld's priority is the creation (through state intervention) of at least a rudimentary functioning system of ownership and property rights, including the commercialisation of credit practices. Steinfeld argues for more, not less, state control over SOE activities in order to establish such a system. He warns that rapid privatisation would be ineffective in the absence of such ownership-creating reform, since privatised SOEs would suffer from same basic inefficiencies as prevail currently. This argument seems to imply that even inefficient privatised firms could somehow perpetuate the soft budget constraint and evade bankruptcy.

Lardy (1998) points to the lack of a fundamental change in ownership and corporate governance as the underlying cause of declining financial performance. He claims that the lesson from other transitional economies is that without formal programs of privatisation, assets and earnings diversion into private hands becomes commonplace once the private economy has become legitimate. He sees over-investment and the over-compensation of employees as the predictable outcome of the environment in which SOEs operate. He sees the solutions — hard-budget wage determination, greater labour mobility and the alignment of managers' actions with the interests of owners — as almost certainly necessitating widespread privatisation. He also warns that the liability to asset ratios of both Chinese SOEs and Chinese state banks have built up to levels that threaten a financial crisis, or even if one can be avoided, threaten to deny the resources that China needs to address various physical constraints to its growth.

3.5 Explanations of poor profitability

This section critically considers the three possible explanations noted by Sachs and Woo for poor SOE profitability (competition, low productivity and over-compensation) as well as various other explanations that have been raised in the literature. We review the literature on the questions of competition and over-compensation, having already reviewed the productivity literature in Section 3.2. We go on to consider what type of empirical evidence would best serve to resolve the outstanding debate, and outline the analysis that the remainder of the thesis will carry out in order to generate such evidence.

Competition

Raiser (1997b) claims evidence to support the contention that increased competition contributed most to the decline in profitability, while finding evidence of income-shifting from profits to wages only in certain sectors. He argues that on a sectoral basis, the lowest profit rates among SOEs were returned by those relatively labour-intensive sectors such as textiles, garments, food processing and forest products.

Naughton (1995) reaches similar conclusions to Raiser after examining the sector-wide (average of SOEs and NSEs) rates of return to capital in different sectors of industry in 1980 and 1989. He notes that at the beginning of reform, profit rates were higher in labour-intensive light manufacturing sectors than elsewhere, yet by 1989 sectoral profit rates were comparatively uniform. He attributes the convergence to increased competition from non-state enterprises, which would have had the effect of competing down the profit rates of the labour-intensive light manufacturing sectors that were most exposed to non-state competition.

Both Sachs and Woo (1997) and Lardy (1998) question this use of evidence. Sachs and Woo note that SOE profitability had shown a similar dramatic drop whether in sectors where NSE competition had been significant, or in sectors that had experienced little NSE entry. Lardy argues that price reform since 1980 had been disadvantageous to light manufacturing sectors, and that therefore competition could not be the sole explanation for their relative profit decline. He adds that SOE profitability had also declined rapidly in certain sectors such as petroleum and natural gas that had been protected from non-state competition.

The evidence of Fan and Woo (1996) reinforces this critique. This study compares SOE profit rates across various sectors against the collective market shares of SOEs in those sectors in 1989 and 1992. SOE profitability declined in four of the five industries where the degree of market domination by SOEs was unchanged, and also declined in six of the seven sectors in which SOE market share declined by less than five percentage points. A regression estimation of the change in SOE profit rates on the change in SOE market share yields an insignificant negative relationship and an R^2 of 0.3.

Such critiques may be taking a too-narrow view of the intensification of competition. Even in sectors where there had been little or no NSE entry, the declining importance of planned allocation meant that SOEs in each sector at least were required to compete for sales against each other. Also, whereas in the pre-reform system SOEs tended to possess significant market

power in their own local areas, as transportation and trading infrastructure improved, the intensity of competition from distant regions increased. Yet another dimension of increased competition concerns competition in factor markets, especially in the labour market. As NSE entry to the broader economy raised growth rates and incomes, and as a measure of flexibility was introduced to labour markets, SOEs must have experienced some pressure to pass on wage rises comparable to those being enjoyed in the non-state sector. Such pressure is likely to have been felt in all sectors, regardless of the degree of competition in product markets.

Singh, Ratha and Xiao (1993) analyse the impact of NSE competition on SOE performance on a regional basis. They find that SOE profitability rates tend to be lowest in those provinces where NSE output has grown most rapidly, while also finding that although greater NSE competition is associated with better TFP performance by SOEs. This link between competition and TFP performance is supported by the results reported by Huang and Woo (1998).

Huang and Duncan (1999) employed a logit model and a profit model to examine the effects of various enterprise characteristics and reform measures on SOE profitability. Far from finding that competition drove down profitability, they report that competition was one of only two factors in their framework that had a positive influence on profitability, the other factor being the proportion of bonuses in the total wage bill. The database employed was the CASS 800 firm database.

In summary, while it is clear that competition did increase and profitability did fall during the reform period, the existing research in this area is not yet strong enough to conclude that competition was the main driver of declining profitability, to the exclusion of all other explanations.

Over-compensation

A fundamental assumption of economics is that economic agents will always seek to maximize the own utility, and therefore their income. During the era of central planning, Chinese SOE managers and workers had

relatively little opportunity to enhance their own incomes through their own behaviour, because of the comprehensive and overlapping nature of state controls. However, as controls were steadily lifted, it is possible that opportunities arose for SOE managers and employees to increase their incomes, not only by improving their firms' commercial performance, but also by diverting some of the profits that notionally belonged to the state.

From as early as the mid-1980s, studies emerged that noted the motivation of SOE managers to convert profits into higher wages and benefits for themselves and for SOE employees. One of the earliest was a report by the China Economic System Research Institute (*Tigaisuo*) in 1986, which noted an increasing tendency by SOEs to make use of dubious accounting methods so as to siphon resources into personal consumption and investment activities. As noted in Chapter 2, Byrd and Tidrick (1987) list the maximisation of family income and benefits as one of the five main motives of SOE workers and hence of their managers. In this view, employees not only sought to maximise wage income, bonuses and job security for themselves, but tended to view their own firms as the best source of employment for their children. The practice of *dingti* (occupational inheritance) is well documented by Korzec (1992) and referred to in Chapter 2. Byrd and Tidrick comment that 'the desires of workers and managers sometimes coincide and sometimes conflict, but are seldom decisive because the allocation and payment of labour is the most tightly controlled aspect of enterprise operations. Nevertheless, there are some ways to evade these controls, and recent reforms have increased the flexibility somewhat.' Note that Byrd and Tidrick were writing just at the time that serious labour market reforms were commencing. As is noted in Chapter 2, by the 1990s these reforms had weakened state control over remuneration mechanisms to the point that Kornai (1990) regarded such controls as non-existent.

Walder (1987 and 1989) described the Chinese enterprise as a socio-political community in which 'managers are responsible not only for production and performance, but also for enhancing employee income and

for delivering a wide range of other benefits and services to their employees.' He stressed that rank-and-file workers have considerable leverage over their managers, arguing that 'if a manager is not a good one by his employees' estimate, the resulting lack of harmony can curb the performance of the firm and harm the manager's career'. Walder argues that a key goal of SOEs is prosperity for the community, and that pursuing this goal requires retaining the greatest possible proportion of the firm's revenues and exercising maximum discretion over the use of those funds, even if illegal means must be employed. He quotes an interview with an SOE manager:

> In recent years the factory benefits fund hasn't been enough, so we overspent our benefits every year, and took the difference out of the reserve fund. So the reserve fund has in reality has turned into a benefits fund. This is especially because of all the housing we are building for workers, and things like medicine are rising in price. We have to get the money from elsewhere. Sometimes we work the expenses into our costs of production, which is not really legal. … The best managers are always one step ahead of the law. The state regulates the treatment of workers, but my superiors in the bureau won't be happy if workers' welfare doesn't improve.

As suggested by the above quote from Byrd and Tidrick, the scope for diverting firm resources to employees and managers is likely to have widened from the mid-1980s as various reforms accelerated, including the internal wage system. The early 1990s saw the emergence of a number of quantitative studies seeking to gauge the extent of over-compensation. The framework used for most of these studies was income share analysis. This approach uses the standard result from the neoclassical theory of the firm, whereby a profit-maximising firm equates input prices with the marginal-revenue products of factors. With a Cobb-Douglas production function this yields the convenient result that the respective income shares of wage and interest payments should equal the output elasticities of labour and capital (see Chapter 4, Section 4.1). Over-compensation can therefore be measured as the positive difference between labour income share and the output elasticity of labour. Should this difference turn out to be negative, however, according to Raiser (1997b) the apparent *under*-compensation could be

interpreted as a measurement of excess profits, perhaps as a result of inadequate market competition.

Woo *et al.* (1994a), Woo (1994) and Fan and Woo (1996) employed various data sets to show that total SOE employee compensation, including direct income such as wages and bonuses and indirect income such as housing and medical benefits, grew faster than labour productivity. Woo *et al.* (1994a) used a survey sample of 300 large and medium-sized SOEs in which the share of total compensation (direct and indirect) within value added grew from 31.8 per cent in 1984 to 48.8 per cent in 1988. Over the same period, taxes and remitted profits fell from 31.5 per cent to 13.7 per cent of value added, while the share of retained profits rose slightly from 11.3 per cent to 15.0 per cent. A parallel analysis of a survey of 200 TVEs from 1984 to 1987 showed that total labour compensation in those firms fell from 39.1 per cent of value added to 30.6 per cent. The authors did not explicitly compare estimates of labour income share with output elasticity, but in a separate section of the paper they reported the results of a two-factor Cobb-Douglas production function regression on the SOE data with an estimated output elasticity of labour of 0.541. The paper also reports three modified translog estimations each with slightly higher estimates of labour output elasticity. According to these estimates then, the labour shares still fell short of labour output elasticity. It is therefore not entirely clear that the growing labour income share uncovered by the authors constituted over-compensation; it may reflect instead a decline in excess profits. (This 1994 paper essentially re-publishes the analysis of Woo *et al.* (1993)).

Woo (1994) used nationwide data from the China Statistical Yearbook to calculate that real direct labour income in SOEs grew an average of 4.1 per cent annually over the period 1978 to 1990, while labour productivity grew by 4.4 per cent on a comparable basis. Incorporating Zhao's (1992) estimates of indirect labour income however, he arrives at an estimate for average annual growth in total labour income of 5.4 per cent, well in excess of productivity growth. Moreover, he contrasts these figures with corresponding figures for the collective sector, where labour productivity

grew 8.3 per cent annually and real direct wages 3.6 per cent. (The implication both here and in Woo *et al.* (1994a) is that indirect wages in the collective sector are small and can be ignored). Woo asserts the following set of inequalities:

COE labour productivity growth > SOE real wage growth > SOE labour productivity growth > COE real wage growth.

Fan and Woo (1996) also used data from the 300 firm SOE survey to show that the share of direct labour income in net output value (value added minus depreciation), after barely changing from 11.6 per cent in 1980 to 11.7 per cent in 1984, rose to 15.9 per cent by 1988. Calculations of indirect income were not incorporated into these figures, but in a separate section several quantified observations regarding indirect income were made, all indicating rapid growth. The authors identified three main categories of indirect income; distribution of private consumer goods, collective consumption and housing. The distribution of consumer goods occurs at both the rank-and-file and elite levels. At the rank-and-file level it takes the form of goods from foodstuffs to furniture bought by the firm, distributed to employees and charged mostly to 'material costs' and 'non-production expenditure' to avoid tax. Fan and Woo partly attribute to such practices the respective 82 and 234 per cent rises in these two accounting items materials over 1984–1988, when net output value rose only 59 per cent. Consumption at the elite level took the form of banquets, travel, luxury official cars and other perquisites, and showed up in 'net management cost' and 'sales cost'. These two items rose by 165 per cent and 300 per cent respectively over 1984–1988. Collective consumption encompassed services paid for out of the enterprise welfare fund such as kindergartens, hospitals, and dining and recreation facilities. The welfare fund was tied to the wage bill and retained profits. It grew by 240 per cent from 1984 to 1988 according to the survey data. Enterprise housing, including the physical structures for kindergartens and other social services, was accounted for as 'non-productive fixed asset expenditure'. The value of such assets grew by 160 per cent over 1980–1988, a remarkable rate considering that this is a stock measure, not a flow.

The share of non-productive fixed assets in total fixed assets rose from 15.1 per cent in 1980 to 19.3 per cent in 1988.

Minami and Hondai (1995) carry out an income share analysis measuring the labour share of output in the machine industry and explicitly comparing it with estimates of the output elasticity of labour. Their data includes a nationwide sample of 389 firms for the years 1980 and 1985 only and a sample of 129 firms in Tianjin from 1985 to 1990. The authors make a serious attempt to capture the non-monetary welfare services in their estimations of remuneration, by utilising data for the capital cost of welfare facilities and the wages of workers operating them. The labour share of income was found to have risen from less than 0.4 in 1985 when incentive and autonomy reforms were accelerated, to approximately 0.7 by 1990. It surpassed the estimated output elasticity of labour from 1988 onwards, which significantly reinforces the findings of the various studies above involving Woo and colleagues. Whereas the Woo papers do not show that the growth in labour income to 1988 was so great as to overtake labour productivity, Minami and Hondai's results suggest that this is only because Woo's data was not recent enough, and that expansion in labour income share has since continued unabated.

Bouin (1998) reports that the marginal product of labour in industrial SOEs grew by 5 per cent from 1989 to 1993 but that wages grew faster. According to his data, real average wages in SOEs grew annually by 8.4 per cent in 1990–1992 and 11.8 per cent in 1993–1994, following annual declines of 1.3 per cent in 1987–1989. Thus real unit labour costs were rising by almost 7 per cent in 1993–1994. This reinforces Minami and Hondai's finding that expansion of labour income share continued past 1988.

Raiser (1997b) as one part of his analysis also carries out an income share analysis, producing less consistent findings than Minami and Hondai. He uses enterprise level data for 180 state, collective and non-state firms for the years 1980, 1985, 1990, 1991 and 1992. The data covers four coastal cities (Shanghai, Guangzhou, Xiamen and Shenzhen) and four industrial sectors (textiles, garments, electrical appliances and iron and steel). Convincing

evidence of over-compensation only arose among the SOE group and only in the textile and garments sectors, and not until 1991 and 1992. 1992 estimates of labour income share and output elasticity respectively were 0.811 and 0.57 for textiles, 0.753 (0.909 in 1991) and 0.68 in garments, 0.24 and 0.91 in electrical appliances and 0.400 and 0.60 in iron and steel. Thus over-compensation is suggested for the garments and textiles sectors but not for electrical appliances or iron and steel. While conceding that the results could indicate that 'excessive worker remuneration particularly in light industry is becoming a serious problem', the overall conclusion of his paper is that 'growing competitive pressures on the domestic market are primarily responsible for the erosion of profit rates in Chinese industry'. He notes that this profit erosion has occurred consistently across all three ownership types featured in his study.

Naughton (1994b) expressed scepticism at the over-compensation argument, noting that 'the wage bill, including all monetary subsidies, has remained unchanged at approximately 5 per cent of GNP since 1978'. Sachs and Woo (1997) criticise this conclusion on two grounds. First, the appropriate denominator for evaluating the SOE wage bill is not GNP but total value added for the SOE sector (which as already noted has declined significantly relative to GNP). Second, this calculation does not take account of indirect labour income. Jefferson and Rawski (1994) also seek to rebut the over-compensation argument, employing Yearbook data to note that the 252 per cent rise in monetary compensation of SOE industrial workers between 1980 ad 1992 was almost matched by the 231 per cent rise in labour productivity over the same period. This yielded only a slight rise in the labour income share of gross output, from 7.0 to 7.5 per cent. They also assert that, even if non-monetary forms of compensation were to double the true estimate of labour income share to 15 per cent, this would be no higher than most estimates of the gross output elasticity of labour.

Knight, Song and Jia (1999) focus on the employment and remuneration of rural migrant workers relative to regular employees. Their data sample comprises 118 urban enterprises in four cities; Beijing, Shenzhen, Wuhan

and Suzhou. The sample firms are of mixed ownership types; 54.7 per cent state-owned, 20.5 per cent collective and 24.8 per cent of other types, with a bias towards large firms hiring rural migrants. Estimating a production function in which migrant labour and non-migrant labour served as separate inputs (alongside capital), they calculate a marginal product of migrant labour of 20,706 yuan per annum at the mean values. This is considerably higher than the geometric mean wage of migrant labour (5,368 yuan per annum). Non-migrant labour on the other hand was found to have a marginal product of 5,597, below their mean wage of 6,956 yuan per annum. This indicates over-compensation of regular employees and constraints in the hiring of migrant employees. It may be the case that regular employees or 'insiders' act as de-facto owners of the firm, effectively sharing profits and maximising their own incomes but employing migrants or 'outsiders' on a quite different, profit-maximising basis. This question is taken up in detail in Chapter 4.

Not all of the literature relevant to the over-compensation debate has followed the income share framework. Sicular (1995) produced a theoretical analysis that modeled the behaviour of SOEs as maximising internally retained funds, comprising retained profits, employee wages and benefits, and subsidies net of taxes. With the size of the firm's labour force exogenously set, the two choice variables for this type of firm are the quantity of capital employed and the wage rate (incorporating non-cash benefits). The model bears some similarity to models of labour-managed firms, such as those developed to describe firms in socialist Yugoslavia. Sicular did not include any empirical analysis but her paper contributes a behavioural explanation of the over-compensation argument.

Meng and Perkins (1998) can be seen as an attempt to empirically test a model along similar lines to that of Sicular. They seek to test the hypothesis that SOEs and COEs behave as labour-managed firms, while foreign-invested firms and TVEs exhibit profit-maximising behaviour. Their data set covers 193 firms from Shanghai, Xiamen, Guangzhou and Shenzhen; 117 SOEs, 24 COEs, 13 TVEs and 38 foreign-invested enterprises. The TVEs

and FIEs were combined into one group. The following nested model was tested:

Average compensation = f (Labour productivity, Retained profits per employee)

The hypothesis was that compensation in SOEs and COEs would be dominated by retained profits per employee and that compensation in FIEs and TVEs would be dominated by labour productivity. The regression results broadly supported these hypotheses. It does not necessarily follow however that these results, as interesting as they are, provide strong support to the over-compensation argument in the SOE debate. Chapter 2 has already related the formal and legitimate links between the total SOE wage bill and retained profits under the 'floating wage' system. These results could be interpreted as merely reflecting this relationship. Meng and Perkins' analysis supports the contention that SOE employees act as de-facto owners, sharing out some of the profits of the firm. But it does not show the extent of any 'illicit profit sharing' , nor does it establish that the total compensation of employees under such a system is necessarily higher than the share that workers might receive under a profit-maximising regime.

In another behavioural contribution to the literature, Gordon and Li (1999) construct an analytical framework incorporating a state sector with a compressed wage structure, competing with a non-state sector that is free of wage-compressing controls. Their paper purports to explain, among other phenomena, (1) the migration of the most skilled SOE workers to the non-state sector, (2) higher productivity in the non-state sector, (3) accounting losses in the state sector reflecting the transfer of tax revenue to finance higher wage payments to unskilled state sector workers, and (4) restructuring within the state sector, to reduce the distortions to relative wages. The paper cites some empirical evidence backing up its assertions but is not an econometric work. It is notable in providing a single framework that theoretically supports the arguments of the pessimistic school, regarding both TFP performance and over-compensation, as well as intra-urban sector labour migration trends.

Groves *et al.* (1994), mentioned in Section 3.2, also produced some relevant insights for the over-compensation debate. They find that the productivity generated in SOEs by strengthened workers' incentives raised workers' incomes (but not those of their managers) and generated greater investment by the enterprises, but did not result in lower subsidies or increased profits.

To summarise, the existing literature provides a number of pieces of evidence to support the over-compensation argument. However, more evidence is needed to form a strong conclusion. In particular, SOE data covering more recent years and more industrial sectors should be examined to confirm the income share trends reported by such authors as Woo *et al.* and Minami and Hondai. The analysis should explicitly compare labour income shares with estimates of labour output elasticity so as to distinguish whether the observed expansion of labour income share represents the competing down of excess profits or actual over-compensation.

Such an analysis could usefully be extended by examining the evidence for overcompensation across firms of different sizes, and across light and heavy industrial sectors. If overcompensation is to be viewed as the result of a breakdown in state monitoring and control, then the evidence for it might indicate where that breakdown has been most severe. It could be that state monitoring is more difficult to conduct over a large number of small firms than a small number of large firms. Derong Chen (1995) has asserted that state controls were withdrawn more rapidly from light industrial sectors than from heavy industry. If this were the case, we could expect to see stronger evidence of overcompensation in light industry than in heavy industry.

Other explanations

Several other explanations for poor profitability or for poor overall performance by SOEs have been variously advanced in the literature. Some of these could be categorised within the three alternatives of competition, productivity and over-compensation discussed above.

Lin *et al.* (1996) discuss the 'policy burdens' imposed on SOEs by their state owners, referring to their duty to provide welfare services at a certain standard, the interest cost of capital previously acquired on apparently interest-free terms, and lingering price distortions. These writers argue that SOE performance cannot be properly judged until SOEs and NSEs compete with each other on an equal basis. It should be noted that NSEs face certain 'policy burdens' of their own, such as inferior access to bank borrowings. Moreover, the policy burdens that Lin *et al.* cite could be considered as causes of poor productivity growth (which is the viewpoint of EAAU 1997), or in the case of welfare services, as possible manifestations of over-compensation.

Some writers have identified over-investment as a cause of poor performance. There is general acceptance of the proposition that many areas of Chinese industry suffered from over-investment during the reform period, and that this turned the markets for most commodities from a state of under-supply to a state of over-supply ('buyer's markets'). If SOEs have suffered from over-investment at a sectoral level, so have NSEs who operate in the same markets. However, SOEs' lack of freedom to divest themselves of unneeded capital capacity is a particular obstacle faced by them. For that matter, the inability to divest themselves of substantial excess labour up to the mid-1990s can also be considered seriously as a cause of under-performance. A special case of the problem of over-capacity is the 'weeding-in' phenomenon' referred to for example by Jefferson and Singh (1997). 'Weeding-in' denotes the non-exit of poor-performing SOEs from the state-sector and the exit of some of the most profitable SOEs from the state sector to assume other forms such as foreign joint ventures. It is analogous to the over-capacity problem in the sense that some completely obsolescent firms may represent in their entirety bundles of idle capital and labour whose scrapping would raise the overall performance of the SOE sector.

Finally, the persistent soft budget phenomenon can be thought of as a cause of poor performance, albeit one that works through a variety of channels

(see the discussion in Chapter 2). 'Soft' firms pay 'soft wages'; they tend to indulge in over-compensation. They tend not to exit the economy even when performing poorly, leading to a weeding-in effect. This in turn leaves more than the optimal level of capacity in the economy. A 'soft' economic environment would be associated with poor TFP performance. And in such an environment, as Kornai noted (Chapter 2), responses to price signals are weak.

3.6 Addressing the debate: the burden of proof

In the remaining chapters of this thesis, I will seek to advance the policy debate on the Chinese SOE sector by addressing the sub-debate on the causes of poor financial performance. How can this best be done? How should we best judge the plausibility of each of the three explanations? How could we decide whether to award the honours in the debate to either the optimistic camp or the pessimists? In order to answer these questions, first let us consider in turn each of the three proposed explanations — competition, productivity and over-compensation — and what onus of proof ought to be placed upon either school before we can accept either case as proven.

First consider the competition argument. It is very clear that the SOE sector prior to reform enjoyed very high profitability. It is also clear that each state firm operating under the old planned system generally did not need to consider the influence of competitors, since the plan guaranteed markets and set output and input prices. Pre-reform SOEs enjoyed an environment similar to monopoly. By contrast, post-reform SOEs in most sectors must now contend with non-state sector competitors that continually expand in size and number. In addition, SOEs now compete with each other for customers (a point that is sometimes overlooked by researchers). In theory, perfect competition among homogeneous firms leads to zero economic profits, while in practice most market economies show positive economic profit rates in excess of interest rates, since firms are not homogeneous but are able to build market power through differentiated products. Let us use the term 'normal profits' to refer to the positive profits that prevail in typical

market economies. In China's case it would be surprising indeed if the expansion of competition had not led to the competing down of the super-normal profits of the pre-reform era. Profit decline attributable to this cause would certainly, as the optimists argue, represent a beneficial and necessary transition to a competitive market economy. If that transition were appropriately managed with no other factor detracting from SOE performance, it could theoretically lead to an endpoint of stable equilibrium in which SOEs were left competing equally with NSEs, both sectors earning normal profits. Such a transition to equilibrium forms an 'optimistic paradigm' whereby all of the decline in profit is attributable to increased competition and where the decline ceases once 'normal' profits are reached in both the SOE and NSE sectors. The transition would presumably take a number of years to complete.

How is profitability affected by poor productivity? Low or even zero TFP growth in the SOE sector need not in itself lead to poor profitability. It has already been shown that TFP growth in the pre-reform period was approximately zero, and yet the sector enjoyed high profitability. In the absence of inter-firm competition, growth was achieved through capital accumulation and input and output prices were set so as to guarantee profitability even without TFP growth. By contrast, in the reform-period environment characterised by mounting competitive pressure, TFP becomes very relevant to profitability. However, in this context it is not absolute TFP growth but the relative productivity of the SOE and NSE sectors that is important. If all firms were otherwise identical, particularly in the input prices that they face, an advantage in TFP held by NSEs over SOEs would enable NSEs to charge lower output prices than SOEs for any given profit margin. Therefore, an intersectoral TFP gap (higher TFP levels in the NSE sector than in the SOE sector) in the presence of intensifying competition would damage SOE profitability in two ways. It would speed up the rate at which new NSE entrants compete down SOE sector profit margins, and it can also leave SOEs earning less than normal profits at the end of the transition when NSE profit rates have fallen to 'normal' levels. If NSEs were still achieving higher TFP growth than SOEs at this endpoint, then the

gap in TFP levels would continue to expand, forcing SOE profit rates ever downward even after NSE profit rates had stabilised at normal levels.

It has already been shown above in our review of the existing TFP literature that an intersectoral gap in TFP growth clearly exists. However, a point that many researchers have missed is that TFP *levels* have been found to be higher in the SOE sector than the NSE sector in most studies (for example, Woo *et al.* 1994, Huang and Meng 1997). The question therefore is whether NSEs are growing their TFP faster than SOEs simply because they are in a temporary 'catch-up' phase, or whether are they destined to surpass SOE TFP levels and keep going. If NSEs had merely held a temporary advantage in TFP growth during the transition to a competitive market environment, then the SOE sector may still have a future. If however at the end of the market transition the NSE sector were to hold a significant and growing TFP advantage in level terms, then the SOE sector would be doomed to chronically expanding losses making its continued existence impossible to support.

What of over-compensation of employees? For any given degree of competition and any given TFP gap, over-compensation of SOE employees reduces profits relative to what SOEs could have achieved given their productive efficiency. If it is prevalent enough, over-compensation at the end of market transition could make the difference between the SOE sector making positive profits or negative profits. The relevant questions to ask are:

(1) Does over-compensation exist?

(2) How significant is it?

(3) Does it expand or contract over time, especially at the end of the transition to competitive markets?

In the light of this discussion, it would be too simplistic to attempt to resolve the debate over SOE performance by asking: 'How much of the profit decline is attributable to increased competition, and how much is due to the other two factors'. The burden of proof is not evenly balanced. The pessimistic school's case could withstand convincing evidence that

competition eroded SOE profits, if it could prove that either a TFP gap or chronic over-compensation would continue to bleed SOE profitability even after the transition to fully competitive markets.

The onus upon the optimistic school is to show not only that intensifying competition contributed to declining profitability, but that it accounts for virtually the entire decline, viewed over the long run. If TFP divergence or over-compensation or both are found to contribute to SOE profit decline, then the optimistic school must show that this effect is only temporary, and that after the full transition to competitive markets SOE profits would converge to rates similar to those of NSEs.

The onus upon the pessimistic school is to show that either the TFP gap or over-compensation or both together are significantly large, and that they are not temporary phenomena, implying that after market transition SOE sector profitability is doomed to persist at unsustainably low levels.

3.7 Conclusion: proposed analysis

In the light of the above discussion, the remaining analysis of this thesis concentrates upon the question of over-compensation. Further evidence on the competition question, while interesting, would not necessarily resolve the SOE debate, since the pessimists' argument could happily co-exist with evidence that competition reduced profits. Further evidence on TFP is also unlikely to resolve the debate at this point. The TFP aspect has already been the subject of far more extensive research than either the competition question or the over-compensation question. Moreover, most studies have shown that, despite inferior TFP *growth*, the SOE sector enjoys a higher *level* of TFP than the NSE sector. What we need to know is whether the NSE sector is destined to catch up with the TFP levels of the SOE sector and then to keep on growing at a faster rate. We keenly await new TFP studies using good quality data from the late 1990s and the new century, to see whether such developments are revealed. However, this author has no such data to hand.

What this thesis can pursue is evidence of employee over-compensation by SOEs over the period from the early 1980s to the mid-1990s. An extensive database collected by the Chinese Academy of Social Science covering the years 1980 to 1994 is suitable for this purpose. In Chapter 4, using the contribution of Sicular as a starting point, I develop a theoretical framework for addressing the over-compensation issue and the related behavioural issue. From this framework, I conclude that the most appropriate empirical test for the over-compensation question would be one along the lines of Minami and Hondai (1995) or Raiser (1997b). Such a test is carried out in Chapter 5.

Endnotes

[1] The producer price index is not available for the pre-reform years. However, it is known that price levels varied little under the traditional centrally planned system.

[2] For completeness, the variable output elasticities are as follows:

$$s_K = \frac{\partial Q}{\partial K}\frac{K}{Q} = \alpha_K + \alpha_{KK} \ln K + \alpha_{KL} \ln L, \qquad \text{and}$$

$$s_L = \frac{\partial Q}{\partial L}\frac{L}{Q} = \alpha_L + \alpha_{LL} \ln L + \alpha_{KL} \ln K.$$

[3] Official data for independent accounting units excludes industrial activity carried out by non-industrial organisations, such as university publishing and printing houses.

[4] After-tax profits for SOEs 'within the budget', a large subset of the SOE sector, actually turned negative a year earlier, in the first quarter of 1996. In the seasonal production pattern of the Chinese economy, the first quarter is typically the weakest, since it encompasses the Lunar New Year holiday period, when enterprises shut down for as long as a month.

4

Explaining the puzzle of state-owned enterprise performance: the labour-managed firm

Chapters 2 and 3 have highlighted two unresolved controversies in the literature on Chinese SOEs in the reform period, which I refer to as the 'Behavioural Issue' and the 'Over-compensation Issue'. The Behavioural Issue relates to the hypothesis that Chinese SOEs have not been behaving as profit-maximising firms but rather sought to maximise the benefits accruing to their own employees. The Over-compensation Issue is closely related and refers to the assertion made by the Pessimistic School that poor SOE financial performance can be explained by increases to SOE wages and benefits beyond the extent that would be justified by productivity. This chapter develops a theoretical framework from which empirical tests can be designed to address both these issues. We begin from the contribution of Sicular (1995), who put forward a theoretical model to explain SOE loss-making on the basis of a different objective function from that of the standard profit-maximising firm. The Sicular model is considered to be a variation of the Labour-Managed Firm (LMF) model.

The profit-maximising firm (PMF), which forms the basis of standard Western microeconomic theory, seeks as its name suggests to maximise the return to capital owners, or after-tax profits. Profit is defined as total revenue minus total costs, the costs including the costs of capital, labour, intermediate materials and other inputs. Labour-managed firms on the other hand seek to maximise the return to the firm's workers, who share out the firm's profits as well as receiving wages. Therefore, whereas the firm's total wage bill is a negative component in the objective function of the PMF, it appears twice in the objective function of the LMF, as both a negative and a positive component. In effect, it cancels itself out, leaving the LMF to maximise total revenues minus total costs *excluding* labour costs. A more detailed mathematical examination of the objective functions of PMFs and LMFs is presented below.

The hypothesis here is that enterprise reforms in China, while ostensibly encouraging SOEs to maximise profits, have in fact created incentives for the firms to recycle potential profits into extra payments and non-cash benefits for employees. In other words, SOEs may have been acting clandestinely as labour-managed firms. Such a behavioural model, if verified by empirical analysis, would explain why gains in SOE productivity have not been matched by concomitant gains in profitability.

The chapter proceeds as follows. The next section presents a review of four theoretical models pertinent to the analysis. The first of these is the standard model of a profit-maximising firm, which serves as a reference point from which the other models are developed. Next, three distinct versions of the labour-managed firm model are reviewed. The first of these is the so-called 'Illyrian' model developed by Ward (1958), Vanek (1970) and others to describe the behaviour of firms in socialist Yugoslavia. The second is a model developed by Sicular (1995) for specific application to the performance puzzle of Chinese SOEs, but which has not been empirically tested by Sicular herself. The third LMF model incorporates a labour force that is segmented into 'insiders' and 'outsiders' with only the 'insiders' being entitled to profit shares. In Section 4.2, we discuss a number of complicating factors that must be taken into account in applying LMF models to prevailing Chinese circumstances. This discussion includes explanations of the various measures that are proposed to deal with each of these complications. We then proceed in Section 4.3 to the development of an empirical test to identify from data whether SOEs in fact behave as PMFs or LMFs. This section commences with a review and critique of a paper by Meng and Perkins (1998), which was the first to attempt an empirical test of this sort. Having noted the strengths and weaknesses of the Meng-Perkins approach, an alternative test is proposed. This empirical test is carried out in Chapter 5.

4.1 Review of theoretical models

This section reviews and compares four firm-behavioural models that are pertinent to the analysis of this chapter: the standard model of a profit-maximising firm; the Ward-Vanek LMF model, the Sicular model for Chinese SOEs, and an Insider–Outsider version of the LMF model. The review of each model encompasses the model's background and context, its objective function and choice variables, first-order conditions for optimisation, consideration of the scale at which optimisation is achieved, capital–labour ratios under optimisation, factor income shares, and other notable features. To elucidate the models, both general and specific production functions are employed. Purely for convenience and ease of exposition, the specific production functions used here are of the Cobb-Douglas form. However, in the actual empirical testing other functional forms are tested for explanatory power against Cobb-Douglas. The four theoretical models are considered under two distinct sets of assumptions regarding economies of scale. These are, first, constant returns to scale (CRS), and second, a pattern in which returns to scale are first increasing (IRS) at low levels of scale, then constant at a certain point or through a range, and finally decreasing (DRS) at high levels of scale.

Standard model of a profit-maximising firm

The profit-maximising firm (PMF) is the standard model of a production unit in microeconomic theory. It is included here simply to provide a useful template upon which to consider the various LMF models and the ways in which they differ (or do not differ) from the PMF.

A conventional profit-maximising firm producing a single output good with two inputs, capital (K) and labour (L), possesses a technology defined by its production function. The firm is assumed to choose its inputs of K and L so as to maximise profits, defined as the difference between revenues and input costs. The objective function is as follows:

$$\underset{(K,L)}{Max}\,\pi \equiv pV - rK - wL \qquad (4.1.1)$$

where π denotes profit, p denotes the price of value-added, V denotes value-added, r denotes the cost of capital and w the cost of labour. This presents the simple case in which the firm is a price-taker in terms of output, and capital and labour; p, r and w are constants.

We establish the convention here of using V rather than output Q as an argument in the profit function. This provides a neat way of incorporating information on various other types of inputs, such as materials, fuels and energy, for the empirical tests to be carried out in the next chapter. Denoting all such miscellaneous inputs as M, we can define V as (Q-M). The price of value-added p is a composite of output prices and materials prices. We implicitly assume here that the quantity of materials required is a fixed proportion of output and hence of value-added and that no substitution is possible between materials and the other two inputs. This is not an entirely realistic assumption. In the real world, some material inputs are certainly of this type. For example, a certain quantity of raw wool is required to produce a yard of pure worsted cloth. Other types of material, clothing dyes for example, do not possess this quality; a manufacturer may use more or less of the material per unit of output. Moreover, some material inputs such as agricultural fertilisers are substitutable for other inputs. Unfortunately, firm-level data typically does not allow us to distinguish between expenditure on different types of input, hence the need for a simplifying assumption.

Substituting the general production function $V=V(K,L)$ into the objective function, differentiating the objective variable π with respect to the input choice variables K and L and setting the derivatives to zero gives the standard first-order profit-maximising conditions whereby the marginal costs of each input K and L are:

$$pV_K = r \qquad \text{and} \qquad pV_L = w. \tag{4.1.2}$$

These conditions imply that for profit maximisation, the marginal cost of each input (on the right-hand side) must equate to the value of marginal product of the input.

By combining the two first-order conditions we can derive an expression for the capital–labour ratio under optimality (in re the maximisation of Equation 4.1.1). For this purpose it is convenient to replace the general production function with a specific function. We will use the Cobb-Douglas form:

$$V = V(K, L) = AK^{\beta_K} L^{\beta_L}$$

with $A > 0,\ 0 < \beta_1 < 1,\ 0 < \beta_2 < 1.$ (4.1.3)

The two first-order conditions become:

$$p\beta_K AK^{\beta_K - 1} L^{\beta_L} = r \quad \text{and} \quad p\beta_L AK^{\beta_K} L^{\beta_L - 1} = w \qquad (4.1.4)$$

Dividing the two first-order conditions one by the other, the optimal capital–labour ratio is derived:

$$K/L = \frac{\beta_K w}{\beta_L r} \qquad (4.1.5)$$

This shows that the optimal factor intensity is a function of the relative factor prices and of the technology expressed via the coefficients of the production function.

Under conditions of constant returns to scale, a PMF that acts as a price taker in all inputs and outputs will earn either positive, negative or zero profits at any level of scale. If profits are negative, it will not produce at all. If zero profits are attainable, the firm will be indifferent to the scale of production. If positive profits are attainable, the firm will always seek to expand the scale of output, to an infinite extent, since it is always profitable to do so under these assumptions. This is of course impossible in reality. In practice it is not possible for a firm to face both constant returns to scale and constant input costs at all levels of scale. Once a firm grows large enough it will face a downward-sloping demand curve for its products, upward-sloping supply curves for its inputs and in many if not most cases decreasing returns to scale.

In the more realistic case of increasing–constant–decreasing returns to scale, and assuming again that the firm is a price-taker in all markets, if positive profits are attainable then the firm will always optimise at a point in the range of decreasing returns to scale. This is self-evident since, while in either the increasing returns to scale or constant returns to scale range, the firm is always in a position where it can increase profits by increasing scale. Therefore it will always expand its scale of production into the decreasing returns to scale range. If the firm has market power in either input or output markets (is not a price-taker), then the optimal point also may occur in the increasing returns to scale or the constant returns to scale ranges, depending on the particular specifications of the supply, demand and production functions.

Under the Cobb-Douglas functional form the factor income shares are easily shown. Having defined value-added V as the value of output minus all input costs other than capital and labour, the question of allocating factor income becomes one of dividing V among the various providers of capital and labour services. Transforming equation (4.1.5) we have:

$$rK/wL = \beta_K/\beta_L \qquad \text{and therefore} \quad rK/wL = \beta_K V/\beta_L V \qquad (4.1.6)$$

If economic profits are zero, then $rK + wL = V$. In this case, rK represents aggregate payments to capital and wL the wage bill, and we can write the factor income shares as follows:

$$rK = \beta_K V \qquad \text{and} \qquad wL = \beta_L V \qquad (4.1.7)$$

β_K and β_L thus represent the fractions of V claimed by capital and by labour, respectively. If the entrepreneur or shareholders had raised the capital via indirect finance (bank finance), then the amount rK is paid to the bank; if the capital is from direct finance (the owners' equity) then rK is collected by the owner(s) themselves. If there are positive profits then we have $rK + wL + \pi = V$ and the owners must receive π in addition to rK (if the capital is financed from owners' equity), while labour still receives only wL. In this

case, the factor shares of capital and labour as represented in equation (4.1.7) are amended to:

$$rK + \pi > \beta_K V \qquad \text{and} \qquad wL < \beta_L V \tag{4.1.7a}$$ [1]

The Ward-Vanek labour-managed firm

Since the initial works of Ward (1958) and Vanek (1970), which introduced the 'Illyrian' model of a firm managed by its workers, a considerable literature has emerged around the labour-managed firm. Ward and Vanek originally wrote in the context of firms in socialist Yugoslavia (the region of modern Yugoslavia roughly corresponds to the ancient Roman province of Illyria, hence the name). However, the model has come to be applied to a broader variety of economic situations, including producer cooperatives in the major market economies. A sole owner-manager in a market economy could be thought of a special case of the labour-managed firm. Some of its advocates claim the LMF to present a more 'democratic' model of economic organisation than either its standard 'capitalist' counterpart or Stalinist socialism.

Profits in an LMF are divided among the workers, who also control the firm by electing the management. Each worker seeks to maximise his or her own income, comprising a base wage plus a share of the firm's profits, and via his voting power compels the management to maximise income per worker, for which we use the notation y. The expression $\tilde{y}$ denotes income per worker at its maximised level. Assuming a uniform base wage and uniform profit shares for all workers in the firm, we have the following objective function:

$$\underset{\{K,L\}}{Max}\, y = \frac{\pi}{L} + w \equiv \left(\frac{pV(K,L) - rK - wL}{L}\right) + w \tag{4.1.8}$$

It can be seen from this expression that the actual level of the base wage is irrelevant to the firm in terms of maximising the objective function, since wages w cancel out on the right hand side,[2] reducing the expression to:

$$\underset{\{K,L\}}{Max}\left(\frac{pV - rK}{L}\right) \tag{4.1.9}$$

Substituting in the general production function, the following first-order conditions for optimisation can be derived:

$$pV_K = r \qquad \text{and} \qquad pV_L = \frac{(pV - rK)}{L} = \tilde{y}\,. \tag{4.1.10}$$

The former condition, that the value marginal product of capital equates to the rental cost of capital, is no different from the first first-order condition that we noted above for the PMF. The latter condition, however, differs from the PMF in that the marginal value product of labour is equated not to the wage but to the maximum attainable income per worker. Rather than the wage, it is income per worker — the amount that the firm must pay to any marginal additional worker — which constitutes the marginal cost of labour for the labour-managed firm. Indeed, for the present purposes, the wage in LMFs is irrelevant and may be set at zero with no inconvenience.

A labour-managed firm that is a price-taker will always optimise by producing at constant returns to scale. Suppose it were operating at increasing returns to scale, then income per worker could always be increased by increasing the scale of output. On the other hand, at decreasing returns to scale, income per worker could always be increased by decreasing the scale of production. If constant returns to scale were to prevail over a range of output scales, then the firm would be indifferent between any of those points at which constant returns to scale prevailed. For example, under constant returns to scale an LMF with 10 workers could divide itself amoeba-like into two firms of five workers each, leaving all the workers no better or worse off; income per worker would be unchanged. This of course assumes the absence of any frictional costs in hiring, firing, or otherwise restructuring the firm.

To examine the capital–labour ratio of the LMF under optimisation, we again employ the first-order conditions as derived from the specific Cobb-

Douglas production function and divide them one by the other. This gives the following:

$$\begin{aligned} K/L &= \frac{\beta_K(pV - rK/L)}{\beta_L r} \\ &= \frac{\beta_K \tilde{y}}{\beta_L r} \end{aligned} \tag{4.1.11}$$

We can see that in this expression compared with the equivalent expression in the case of the PMF, the only difference is that maximised income per worker $\tilde{y}$ replaces the wage. Let us imagine a hypothetical economy populated by both PMFs and LMFs, all possessing the same technology. So long as the prevailing wage rate facing the (price-taking) PMFs happens to equate with the maximum income per worker attainable by LMFs, then both types of firm will behave identically as regards their factor intensity. Moreover, with free movement of labour, this equality in worker incomes can be viewed as an equilibrium condition since, if it did not hold, workers would be induced to migrate from one form to the other. Such an equilibrium would also entail zero profits for the PMFs, as per the standard result for price-taking PMFs under constant returns to scale.

The system of factor income distribution in LMFs is clearly different from the PMF case since any profits are paid to workers rather than to providers of capital. To usefully compare the LMF case with the PMF case, let us assume that LMFs and PMFs coexist and set a 'wage' w^* within the LMF sector that happens to be equal to that prevailing in the PMF sector. Payments to LMF employees in excess of (falling short of) w are defined as profits (losses), so that we have $\tilde{y} = w^* + \pi/L$. If profits so defined are zero and constant returns to scale prevail such that $\beta_K + \beta_L = 1$, then the factor income distribution is identical to the PMF case with zero profits. This follows because (4.1.11) is the equivalent of (4.1.5), giving us $rK = \beta_K V$ as the factor income share of capital, with $w^*L = \beta_L V$ following from the CRS condition. If profits, as defined here, are positive then we have:

$$(wL+\pi)/V > \beta_L \qquad \text{and} \qquad rK/V < \beta_K \tag{4.1.12}$$

With positive economic profits therefore, the factor income share of labour ought to be less than its output elasticity under profit maximisation, but would exceed its output elasticity under labour management.

In the context of factor income distribution, we can consider the Chinese SOE under the Contract Management Responsibility System and the floating wage system as representing a kind of hybrid between the PMF and the Illyrian LMF. In many cases, both the state (as shareholder) and employees both typically had claims on profits as stipulated in the contracts.

The Sicular model of Chinese SOEs

A model constructed by Sicular (1995) to explain the loss-making behaviour of Chinese SOEs shares some characteristics with the Ward-Vanek 'Illyrian' model. Hence I use the term Sicular LMF to refer to its representative firm and to distinguish it from the Illyrian LMF.

A Sicular LMF maximises 'internally retained funds', which include both profits and wages as in the Illyrian model, plus any subsidies that the firm might be able to obtain from government, minus taxes. This is quite analogous to worker income as it has been considered above, since taxes and subsidies could easily be incorporated into the Illyrian model. It should be noted that 'wages' in this context include not only monetary payments but also all types of non-cash benefits received by workers, such as housing, health and education services, the sum of which typically comprises a large portion of the real income of SOE employees. In Sicular's approach, what the firm explicitly maximises is the totality of these funds rather than funds per worker. Since a fixed labour force is assumed, income per worker is also maximised, albeit in an implicit sense. The quantity of labour, being fixed, does not serve as a choice variable. The firm is free to set its own wage rate, and therefore the wage serves as a second choice variable along with the quantity of capital. Thus described, the objective function of the Sicular LMF would be expressible as follows:

$$\underset{(K,w)}{Max}\, E \equiv \pi + wL + S = pV - rK - wL + wL + S$$
$$= pV - rK + S \tag{4.1.13}$$

where E denotes internally retained funds and S denotes subsidies.

A feature of this model is that it can be specified to incorporate either a hard or a soft budget constraint. For example, we could set subsidies equal to zero and require that profits not fall below zero (a hard-budget assumption). Alternatively, we could assume that any negative profits would be fully compensated by subsidies, either up to a certain amount, or even infinitely (an extreme soft-budget assumption). As a starting point we will take the former assumption; that subsidies are unavailable and that profits may not fall below zero, that is:

$$pV - rK - w\bar{L} \geq 0 \tag{4.1.14}$$

The maximisation problem can now be written without subsidies and with the non-negative profit constraint as follows:

$$\underset{(K,w)}{Max}\, E_{ns} = pV(K,\bar{L}) - rK + \lambda[pV(K,\bar{L}) - rK - w\bar{L}] \tag{4.1.15}$$

Differentiating with respect to K gives the familiar first order condition $pV_K = r$, just as in the PMF and Illyrian LMF models. The choice of the wage rate w, despite playing a role in meeting the non-negative profits constraint, is irrelevant to the *productive* behaviour and efficiency of the firm. The first-order condition generated via differentiation of w is $w \leq \frac{(pV - rK)}{\bar{L}}$. That is, w may take any value so long as it is low enough to avoid negative profits. Under the objective function as expressed above, the firm (including its workers, assuming that profits are to be distributed equitably among all employees) would regard all levels of the wage with indifference. Nevertheless, the firm's choice of wage level has a critical effect on its *financial* performance, determining the decomposition of the firm's internal funds among wages and profits and hence whether the firm is profit- or loss-making. We will examine this aspect in more detail below.

As labour is not a choice variable in this model, the firm can only optimise subject to the pseudo-constraint created by its initial endowment of L. Whether the attainable 'constrained optimum' is equal to or inferior to the unconstrained optimum that would obtain if the firm were free to set L, that is, whether a Sicular LMF is capable of achieving the same level of factor productivity as an Illyrian firm with an identical production function, depends on scale considerations.

Under the case whereby constant returns to scale prevail everywhere, the efficient choice of K will imply constant returns to scale and hence an efficient 'choice' of L. This follows from the standard result wherein under constant returns to scale, a production function in two inputs can be transformed into a production function in the ratio of those inputs, with output expressed in per-worker terms. For example, the production function $V = F(K,L)$ transforms to $\frac{V}{L} = F(\frac{K}{L},1)$ or $v = f(k)$. Choosing the optimal level of capital given the fixed labour force is therefore equivalent to choosing the optimal capital–labour ratio, and is sufficient for a global optimum.

Under an assumption of increasing–constant–decreasing returns to scale, full efficiency is only attainable over the constant returns to scale range. It may be the case that the firm's endowment of labour is too small, so that even with the most efficient choice of capital the firm would be operating under increasing returns to scale, and cannot attain a global optimum. On the other hand, too high an initial endowment of labour may consign the firm to decreasing returns to scale. In either of these cases, internal funds per worker could be increased if the firm were free to adjust capital *and* labour simultaneously so as to arrive in the constant returns to scale range of output.

To derive an expression for the optimal K/L ratio in this model, we can use the first-order condition $pV_K = r$ and the fact that labour is fixed at $\overline{L}$. Again specifying the production function as Cobb-Douglas, we have:

$$pV_K = p\beta_K AK^{\beta_K - 1}\overline{L}^{\beta_L} = r$$

$$K^{\beta_K - 1} = \frac{r}{p\beta_K A\overline{L}^{\beta_L}}$$

$$K = \left(\frac{p\beta_K A\overline{L}^{\beta_L}}{r}\right)^{\frac{1}{1-\beta_K}}$$

$$\frac{K}{L} = \frac{1}{L}\left(\frac{p\beta_K A\overline{L}^{\beta_L}}{r}\right)^{\frac{1}{1-\beta_K}} \qquad (4.1.16)$$

It can be seen therefore that the capital–labour ratio is a function of the initial endowment of labour $\overline{L}$ as well as the parameters of the production function. Were these parameters such that constant returns to scale were to prevail, that is, should β_K and β_L sum to unity, then the expression would simplify to:

$$\frac{K}{L} = \left(\frac{p\beta_K A}{r}\right)^{\frac{1}{1-\beta_K}} \qquad (4.1.17)$$

In other words, if constant returns were attainable, then the initial endowment of labour would be immaterial as far as the optimal *K/L* ratio is concerned. If, on the other hand, returns were increasing (decreasing), that is if the sum of β_K and β_L were greater than (less than) unity, then production would be more (less) capital intensive than in the case of constant returns to scale.

It was noted above that the choice of *w* had no effect on the firm's productive efficiency in this model, but that it did have a critical impact on financial performance. Clearly, any increases in the wage, while having no net effect on the firm's objective, decrease profits by transferring them to the wage bill. To see why the firm may wish to do this, we can add further features to the model.

One modification we can make is to adopt a different set of assumptions regarding subsidies and budget constraints. Two possible approaches to this

are (1) to assume that infinite subsidies are available to make good any losses incurred by the firm, and (2) to assume that subsidies are available up to a certain finite amount. In the former case, the intuitive solution is very obvious; the firm would seek to employ an infinite quantity of inputs (confined to capital inputs due to the assumption of the fixed labour force), so long as the marginal product of such inputs were positive. Such a case is theoretically instructive but unrealistic; in the real world *some* constraint must operate. Let us therefore leave this case to one side and examine the second case more closely.

If we set the ceiling on subsidies to S_0, and assume that the government will fully compensate losses up to this amount, then we can write:

$$rK + w\bar{L} - pV = S \leq S_0 \tag{4.1.18}$$

Therefore the optimisation problem simplifies as follows:

$$\begin{aligned} \underset{K,w}{Max}\, E_S &= pV(K,\bar{L}) - rK - w\bar{L} + w\bar{L} + S_0 \\ &= pV(K,\bar{L}) - rK - w\bar{L} + w\bar{L} + rK + w\bar{L} - pV(K,\bar{L}) \\ &= w\bar{L} \end{aligned} \tag{4.1.19}$$

The firm is now no longer indifferent to a wide range of values for w and has a single optimal choice. Having chosen the optimal levels of K and hence V, it then raises wage payments $w\bar{L}$ up to the limit represented by equation (4.1.18).

Another motivation for increasing the wage bill at the expense of profits arises from the effects of taxes. For most of the reform period, the incomes of most industrial workers lay below the tax-free threshold for income tax. Therefore, while profits were typically taxable (see Chapter 2 for a review of tax regimes), wages were taxed lightly, if at all. This produced an incentive for the firm to convert its internal funds from profits to wages. To illustrate

this more formally, the objective function can be re-written to incorporate profit tax. At this point, we return to the assumption of no subsidies and non-negative profits. We also introduce capital depreciation; this allows us to write the function essentially as it appeared in Sicular's paper:

$$\underset{\{K,w\}}{Max}\, E_{ns} = pV(K,L) - w\bar{L} - (r+\delta)K + w\bar{L} - T - t[pV(K,L) - w\bar{L} - (r+d)K - T]$$

$$= (1-t)[pV(K,\bar{L}) - w\bar{L} - r+d)K - T] + w\bar{L} + (d-\delta)K \quad (4.1.20)$$

where E_{ns} denotes internally retained funds in the absence of subsidies, T denotes lump-sum taxes (such as the adjustment tax), t denotes the rate of profit tax, δ denotes the actual rate of depreciation on physical capital, and d denotes the rate of depreciation that the Chinese authorities permit firms to employ in their accounts.

Differentiating by K, we obtain the first-order conditions governing the allocation of capital:

$$pV_K = r+\delta \quad (4.1.21)$$

Having maximised its productive efficiency via its choice of K, the firm is induced by the tax bias against profits and in favour of wages to choose w so as to convert all potential profits into wages. This would imply that the optimal level of retained income equates precisely with the wage bill, also expressible as value added less capital costs and lump-sum taxes. We can write:

$$E_{ns}^{*} = pV^{*} - (r+\delta)K^{*} - T = w^{*}\bar{L} \quad (4.1.22)$$

where asterisks denote optimal values.

In both the above cases, a preference for wages over profits within the mix of internal funds induces the firm to 'aim' its profit outcome at the lowest possible level given the constraints it faces. But note again that the model characteristics that generate zero or negative profits in no way impair the firm in its pursuit of productive efficiency.

In considering the factor income distribution characteristics of the Sicular LMF, it is useful to again consider my above observation that the Chinese SOE under CMRS could be thought of as a kind of hybrid between the PMF and the Illyrian LMF. Formally, the CMRS contracts should stipulate the proportions of the operating surplus (profits) accruing to the state and to employees, respectively. In Sicular's world however, the true profit shares actually paid out are determined by the employees' capacity to transfer resources to themselves and to conceal this activity from the government agencies. The firm's actual profit share therefore is likely to be more generous than that written into the CMRS contract. We can consider true total profit π as being divided into the government's and the employees' shares, denoted π_G and π_W respectively. The firm notionally pays the rK to the state via the state-owned bank and seeks to maximise the employees' share of value-added, which is $MPL + \pi_W$. Since $\pi_W = \pi - \pi_G$, it has two ways of maximising π_W; it can maximise π by operating efficiently and it can also minimise π_G by surreptitiously transferring resources. The extent to which it can do the latter depends upon the weakness of state monitoring mechanisms. The weaker those mechanisms are, the greater will be the extent to which the employee share of value-added exceeds to output elasticity of labour. One can consider π_G to be to some extent institutionally determined by the monitoring regime, as has been suggested above.

The Sicular LMF model would seem to hold some promise as a means of explaining SOE behaviour. Furthermore, the model has the attractive feature of allowing us to consider varying degrees of budget 'hardness' and their effects on firm behaviour. A possible weakness of this model, however, is that the assumption of a fixed labour force weakens its realism and usefulness.

It is debatable whether Sicular's fixed labour force assumption presents an accurate depiction of the environment facing Chinese SOEs. It is certainly the case that through most of the reform period SOEs operated something akin to the Japanese system of lifetime employment. It was virtually unheard

of even for loss-making firms to dismiss significant numbers of employees (although this has changed under the most recent reforms). Nevertheless, as Meng and Perkins (1998) argue, SOEs have gradually acquired the right to hire and fire employees. They note from survey evidence that by the early 1990s a majority of state firms claimed to have the right to dismiss workers, even though they may have been reluctant to *exercise* that right since they are politically accountable for the overall welfare of their employees. In modelling terms, we could propose that the firm is free to dismiss workers, but that there is a cost to be incurred for doing so, and that this cost increases sharply with the number of workers to be dismissed. This would allow the firm to remove the occasional recalcitrant, but would make large-scale retrenchments unattractive, with the costs of severance and damage to workplace morale exceeding the labour cost savings. Even though it may be reasonably accurate to assume that SOEs never reduce their labour forces, it is another matter to assume that they never increase their labour forces either. Moreover, in practical terms it is very difficult to proceed with empirical testing of a model that assumes a fixed labour force when it will be found (as we do in Chapter 5) that the data inevitably reveal firms' labour forces increasing over time.

A potential solution to the problem of setting the most appropriate assumptions for the labour force lies in the fact that lifetime employment (the 'iron rice bowl') in SOEs only extends to those workers who are permanent employees of the firm. As noted in Chapter 2, such workers are not the only sources of SOE labour. SOEs also frequently hire temporary workers (often migrants from rural areas) over whom they have more complete freedom to hire and fire. Firms are also free to contract out some of their work to other enterprises, including collective and privately-owned firms, as described for example in Chen (1995).[3] Since these contracts need not be permanent arrangements, the effect is similar to having available a pool of discretionary labour.

The Insider–Outsider Labour-Managed Firm

As a compromise between the Sicular model, with its fixed labour force, and the Illyrian model with its flexible force of profit-sharing employees, a third model can be constructed, which I refer to as the Insider–Outsider Labour-Managed Firm (IOLMF). The IOLMF borrows from Lindbeck and Snower (1988) the concept of a firm in which some employees (insiders) are in an advantageous position relative to outsiders.

Lindbeck and Snower's paradigm sought to explain persistent involuntary unemployment in market economies. The differences between insiders and outsiders are described as follows:

> Insiders are experienced incumbent employees whose positions are protected by various job-preserving measures that make it costly for firms to fire them and hire someone in their place. The outsiders have no such protection; they are either unemployed or work at jobs in the "informal sector," which offer little, if any, job security. Insiders have more clout than outsiders.[4]

In standard insider–outsider models, dismissal of insiders is costly for various reasons, and therefore insiders are able to demand and receive wages in excess of what outsiders would accept in order to work in the firm. This can result in a non-market-clearing equilibrium in the labour market and involuntary unemployment among the outsiders.

Our model of the insider–outsider LMF is not motivated by any desire to explain unemployment but simply to model accurately the labour-hiring behavior of SOEs. We postulate the existence of two classes of employee, insider and outsider. Insiders (the permanent worker class employees of SOEs) cannot be dismissed (or at least not without incurring prohibitive costs) and their numbers are regarded as fixed. Outsiders, on the other hand, represent temporary workers and subcontractors, and may be employed and terminated freely.

The firm maximises profits plus insider wages, after taxes and subsidies, divided by the number of insiders. The objective function is as follows:

$$\underset{K,L_O}{Max}\frac{(\pi - T + S)}{\overline{L}_I} + w_I = \frac{1}{\overline{L}_I}\left\{pV[K,(\overline{L}_I + L_O)] - rK - w_I\overline{L}_I - w_O L_O - T + S\right\} \tag{4.1.23}$$

Here we implicitly assume that insiders and outsiders are equally productive. The wage paid to outsiders is market determined; the firm is a price-taker in w_O. It can be shown that the wage paid to insiders w_I is immaterial to the results, unless taxes and subsidies create a preference for wages over profit shares, as outlined in the Sicular model. We can abstract from taxes and subsidies for the moment by assuming that all taxes and subsidies are lump-sum and unaffected by firm behaviour. The level of w_I may be set equal to w_O, at a level higher than w_O or indeed at virtually any other level. The simplest assumption is in fact to set it at zero and assume that insiders take all their income in the form of profit shares.

Differentiating with respect to K and L_O, we derive the first-order conditions:

$$pV_K = r \qquad \text{and} \qquad pV_L = w_O. \tag{4.1.24}$$

These are essentially the same as the first-order conditions for a profit-maximising firm. This is not surprising if one looks back at the left hand side of the objective function. Setting w_I equal to zero eliminates it from the expression, and under the present assumptions T, S and $\overline{L}_I$ are all constants with respect to the choice variables. Therefore the objective function reduces simply to maximising profits by choosing capital and the flexible component of the labour force, outsider labour.

In terms of both the optimum scale of production and the optimum capital–labour ratio, the IOLMF again shares the characteristics of the PMF as discussed above. The only proviso worth noting is that in the expression

for the optimal *K/L* ratio, $\frac{\beta_K w_O}{\beta_L r}$ the wage rate w_O is relevant only for the outsider labourers.

The factor income distribution for an IOLMF is analogous to that prevailing in other LMFs, excepting that the employees' share of profits is distributed only among insiders. Outsider employees receive only the equivalent of their output elasticities, or even less. Since outsiders are typically registered as rural residents, their reservation wages correspond to the wages in rural areas, rather than the higher wages prevailing in urban labour markets. Therefore urban SOEs may be able to pay rural outsiders even less than their value marginal products. Empirical results reported by Knight, Song and Jia (1999) suggest that this has indeed been the case. This paper found evidence of over-compensation of SOE insiders and under-compensation of outsiders, and these findings were broadly supported by the evidence of Meng and Zhang (2001). Where an IOLMF also has some power to surreptitiously transfer profits from the state to its employees *à la* Sicular, its employees may receive the equivalent of their labour output elasticities plus a profit distribution, with the profit distribution coming from as many as three potential sources: (1) a legitimate profit share under CMRS contracts (2) illicit distributions from the State's share, and (3) proceeds from the exploitation of rural outsiders. The extent of insider over-compensation depends on the firm's power over state agencies and outsiders. As with the other models already discussed, *rK* is assumed to be paid to the providers of capital, such as state banks. However, the state as shareholder may also collect a negative profit share (incur a loss) if the employees' power to transfer and conceal funds is sufficiently great.

The IOLMF therefore is a labour-managed firm model that shares some of the key characteristics of profit-maximising firms. Theoretically, it may achieve similar productive efficiency to profit-maximising firms. However, given particular incentives, the IOLMF is likely to exhibit behaviour similar to the other forms of LMF in terms of converting would-be profits into wages and benefits for insider labourers.

4.2 Realism of assumptions

The foregoing discussion of the three LMF models employed a number of assumptions that, while quite standard in nature and convenient for exposition, do not accurately reflect the Chinese economic environment. This section takes note of six aspects of Chinese conditions where alternative sets of assumptions or refinements to the models may be appropriate.

First, it should be noted that, although we have discussed the various models in this chapter in terms of decisions firms make to maximise their objectives, in practice SOEs have, of course, not been entirely free to make choices regarding capital and labour allocation and a plethora of other matters. Rather, firms can be viewed as engaging in a messy partnership with government authorities at various levels, who intervene in the management of firms in order to pursue a variety of economic, social and other objectives. Moreover, the nature of this intervention has tended to be arbitrary and inconsistent in nature, and therefore does not easily lend itself to formal modeling. My approach is to view the performance of firms as the result of the joint actions of management and their governmental 'partners', rather than of firm management alone. Performance outcomes therefore reflect not only on the firm in question but also on the policy authorities that interact with it.

Another complication is the classification of profits to be remitted to the government as the owners of SOEs. While these non-retained earnings are generally labeled as profits in financial results and elsewhere, for our purposes they are in part analogous to taxes. If a firm seeks to maximise retained income, it will only regard its own share of profits as a part of retained income; where moneys are to be remitted to the government it makes little difference whether those funds are classified as profits or as taxes. Certainly, in terms of the import of state enterprise reform to the overall reform process and Chinese economic performance, government profits are crucial. As the 'pessimistic' camp has argued (see Chapter 3) the

spiraling loss-making of SOEs has been placing great strain on the Chinese fiscal position, imperiling macroeconomic control and creating the potential for a financial crisis. From this macro-economic perspective, the loss of profit revenue to the state would not be a problem if an equivalent stream of tax revenue were to replace it (although issues of resource allocation may arise). Therefore, in this sense also, it is state profits *plus taxes* (and arguably even interest payments to state-owned banks) that are relevant.

The presence of soft budget constraints and endogenous subsidies presents another complication to the analysis. In this chapter we have mostly considered subsidies in 'hard' form. That is, we have supposed that there is an absolute maximum amount of subsidy that the firm can obtain. In practice, the upper limit to subsidies is not pre-determined but is determined by authorities *ex-post* after observing firms' trading results, negotiations between firms and authorities and related factors. This is the nature of the soft-budget syndrome.

An issue closely related to subsidies and soft budgets is the existence of distortions in the capital market that depress interest rates to artificially low levels. Indeed, as noted in Chapter 2, subsidisation of SOE losses has increasingly come to take the form of easy credit from state banks, often on an *ex-post* basis. This has the effect of depressing effective interest rates to artificially low levels and inducing SOEs to engage in excessive and value-destroying capital investment (Lardy 1998). Such distortions may well be the primary source of productive inefficiency among SOEs. A way to model this process would be to designate the interest rate as an endogenous variable. The firm would seek to engage in excessive capital investment and to expend managerial effort in bargaining with the authorities to compensate losses via reductions in interest rates.

The existence of highly segmented labour markets in China due to restrictions on internal (especially rural–urban) migration and other factors has implications for the market-clearing wage. In the models presented in this chapter, we have generally assumed implicitly that all firms face a

single market-clearing wage. In fact, in China there are many differing wages at which markets clear. Urban wages are generally considerably higher than rural wages, and there are considerable differences across and even within provinces. There are also differences across ownership categories; foreign-funded enterprises tend to pay higher wages than SOEs and collective enterprises lower wages than SOEs. This partly reflects differences in non-cash benefits and the geographical distribution of firms.

A final observation in this section is that the assumption of price-taking behaviour (perfect competition) is far from appropriate for many SOEs. Many SOEs are large and exert market power, if not on a national scale, then at least in their local regions, due to local protectionism, institutional and policy barriers and deficiencies in infrastructure that hamper inter-regional trade. In general, the extent of market power has lessened over the course of the reform period, due to improvements in infrastructure and the entry of new competition from non-state firms, foreign imports and from other SOEs breaking out of traditional markets.

4.3 Review of Meng and Perkins

The chapter up to this point has laid out the theoretical differences between the PMF and LMF models. Our objective is to derive from these a workable empirical test to resolve the over-compensation issue. First however, let us review the approach of Meng and Perkins (1998), who were the first to apply the Sicular theoretical model empirically to actual Chinese data and thus to test its assertions regarding SOE behaviour.

Theoretical model

In the theoretical model proposed by Meng and Perkins, the firm seeks to maximise retained funds per employee, and the short-run maximisation problem is expressed as follows:[5]

$$\underset{L}{Max}\, S = \frac{(1-t)[pQ(L,\overline{K}) - wL - (r+d)\overline{K} - T] + (d-\delta)\overline{K}}{L} + w \qquad (4.3.1)$$

where S denotes income per workforce member, t denotes the profit tax rate, d denotes the government depreciation rate, δ denotes the enterprise depreciation rate, T denotes lump-sum taxes or profits remitted to the government, Q denotes output, p denotes output prices and other variables are as defined previously in this chapter.

Note how this model derives partly from Sicular and partly from the Ward-Vanek LMF model. It differs from Sicular in three main respects. First, wage only comprises the basic wage here, whereas it encompasses all compensation to employees in Sicular's model. Second, this firm maximises retained income per employee, reflecting the Illyrian LMF model rather than total retained income as per Sicular. Third and most importantly, labour is the only choice variable in this model (capital is assumed to be fixed) whereas in Sicular's model, wages are the endogenous variable.

Empirical model

The Meng-Perkins study utilised data for collective and privately-owned firms in China as well as SOEs, covering the years 1985 and 1990 to 1992. They based their empirical tests upon the following hypotheses relating to the respective ownership sectors. For the SOE and collective sectors, the determination of employee income levels were thought to be dominated by firms' retained profit per employee, with labour productivity playing a minor role. For private Chinese firms, on the other hand, labour productivity was expected to dominate earnings determination, with firm profitability contributing little. In other words, the following general model of employee earnings determination was proposed:

$$W = W(\frac{rt\pi}{L}, LP) \qquad (4.3.2)$$

where W denotes average firm level income, $rt\pi/L$ denotes retained profits per worker and LP denotes labour productivity measured as value added per worker. Here the authors make use of the result that under Cobb-Douglas production technology, the marginal return to labour is proportional to the average product of labour. The prior expectation was that for SOEs and collectives the coefficient on $(rt\pi/L)$ would be significant and the coefficient on LP possibly insignificantly different from zero, while for private firms, the coefficient on LP would be more significant relative to that on $rt\pi/L$.

Results and interpretation of the Meng-Perkins study

The empirical results fulfilled these prior expectations. In the cases of all three ownership sectors, the coefficient on the explanatory variable that had been expected to dominate was both larger in magnitude and of a higher order of significance than the other coefficient.

What the Meng-Perkins results show is that the remuneration of SOE employees is closely related to firm profitability. This result should be of no surprise when we recall from Chapter 2 that SOEs at the time operated under the Contract Management Responsibility and Floating Wage systems. Employees were entitled to a profit-determined bonus under most CMRS contracts, and under the Floating wage system the boundaries between wages and bonuses were blurred. The results are not inconsistent with the hypothesis that employees received a wage component that was determined by labour productivity plus a profit share that was determined by firm profitability. If, as is reasonable to suppose, labour productivity and profitability were multicollinear, and if profitability were to vary more from firm to firm than labour productivity, then it is quite likely that the direct relationship between wages and labour productivity could be submerged in Meng and Perkins's nested test.

The important question as far as this thesis is concerned is whether SOEs over-compensate their employees. Establishing that employees received some share of profits as indeed they ought under CMRS, does not directly address this question. What we need to investigate is whether profit-sharing

behaviour had degenerated to the point where employees received substantially more than their legitimate share as measured by the output elasticity of their labour. Therefore for the present purposes, a framework along the lines of Minami and Hondai (1995) or Raiser (1997b), both of which are reviewed in Chapter 3, would be more appropriate than Meng and Perkins (1998).

Meng and Perkins's study may also be improved upon in one technical sense. Their models feature at least two variables, retained profits and income per worker, which ought to be difficult to observe under the assumptions of the Sicular model, the very model which was to be tested. Sicular had proposed, as an explanation for persistent SOE losses, that firms were effectively converting profits into wages and other benefits for distribution to employees. Therefore, one cannot credibly rely upon reported profit data at face value to test whether firms are engaging in 'Sicular behaviour'. Moreover, since the greater part of these diverted profits are likely to be converted into non-wage benefits such as housing, education, medical and welfare services, reported wage data are likely to be similarly unreliable. The choice and measurement of variables for the analysis need to be carefully considered in this light.

4.4 Proposed empirical test

What criteria can be used to empirically differentiate profit-maximising firms from labour-managed firms using commonly available data? What is it in the data that can reveal the true objective function actually being pursued by a group of firms? Three possibilities can be listed based on the discussion in Section 4.1.

1. First-order conditions

2. Capital/labour ratios

3. Factor income shares

Let us first consider the feasibility of first-order conditions as a criterion. The first-order condition relating to capital is the same for the PMF and for all three forms of the LMF discussed above; $pV_K = r$. This leaves the FOC relating to labour as the only possibility. For the Ward-Vanek LMF, we have $pV_L = \frac{(pV - rK)}{L} = \tilde{y}$, with $\tilde{y}$ representing the maximised level of income per worker. But we have no workable procedure for determining what the maximised level of a variable would be. The Sicular model does not provide any FOC for labour allocation at all, since it treats the labour force as exogenous. For the IOLMF, the FOC relating to labour is the same as that for the PMF, except that the value marginal product of labour is set equal to the wage of outsiders rather than to a general wage covering all employees. In short, first-order conditions do not provide any workable avenue for empirically differentiating PMFs from LMFs.

To conduct a test using capital/labour ratios, we would need to be able to test whether firms obey the PMF condition $K/L = \frac{\beta_K w}{\beta_L r}$ or the LMF condition $K/L = \frac{\beta_K \tilde{y}}{\beta_L r}$. Again we have the difficulty of somehow calculating $\tilde{y}$. We also have the difficulty of producing an accurate measure of the interest rate *r*. We can generally observe *ex post* the amounts of interest payments that firms may have paid, and to divide these by measures of capital to estimate actual interest rates. But in the light of the problem of soft finance (see Chapter 2) the actual payments may be considerably less than what firms were to have paid *ex ante*. It is highly dubious that the *ex post* interest rates should be used to discern what behavioural rules firms are seeking to follow.

Factor income shares offer the only feasible measures by which to distinguish PMFs from LMFs. Under the PMF model, the labour share of value added unambiguously equals the output elasticity of labour. Under LMF models on the other hand, there is scope for the labour share of value added to exceed the output elasticity of labour, via as many as three channels

as detailed in the sub-section on IOLMFs. Moreover, measures of factor income share clearly illuminate the issue of labour over-compensation with which we are centrally concerned. Factor income share is also a workable aspect from the point of view of collecting appropriate data.

It is apparent then that the most appropriate test of LMF behaviour, and of the over-compensation hypothesis, would essentially follow the lines of Minami and Hondai (1995) or Raiser (1997b), which are reviewed in Chapter 3. This would provide, for our purposes, a more appropriate test of Sicular's hypothesis of labour-managed behaviour than the approach taken by Meng and Perkins (1998). It would also have the advantage of not relying heavily on the accuracy of reported wage and profit data. Profit data is not required for the analysis at all, and as far as wages are concerned we can use broad measures of compensation including bonuses, welfare payments and welfare facilities, rather than the money wage alone.

The first step in the empirical analysis is a production function estimation, from which we derive estimates of the output elasticity of labour. The labour share of value added is then calculated and the two measures compared. Within each of these sets of estimates we seek to ascertain trends over time, and also measures specific to a number of industrial sectors.[6] If Minami and Hondai's results are confirmed, we will observe under-compensation of SOE labour during the opening years of the reform process, followed by a pronounced trend toward over-compensation through the reform period. We are also able to observe which sectors over-compensated the most at various times. This analysis is carried out in Chapter 5.

Endnotes

[1] Under perfect competition, it is a standard result that economic profits are zero in the long run, since any profits are competed down. Equation 4.1.6 can be thought of as representing this situation. It follows that equation 4.1.7a describes some sort of imperfect competition. For example, the firm may enjoy some sort of market power that generates rents, resulting in the profit π. Such market power would enhance the value marginal products of both capital and labour, since the firm would be able to extract higher output prices *ceteris*

paribus. If the owners of the firm were able to extract all of the value of the rent by paying employees only the competitive market wage as per equation 4.1.6, then employees would be under-compensated; their remuneration would fall short of their (higher) marginal value product.

[2] In socialist Yugoslavia, government agencies employed a schedule of notional accounting wages in order to split workers' incomes into wage and profit components for accounting and statistical purposes. These 'wage' levels had relatively little meaning from the point of view of the employees, and in many cases the workers may not have even been aware of what their 'wages' were (Sarkovic 1986).

[3] See, for example, discussion of the subcontracting activities of Beijing Dahua Shirt Company p. 119.

[4] Lindbeck and Snower (1988) p. 1.

[5] In Meng and Perkins's paper, the actual expression that appeared was:

$$\underset{L}{Max}\, S = \frac{(1-t)[pQ(L,\overline{K}) - wL - (r+d)\overline{K} - T] + (d-\delta)\overline{K}}{L}$$

However, such an expression omits wages, which must be counted as a part of retained income.

[6] An interesting variation on the analysis would be to separately examine the output elasticity and labour income share of permanent ('insider') and temporary ('outsider') employees, after the manner of Knight, Song and Jia (1999) and Meng and Zhang (2001), who find over-compensation for insiders and under-compensation for outsiders. Unfortunately it is not possible to replicate this analysis with the broad compensation measures and the data set being used for this thesis, since the data set lacks any breakdown between permanent and temporary employees for (1) non-production line labour, and (2) non-monetary benefits received by employees.

5

The overcompensation question: empirical analysis

As is argued in Chapter 4, the most appropriate empirical test for identifying and measuring over-compensation in a given set of firms is a comparison of the estimated labour elasticity of output with the estimated labour share of value added in those firms. This chapter carries out such a test using a multi-sector panel data set of state-owned firms.

The database used is the Chinese Academy of Social Sciences (CASS) 800 Firm Database. It is in two parts, one survey covering the years 1980 to 1989 and a second survey covering the years 1990 to 1994. In total, 840 firms appear in the database, but of these only 681 participated in both surveys. General descriptions of the data series used in this chapter are included in Sections 5.1 and 5.2 as relevant, with more detailed descriptions on aspects such as deletions, depreciation and deflation processes being provided in Appendix 5.1. My data set covers nine specific industrial sectors plus the miscellaneous category of 'other manufacturing sectors', and the time span is both longer and more recent, covering the years 1980 to 1994. After deletions, 661 firms are included in the data set for the principal estimations. The data is drawn from 21 cities in four geographically diverse provinces: Jiangsu, Sichuan, Shanxi and Guilin.

The analysis here follows the same concepts as Minami and Hondai (1995), but improves upon that contribution in data coverage and some methodological aspects. The Minami and Hondai study covered only the machinery industry and used national census data for 1980 and 1985 (389 firms), plus survey data of firms taken only from the city of Tianjin during the years 1985 to 1990 (129 firms). The various methodological differences between the two studies are explained in the next section.

Section 5.1 carries out a production function analysis to generate estimates of the output elasticity of labour. Section 5.2 estimates the labour share of value added. The two sets of estimates are compared in Section 5.3 and the implications discussed. Appendix 5.1 describes the preparation of the data

for the analysis. Appendix 5.2 holds many of the tables and figures that present the results of this chapter.

5.1 Estimation of labour elasticity of output

Model specification

Recall from Equation 4.1.2 that under profit maximisation the value marginal product of labour is equated to the wage:

$$pV_L = w. \tag{5.1.1}$$

Normalising the price of value added to unity and multiplying each side by L/V we have:

$$\frac{\partial V}{\partial L}\frac{L}{V} = \frac{wL}{V} \tag{5.1.2}$$

The left-hand expression is the labour elasticity of value added[1] while the right-hand expression is the labour share of value added (if wages as denoted by w represent all income accruing to labour).

A production function estimation is necessary to generate estimates of labour elasticity. The estimation process can be carried out either on the basis of net output or value added, where intermediate inputs are subtracted from gross output, or on the basis of gross output with intermediate inputs serving as one of the explanatory variables in the estimation. Using the Cobb-Douglas functional form a basic econometric model for net output is:

$$\ln V = A + \beta_L \ln L + \beta_K \ln K + u \tag{5.1.3}$$

An alternative model in gross output terms is:

$$\ln Q = A + \beta_M \ln M + \beta_L \ln L + \beta_K \ln K + u \tag{5.1.4}$$

where u represents stochastic shocks to production and all other notation follows Chapter 4.

Minami and Hondai (1995) employ a net output approach and a Cobb-Douglas functional form, imposing constant returns to scale such that $\beta_L + \beta_K = 1$. Using α as their notation for β_L and Y as their notation for net output, they are accordingly able to express their model as:

$$\ln\frac{Y_P}{L_P} = A + (1-\alpha)\ln\frac{K_P}{L_P} + u \tag{5.1.5}$$

Their use of the subscripts P denotes the fact that only productive inputs are used in their estimations.

Minami and Hondai add further explanatory variables to their estimation by modeling the technology variable A as follows:

$$A = a_0 + \sum_{1}^{3} a_i T_i + \sum_{3}^{5} a_i S_{i-2} + a_6 \ln FAU + \sum_{7}^{9} a_i S_{i-6} \ln FAU + \varepsilon \tag{5.1.6}$$

where T denotes type of ownership (state, collective, or state-collective joint venture), S denotes sub-sector within the machine industry and FAU denotes the intensity of fixed asset utilisation as measured by the ratio of materials and fuels to net fixed assets. The latter variable is included to account for the effects of materials rationing and bottlenecks. My analysis does not employ the full set of these categorical dummy variables. In the first place, ownership dummies are not required since my data set solely includes SOEs. I do incorporate categorical information on sectors, although my method is different from Minami and Hondai's and is explained later in the chapter. I do not include Minami and Hondai's FAU since for these purposes I regard productive inefficiency arising from supply shortages no differently to inefficiency arising from any other cause. Finally, whereas Minami and Hondai appear to have simply used ordinary least squares (OLS) estimation, I also conduct fixed effects (FE) and random effects (RE) estimations and use Breusch-Pagan and Hausman tests to determine the most appropriate model from among these three. FE and RE estimation effectively incorporate firm-specific dummy variables for each firm, thereby reducing the need for additional variables such as FAU.

In the analysis of this chapter, rather than selecting one functional form at the outset, I conduct functional form tests to choose between the CES, translog and Cobb-Douglas specifications. Constant returns to scale is tested for rather than being automatically imposed on the model. Gross output functional forms as well as net output forms are tested. Whereas Minami and Hondai only use data for productive labour and productive capital in their estimation, I test various alternative specifications that also include 'non-productive' labour and capital.

Data issues

The data required for the analysis falls basically into four categories; output, intermediate inputs, capital and labour. Because of various features of the data set, we have alternative series to choose from in each of these categories.

For output, we can use gross output (with intermediate inputs as an extra explanatory variable), or one of two different variables that I refer to as net output and value added. Net output is provided in the survey as a single series. Value added must be calculated as the difference between gross output and intermediate inputs. If the net output series has been compiled correctly, it should represent gross output minus all intermediate inputs and depreciation. Value added should therefore comprise net output plus depreciation.

My measure of intermediate inputs sums the various database series for materials, ancillary materials (a series provided in the 1980-1989 survey only), fuels and energy. Hereafter I also refer to this variable as materials, fuels and energy or MFE. Due to missing data etc., some discrepancies may arise between net output which is compiled by the responding firms and value added which is compiled by myself.

In the 1980–1989 survey, the available data series for capital (commonly referred to as fixed assets in Chinese sources) include total capital, productive capital and non-productive capital. In this survey, non-productive capital mainly comprises non-manufacturing facilities such as employee housing and welfare facilities, but may also include idle manufacturing capital. In the 1990-1994 survey we have an explicit series for housing and welfare capital. In this latter survey, productive capital is calculated as the sum of separate series for plant-and-equipment and for buildings. The procedures used for depreciating and deflating the capital data are detailed in Appendix 5.1.

In preparation for the production function estimations, I convert both the capital and labour input data from year-end form to year-average form. This is a standard technique that is carried out so that the input data reflects the

productive activity throughout a calendar year and thus matches the output data. I generate year-average capital data for year *t* by taking the simple mean of year-end observations for the years *t* and (*t-1*).

Available data series for labour include total labour and its constituent categories; line workers, managers, engineers/technicians and non-line workers (or 'other employees'). Non-line workers would predominantly comprise those workers employed to provide social services to employees.[2] Productive labour is considered as the sum of line workers, managers and engineers/technicians. Both year-end and year-average data is available for total labour. The database only provides year-end data for the categories but year-average data for these series is estimated by multiplying each year-end category series by the ratio of year-average total labour to year-end total labour.

Summary statistics for the main data series employed in the various estimated specifications are listed in Tables A5.2.1 and A5.2.2 in Appendix 5.2. For reasons explained in Appendix 5.1 (page 186), I believe that the reliability of the data is better towards the end of the survey period than at the beginning. Therefore, results derived for the early part of the survey period should be interpreted with greater caution.

Specification tests — panel data estimation

To determine the appropriate panel data model for the data, Breusch-Pagan (1980) Lagrange Multiplier tests and Hausman (1978) tests were carried out on a number of alternative specifications. The random effects or random components model is expressed as follows:

$$y_{it} = \alpha + x_{it}\beta + v_i + \varepsilon_{it} \qquad (5.1.7)$$

where *y* is the dependent variable, *x* is the vector of explanatory variables, the subscripts *i* denote individuals (firms in our case) and subscripts *t* denote years. The error term is in two parts; v_i is a firm-specific random error whose value is constant for a given firm, and ε_{it} is a conventional error term of the type assumed in Ordinary Least Squares (OLS) estimation. Under fixed effects assumptions the v_i are constants; under random effects assumptions they are random drawings. The Breusch-Pagan Lagrange Multiplier reports a

test of the hypothesis that v_i =0, which if true would imply that the model reverts to the standard panel data model, which can be estimated using the OLS method. The Hausman test can be used to aid the choice between the fixed effects and random effects estimators. Under RE, v_i is uncorrelated with ε_{it}.

As has been noted, data used in this analysis was collected in two separate surveys covering 1980–1989 and 1990–1994 respectively. The data-collecting questions asked of the two surveys were quite different in a number of respects, the most notable being that which is called Non-Productive Capital in the 1980–89 survey and Housing and Welfare Capital in the 1990–94 survey (see Appendix 5.1 for more details on data series). For this reason, we first proceed separately to conduct functional form tests on the 1980–89 and 1990–94 period data, before assessing whether it is feasible to pool the two halves of the data set. A decision to pool the data would require tests to show a similar preferred model for each of the two periods, using data series that are common to both surveys.

In tests on the 1980-1989 data, regardless of the specifications used, all of the Breusch-Pagan tests indicate the rejection of the OLS model versus the random-effects model, and all of the Hausman tests indicate the rejection of the random-effects model versus the fixed-effects model. Results are presented in Table A5.2.3a.

For tests on the 1990–1994 data, the results are slightly mixed. For the eight different specifications listed in Table A5.2.3b, the Breusch-Pagan tests consistently indicate rejection of the OLS model versus the random-effects model. However, the Hausman test does not indicate rejection of the random-effects model versus the fixed-effects model at the 95 per cent significance level in one specification, and random effects is not rejected at 99 per cent in a further three specifications. The remaining four specifications, in which the random effects model is rejected, all employ my own calculated value added series rather than the survey-supplied net output series. On the basis of these results we proceed with fixed-effects estimation

to carry out the various specification testing, and repeat the Breusch-Pagan and Hausman tests when the preferred specification has been determined.

Functional form tests — 1980–1989 survey data

Tests for functional form between the translog, CES and Cobb-Douglas forms were carried out for both total-input and productive-input data from the 1980–1989 survey. The format of the translog specification is as follows:

$$\ln V = \beta_1 + \beta_2 \ln L + \beta_3 \ln K + \beta_4 \frac{\ln^2 L}{2} + \beta_5 \frac{\ln^2 K}{2} + \beta_6 \ln L \ln K + \varepsilon \tag{5.1.8}$$

We test the Cobb-Douglas model via the joint restriction $\beta_4 = \beta_5 = \beta_6 = 0$.

The format of the Taylor series approximation to the CES (Constant Elasticity of Substitution) specification is as follows:

$$\ln V = \beta_1 + \beta_2 \ln L + \beta_3 \ln K + \beta_4 \ln^2\left(\frac{K}{L}\right) + \varepsilon \tag{5.1.9}$$

In this case we test Cobb-Douglas via the restriction $\beta_4 = 0$.

The results of a series of specification tests are summarised in Table A5.2.4.[3] The Cobb-Douglas specification is not rejected at 95 per cent significance in tests versus both translog and CES regardless of whether total input data or productive input data is used.

We find however that the goodness-of-fit measures of all three of these specifications are very sensitive to the years of data that are employed. Adjusted R^2 improves if we exclude certain years, notably 1981, 1982, 1988 and 1989. (1980 data is already lost due to the averaging of year-end data to generate year-average series for capital.) Conducting separate regressions on the pooled 1981–1982 and 1988–1989 period data, we find results that are very different to the 1983–1987 period. Results using productive inputs for the period 1981–1982 yield an insignificant coefficient on productive capital and a coefficient on productive labour of 1.05, which is not only very different from 1983–1987 but a strange result from a theoretical perspective. Results for 1988–1989 yield a negative and insignificant coefficient on productive capital as well as an insignificant coefficient on productive

labour. This divergence between the 1981–1982, 1983–1987 and 1988–1989 period results makes some intuitive sense. Two factors could explain the apparent structural divergence of the earliest part of the period. First, it could reflect the 'the truth' with regard to the Chinese economy in the early reform years when it was just starting to emerge from central planning. Second, it could reflect inaccuracies in the data. The quality of data in the early years of the survey appears to be quite poor compared to later years, as evidenced by the number of missing values and the number of obvious clerical errors found (see Appendix 5.1). A possibility is that, since the survey was actually carried out after 1989, some firms may no longer have had accurate information about their operations in earlier years.[4] The results for 1988 and 1989 are likely to have been impacted by the severe recession that occurred in those years, which would have delivered a major demand shock, left capital and labour underutilized and impacted upon production function results. Note that the model we have been testing here holds the coefficients constant over time. Later in the analysis we will test models with year-variant coefficients.

To cover the possibility that the best specification may turn out to be one confined to the years 1983 to 1987, we conduct the functional form tests again to cover only those years. These results are also reported in Table A5.2.4. We find that the Cobb-Douglas specification is preferred over translog and CES regardless of whether total inputs or productive inputs are used. For each of the three specifications, a better fit is obtained by using productive input data as opposed to total input data, as measured by adjusted R^2. The best specification therefore appears at this point to be Cobb-Douglas using productive inputs, possibly confined to the years 1983 to 1987.

Specification tests incorporating non-productive inputs — 1980–1989 survey data

A number of further econometric specification tests incorporating non-productive labour and non-productive capital were carried out against the productive-input Cobb-Douglas specification. The test results are summarised in Tables A5.2.5a and A5.2.5b in Appendix 5.2. Table A5.2.5a presents tests on the full period of the 1980s, and in these tests Cobb-Douglas is consistently rejected, although the specification featuring only

non-productive labour shows a substantially lower test statistic than those specifications that feature non-productive capital in some form. Table A5.2.5b presents tests on the 1983 to 1987 period only. In this group of tests, Cobb-Douglas is not rejected for the specification featuring only non-productive labour, while Cobb-Douglas is rejected for all five specifications in which non-productive capital appears.

Why does non-productive capital hold possible explanatory power in a production function? It is possible that in fact this is a case of reverse causality; that firms enjoying high productivity have more access to funds that can be invested in non-productive welfare capital. We investigate this hypothesis via a Granger (1969) Causality Test carried out between TFP (calculated as value added minus productive capital and productive labour each multiplied by their respective coefficients from the Cobb-Douglas estimation) and non-productive capital. For the explanatory variables we use just a single lag. The test is carried out on the full period using full-period estimated coefficients and on the 1983–1987 period using estimated coefficients for that period. Tables 5.2.6a, and 5.2.6b summarise the results. In each case, lagged TFP is a significant explanator of lagged non-productive capital, but the reverse is not the case (in two cases the coefficients on lagged non-productive capital are significant but of negative sign). The results therefore indicate that there is only unidirectional causality running from value-added to non-productive capital. It seems that non-productive capital does not contribute to value-added production, but rather productivity is associated with higher profits that in turn are partly invested in non-productive welfare capital. These results hold regardless of whether the full data set is used or only the years 1983 to 1987. Therefore we discard non-productive capital as an explanatory variable and our preferred specification at this point remains Cobb-Douglas using productive labour and capital inputs, possibly covering only the years 1983 to 1987.

Functional form tests — 1990s survey data

The results of various specification tests for the 1990–1994 survey data are presented in Table A5.2.7. First, the translog and CES specifications are tested against the Cobb-Douglas model. At this stage we use year average

data for the input variables and our own calculated series for value added rather than the net output series supplied by the firms. The F test for the translog model leads us to reject Cobb-Douglas when total capital and total labour are used as regressors, but leads us to not reject Cobb-Douglas when productive inputs are used. Tests on the CES form lead us to not reject Cobb-Douglas regardless of whether total or productive inputs are used.

Tests on specifications featuring non-productive input variables are presented in Table A5.2.8. As was found with respect to the 1980–1989 data results, a number of specifications featuring non-productive inputs outperform the Cobb-Douglas specification on the basis of F tests. The best fitting of these are those that include housing and welfare capital; non-line labour does not have strong explanatory power. The best performing specification is $lnV = \beta_1 lnL_p + \beta_2 lnK_p + \beta_3(lnK_p * lnK_h) + \varepsilon$, although other models with K_h such as $lnV = \beta_1 lnL_p + \beta_2 lnK_p + \beta_3 lnK_h + \varepsilon$, also perform very well.[5]

As with the 1980–1989 data, we test via a Granger Causality Test the hypothesis that under the Chinese system productivity leads to profitability and thence to higher investment in housing and welfare facilities. The results are reported in Table A5.2.9. We find that lagged housing and welfare capital is not significant as an explanator of TFP (calculated as value added minus [0.602*K_P] minus [0.476*L_P]), but lagged TFP is a significant explanator of housing and welfare capital at the 99 per cent significance level. Therefore we conclude that productivity drives housing and welfare capital rather than vice versa, and set aside all of the specifications that include non-productive inputs. As is the case with regard to the 1980–1989 data, our preferred model remains Cobb-Douglas with productive inputs.

Tests for constant returns to scale

Having established Cobb-Douglas as the appropriate functional form, we can test for constant returns to scale via hypothesis tests on the restriction $\beta_K + \beta_L = 1$. The format of the F tests is:

$$F[1, N-3] = \frac{(\hat{\beta}_L + \hat{\beta}_K - 1)^2}{Cov[\hat{\beta}_L, \hat{\beta}_L] + Cov[\hat{\beta}_K, \hat{\beta}_K] + 2Cov[\hat{\beta}_L, \hat{\beta}_K]}$$

(5.1.10)

Table 5.1 summarises the results of separate hypothesis tests on the 1980–1989 and 1990–1994 data. We see that the assumption of CRS is valid for the 1991–1994 period and for 1983–1987. However, the strength of the finding for CRS in the 1980s is somewhat diluted when we add the years 1988 and 1989 (the F statistic rises substantially, while remaining below the critical value), and the results indicate rejection of CRS when we add 1981 and 1982 to the estimation period.

To resolve the ambiguity in these results, we conduct a new hypothesis test using all of the data from 1981 to 1994, with multiplicative dummy variables for each year. Since the specification tests carried out above have indicated similar preferred functional forms for both the 1980–89 and 1990–94 periods (Cobb-Douglas with productive inputs), it is now appropriate to pool the data from the two surveys. Estimations were initially conducted on the two surveys separately because of differences in the compilation of certain data series, notably for non-productive capital. However, we have by now excluded non-productive capital from the specification and are only using productive capital and productive labour as explanatory variables. Based on the definitions listed in the database there would not seem to be any problem of discontinuity with these two variables.

Using multiplicative dummy variables for each year, we can express the econometric model as follows:

$$\ln V = \alpha + \beta_K K_P + \sum_{Y=81}^{94} \beta_{KY} D_Y K_P + \beta_L L_P + \sum_{Y=81}^{94} \beta_{LY} D_Y L_P + \varepsilon \qquad (5.1.11)$$

where D_Y is a vector of dummy variables denoting the year.[6] This specification allows us to test the hypothesis of constant returns to scale separately for each individual year, as follows:

$$H_0 : \beta_K + \beta_{KY} + \beta_L + \beta_{LY} = 1 \qquad (5.1.12)$$

Table 5.1 **Tests for constant returns to scale: FE estimation**

Years covered	$\hat{\beta}_K$	$\hat{\beta}_L$	F Statistic	D.F. (*j*,*N-k*)	Result
(a) 1983–1987	0.382	0.592	0.078	1,2229	Not reject CRS
(b) 1983–1989	0.316	0.793	2.446	1,3163	Not reject CRS
(c) 1981–1989	0.407	0.899	21.130	1,3968	Reject CRS
(d) 1991–1994	0.476	0.602	0.647	1,2320	Not reject CRS

Note: (1) The above estimations are carried out in the Cobb-Douglas form with productive inputs, in year-average terms.

(2) F test critical values for J= 1 and N-k> 100 are [at 95%] 3.84; [at 99%] 6.63.

(3) The denominators of the respective F tests are: (a) 0.01268 + 0.00231 – 2 (0.003324); (b) 0.007792 + 0.001839 – 2 (0.002388); (c) 0.007213 + 0.001395 – 2 (0.002089); and (d) 0.01305 + 0.003766 – 2 (0.00359).

For the base year 1994, both year dummy coefficients are automatically zero so the test simplifies to a test of $\beta_K + \beta_L = 1$. Tables A5.2.10a and A5.2.10b summarise the results using fixed effects and random effects estimation respectively. Each row presents results for a specific year; coefficients and t statistics for the two year-dummy products and an F test statistic for the hypothesis of constant returns to scale in that year. Using fixed effects estimation, the results lead us to reject the null hypothesis of constant returns to scale at 95 per cent significance for all years except 1988 and 1990. Using random effects estimation on the other hand, the constant returns to scale hypothesis is not rejected for all years except for 1981 and 1982. This latter result is consistent with the inclusion of 1981 and 1982 data upsetting the finding of CRS in the estimations reported in Table 5.1.

We also find that the year-variant coefficients are relatively stable through the years 1983 to 1987. This is consistent with our previous finding under year-constant coefficients that the 1983–1987 period has a better econometric fit than the full period of the 1980s (see Figure 5.1).

To further pursue the most appropriate econometric specification, we shall now examine regression results using an alternative measure of Value Added. The data series that I have called Value Added and used in the various regressions to this point is calculated as Gross Output minus Real Materials, Fuels and Energy. An alternative series provided in the CASS database is a standard Chinese accounting term known as Net Output (*gongye jingchanzhi*). It is equal to Gross Output minus a wider range of intermediate inputs, including Materials, Fuel and Energy but also other inputs such as advertising costs, and also capital depreciation. The broader

coverage of intermediate inputs that this series provides is desirable but not the subtraction of capital depreciation. Capital depreciation already enters the model via the explanatory variable Productive Capital, and it has no place in the calculation of the dependent variable Therefore my preferred measure of income is the one that I label Adjusted Net Output, whereby I add capital depreciation back into Net Output. This series comes closest to a standard theoretical concept of value added.

A test for CRS using Adjusted Net Output and RE estimation is reported in Table 5.3, and a similar test using FE estimation is reported in Table A5.2.10c. Under fixed effects, the previous results are echoed as the hypothesis of constant returns is rejected at 95 or at 99 per cent significance for every year except 1988. Under random effects on the other hand, the hypothesis of constant returns is rejected for every year except 1981, where it is rejected at 95 per cent but not at 99 per cent significance.

The results of Hausman and Breusch-Pagan Lagrange Multiplier tests for RE models incorporating multiplicative year dummy variables (Tables 5.4 and A5.2.11b) are summarised in Table 5.2. The tests indicate that the RE model is appropriate if using Value Added, while with Adjusted Net Output the FE model is preferred at the 95 per cent significance level but not at 99 per cent.

Table 5.2 **Breusch-Pagan Lagrange multiplier and Hausman tests: 1980–94**

	Breusch-Pagan LM		**Hausman**	
	Chi^2	**Prob>Ch i^2**	**Chi^2**	**Prob>Ch i^2**
Cobb-Douglas in CRS terms, value-added, productive inputs, multiplicative year dummies, 1981 to 1994	9512.87	0.0000	13.21	0.5097
Cobb-Douglas in CRS terms, adjusted net output, productive inputs, multiplicative year dummies, 1981 to 1994	11928.76	0.0000	45.01	0.0220

Note: All input and output variables used in the above regressions are in year-average terms.

On balance, on the basis of the CRS tests and the Hausman and Breusch-Pagan tests I prefer to rely primarily on the random effects model using Adjusted Net Output for the analysis. The reasons are:

1. Adjusted Net Output appears to be closer to the proper definition of value added than my own calculated Value Added series. It also results in a better 'fit' as measured by Adjusted R^2 than does Value Added; 0.6560 as opposed to 0.5753 when using RE estimation.

2. On the basis of the tests for CRS, the use of random effects rather than fixed effects permits us to impose constant returns to scale upon the model, which is very convenient for the comparison with labour income share.

3. Using Adjusted Net Output under RE estimation, we can be fairly confident in using data for the full period, rather than dropping any years. The only year for which CRS was rejected is 1981, but it is rejected somewhat marginally. At any rate, the early years of the period are of the least interest for the purposes of the question that we are investigating. We are chiefly interested in whether SOEs were overcompensating by the end of the period.

The principal argument that can be raised against our choice of model is that the Hausman test found in favour of FE over RE estimation when using Adjusted Net Output. While this makes the decision over models somewhat difficult, it is not an overwhelming argument. The theoretical literature of econometrics recognizes that the choice between RE and FE models is often contentious and does not reduce to a single straightforward test (Greene 1993: Chapter 16, Hsiao 1986: Chapter 2, Mundlak 1978). There is scope for judgment based on the nature of the problem at hand. For example, RE models may be preferred to FE models where we wish to make inferences from a random sample regarding a larger population, which is the case here, whereas FE is more appropriate where we are intrinsically interested in the particular firms or individuals in the sample.[7]

Assuming CRS then, the year-dummy model can be expressed in the following terms:

$$\ln\left(\frac{V}{L}\right) = \alpha + \beta_K \ln\left(\frac{K_P}{L_P}\right) + \sum_{Y=81}^{94} \beta_Y D_Y \ln\left(\frac{K_P}{L_P}\right) + \varepsilon \qquad (5.1.13)$$

Estimation results for this model in its preferred form, using RE estimation, Adjusted Net Output as the dependent variable and the whole survey period,

are presented in Table 5.4. Results from a number of variations to this model are presented in Tables A5.2.11a to A5.2.11e. Year-specific estimates of the labor elasticity of output are generated from these results as follows:

$$\eta_Y = 1 - \beta_K - \beta_Y \tag{5.1.14}$$

These are plotted in Figure 5.1 alongside five alternative sets of labour elasticity results including those from the corresponding FE estimation, results over the period 1983–1994, and results from the regressions without CRS imposed as presented in Tables 5.3 and A5.2.10c, calculated as $\beta_L + \beta_{LY}$. A clear inverted U-shaped trend is visible; labour elasticity rises from 1981 to 1985, roughly maintains its peak until 1990 and then declines. There is a sharp spike in 1990, which might be attributed to some firms altering their data reporting procedures somewhat between the two survey periods. Comparing the results with CRS imposed with those where CRS is not imposed, we see that both sets of results show remarkably similar estimates, except that the results without CRS imposed indicate higher labour elasticity estimates for 1981 and 1982. This gives us confidence in using the model with CRS imposed as represented in equation 5.1.13, which is convenient for the analysis since under CRS, $(1 - \beta_K - \beta_Y)$ can be compared directly with the labour income share to ascertain the extent of over-compensation. Note also that FE and RE estimation provide very similar estimates of output elasticity, thus minimizing any concern as to our choice of RE over FE estimation in the face of the adverse Hausman test result.

Table 5.3 **Test for constant returns to scale with year dummies: 1981–1994**
Random effects estimation, dependent variable adjd. net output

Year	$D_Y K_P$		$D_Y L_P$		Sum of β's	F test
	Coefficient	**T Statistic**	**Coefficient**	**T Statistic**		**Statistic**
1981	-0.255	-6.29***	0.222	5.82***	0.956	4.41**
1982	-0.161	-4.10***	0.143	3.85***	0.970	2.03
1983	-0.142	-3.58***	0.144	3.81***	0.990	0.23
1984	-0.198	-5.10***	0.215	5.79***	1.005	0.07
1985	-0.144	-3.59***	0.173	4.50***	1.017	0.71
1986	-0.150	-3.82***	0.178	4.70***	1.016	0.63
1987	-0.148	-3.74***	0.182	4.75***	1.022	1.20
1988	-0.107	-2.69***	0.156	4.02***	1.037	3.30
1989	-0.143	-3.64***	0.174	4.55***	1.020	0.97
1990	-0.043	-1.04	0.059	1.44	1.004	0.04
1991	-0.045	-1.19	0.051	1.36	0.994	0.09
1992	-0.045	-1.21	0.062	1.68*	1.005	0.06
1993	0.007	0.20	0.001	0.04	0.996	0.03
1994	(base year)				0.988	0.094

	Coefficient	**T Statistic**
lnK_P	0.439	15.42***
lnL_P	0.549	15.88***
Con-stant	-0.624	-4.64***
Adj. R^2		
-within	0.3524	
-between	0.7451	
-overall	0.6560	
No. of obsns	6549	
No. of firms	661	

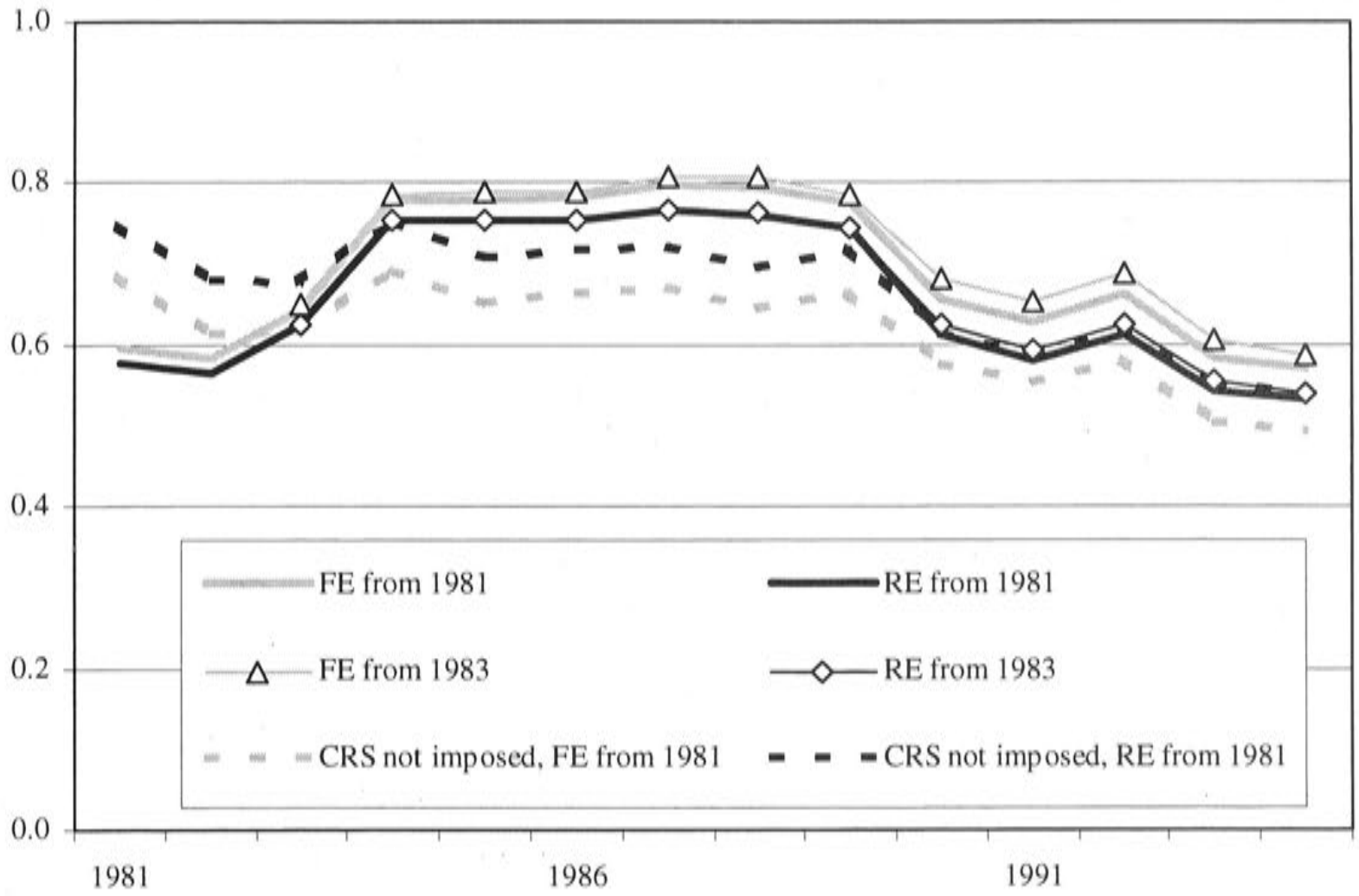
Note: (1) The above estimations are carried out with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.
(2) F test critical values are [at 95%] 3.84; [at 99%] 6.63.

Table 5.4 **Estimation with CRS imposed and year dummies: 1981–1994**
Random effects estimation: dependent variable adjd. net output

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.467	16.48***
$D_{1981}.(K_P/L_P)$	-0.046	-1.30
$D_{1982}.(K_P/L_P)$	-0.033	-0.94
$D_{1983}.(K_P/L_P)$	-0.091	-2.58***
$D_{1984}.(K_P/L_P)$	-0.222	-6.30***
$D_{1985}.(K_P/L_P)$	-0.221	-6.02***
$D_{1986}.(K_P/L_P)$	-0.222	-6.03***
$D_{1987}.(K_P/L_P)$	-0.233	-6.24***
$D_{1988}.(K_P/L_P)$	-0.228	-5.97***
$D_{1989}.(K_P/L_P)$	-0.212	-5.58***
$D_{1990}.(K_P/L_P)$	-0.077	-1.86*
$D_{1991}.(K_P/L_P)$	-0.046	-1.23**
$D_{1992}.(K_P/L_P)$	-0.079	-2.13
$D_{1993}.(K_P/L_P)$	-0.011	-0.30
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.605	-27.49***
Adj. R^2 – within	0.1097	
- between	0.2564	
- overall	0.1993	
No. of obsns	6527	
No. of firms	661	

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Figure 5.1 **Meta-function estimates of labour elasticity of output**



Note: These elasticity estimates all use Adjusted Net Output as dependent variable. Estimates are performed on the same basis as comparative results in Section 5.3; observations are deleted as required by labour income share data. 'RE from 1981' represents the main set of estimates used in Section 5.3.

The results presented to this point are all based on a meta-production function, imposing the same production function on every sector. Tables 5.5 and A5.2.12 present results for estimations in which each sector has its own multiplicative dummy. This permits the various sectors to display variations in factor intensity while maintaining constant returns to scale for every year and sector. Such a model would be represented as follows:

$$\ln\left(\frac{V_{YS}}{L_P}\right) = \alpha + \beta_K \ln\left(\frac{K_P}{L_P}\right) + \sum_{Y=81}^{94} \beta_Y D_Y \ln\left(\frac{K_P}{L_P}\right) + \sum_{S=1}^{10} \beta_S D_S \ln\left(\frac{K_P}{L_P}\right) + \varepsilon \qquad (5.1.15)$$

where the subscripts S denote sectors, of which there are five with adequate sample sizes. (In the above expression, Y and S subscripts have been omitted from the K and L variables for simplicity.) Figure A5.2.1 in Appendix 5.2 presents in chart form the elasticity estimates for each of the five sectors that have fairly large sample sizes. The results are generally in line with what would be expected, with sectors such as textiles and food processing exhibiting labour intensive technology and others such as iron and steel exhibiting capital-intensive technology. An exception is machinery; this

might be attributable to the distorting effects of the recession of the late 1980s, the temporary re-imposition of central controls at that time, and import competition, which together would have resulted in substantial domestic overproduction of capital machinery (see Chapter 2).

Table 5.5 **Estimation results with CRS imposed and year and sector dummies: 1981–1994 (random effects estimation)**

Variable	Coefficient	T Statistic	Prob>|t|
$ln(K_P/L_P)$	0.508	8.00***	0.000
$D_{1981}.(K_P/L_P)$	-0.049	-1.40	0.161
$D_{1982}.(K_P/L_P)$	-0.034	-0.97	0.330
$D_{1983}.(K_P/L_P)$	-0.096	-2.73***	0.006
$D_{1984}.(K_P/L_P)$	-0.232	-6.58***	0.000
$D_{1985}.(K_P/L_P)$	-0.227	-6.19***	0.000
$D_{1986}.(K_P/L_P)$	-0.225	-6.13***	0.000
$D_{1987}.(K_P/L_P)$	-0.237	-6.35***	0.000
$D_{1988}.(K_P/L_P)$	-0.232	-6.07***	0.000
$D_{1989}.(K_P/L_P)$	-0.207	-5.46***	0.000
$D_{1990}.(K_P/L_P)$	-0.083	-1.99**	0.046
$D_{1991}.(K_P/L_P)$	-0.049	-1.30	0.195
$D_{1992}.(K_P/L_P)$	-0.081	-2.18**	0.029
$D_{1993}.(K_P/L_P)$	-0.013	-0.36	0.719
$D_{1994}.(K_P/L_P)$	(Base year)		
Food Processing	(Base sector)		
Textiles	-0.109	-1.69*	0.092
Chemicals	0.028	0.38	0.703
Pharmaceuticals	-0.170	-2.15**	0.032
Bldg Materials	-0.027	-0.35	0.724
Iron & Steel	0.213	2.26**	0.024
Machinery	-0.128	-1.96**	0.050
Transport Eqpt.	0.184	2.01**	0.044
Electronics	0.200	2.76***	0.006
Other Mfg.	-0.058	-0.90	0.368
Constant	-0.609	-28.24***	0.000
Adj. R^2 - within	0.1228		
- between	0.2398		
- overall	0.1906		
No. of obsns	6527		
No. of firms	661		

Note: (1) Adjusted Net Output used as dependent variable. Estimates are performed on the same basis as comparative results in Section 5.3; observations are deleted as required by labour income share data. Figure A5.2.1 is based on these estimates.

The estimation summarised in Table 5.5 and Figure A5.2.1 has a limitation in that it imposes a uniform 'shape' on the elasticity estimates for each sector. Estimations are also carried out that allow each sector to trend independently over time. There are at least two possible approaches that can achieve this. First, the estimation can be carried out on each sector's data one at a time in separate regressions. Second, dummies can be created to account for both years and sectors. With fourteen time periods and ten sectors to be covered, 140 dummy variables would be required. Estimations were attempted under this method for the 1980–1989 and 1990–1994 periods separately only (requiring 100 dummy variables). The estimation results were not useful however, as (1) not a single dummy variable was found to be statistically significant even at 90 per cent, and (2) the overall adjusted R^2 measure in each case was lower than for the corresponding year-and-sector-dummy specification (such as the one reported in Table 5.5). We therefore regard the results in Table 5.5 as the best available estimates of the labour elasticity of output.

5.2 Estimation of the labour share of income

This section seeks to generate the most realistic possible estimates of the costs associated with labour as a proportion of value added, within the constraints of the available data. Minami and Hondai (1995) identified three main components of employee compensation; (1) cash wages including bonuses (2) welfare payments in cash such as accident insurance, medical care payments and pensions, and (3) benefits from various types of welfare capital facilities such as housing, clinics and schools. They also presented three alternative measures of labour share as follows:

Estimation A:
$$\frac{W_P}{Y_P} = \frac{W_{P1}}{Y_P} + \frac{W_{P2}}{Y_P} + \frac{W_{P3}}{Y_P} \qquad (5.2.1)$$

Estimation B:
$$\frac{W}{Y} = \frac{W_1}{Y} + \frac{W_2}{Y} + \frac{W_3}{Y} \qquad (5.2.2)$$

Estimation C:
$$\frac{W}{Y_P} = \frac{W_1}{Y_P} + \frac{W_2}{Y_P} + \frac{W_3}{Y_P} \qquad (5.2.3)$$

where the subscript P denotes productive manufacturing activity and the numerical subscripts denote the three components of remuneration listed

above. Y_P refers to the production of manufactured goods for external sale, such as a textile firm's production of cotton cloth, as opposed to the production of housing and other services for the internal use by employees.

As the production data supplied by the CASS data set only covers goods produced for external sale, then as far as the denominator is concerned I can only calculate Y_P. As for the numerator, the CASS data on the various components of compensation does not feature breakdowns between benefits received by 'productive' and 'non-productive' employees. Therefore, my compensation data corresponds to W and the calculated ratio corresponds to Estimation C. Conceptually however, one can think of the wages of 'non-productive' employees as reflecting the value of services whose ultimate purpose is to compensate 'productive' employees. In this sense we can regard the estimates generated here as corresponding to Estimate A in a broad sense.

Cash wages

Data for this component is supplied in the CASS database. It is broken down into various sub-components including basic wages, bonuses and overtime payments, the sum of all these sub-components being the variable of interest for this exercise. For the 1980–1989 data survey, a breakdown is also provided by types of employee (managers, line workers, engineers etc.). The data that is provided on the sub-components and employee types is useful in checking against the totals to expose clerical errors. A series for the wages of casual workers is provided, and it is apparent that some firms included this amount in their figures for total cash wages while others did not. The Data Appendix details how this anomaly is dealt with.

Cash welfare payments

There are two available approaches to calculating cash welfare components. The first is to sum various entries in the CASS database. The second is to follow Minami and Hondai and use certain aggregated annual data published in the *Statistical Yearbook of China* (page 685 in the 1995 edition). This table enables us to calculate the ratio of welfare cash payments to total cash wages for the combined SOE, civil administration and urban collective

sectors. Since SOEs comprise over 80 per cent of total welfare cash payments of this group of organisations, the data is reasonably representative of the SOE sector. This ratio is then multiplied by the measure of total cash wages in our own sample to obtain the relevant estimate of cash welfare payments.

In the CASS database, cash welfare payments are compiled quite differently in the two survey periods. For the 1980–1989 period they comprise payments into the employee collective welfare fund plus total payments to retirees. For the 1990–1994 period they comprise medical expenditures, upward payments to state authorities or funds for medical purposes, collective welfare expenditure, firm payments to retirees, plus firm payments into consolidated retirement funds. Examining the data on a year-to-year basis as presented in Table A5.2.13 and Figure A5.2.2, we see that the use of the CASS data seems to introduce a sizeable structural change between 1989 and 1990, in that the 1980–89 data produces much lower ratios to value added than the 1990–94 data. The *Statistical Yearbook of China* data on the other hand tracks the 1990–94 data quite closely. Therefore I surmise that the 1990–94 data is probably more complete than the 1989–94 data, and is quite well represented by the *Statistical Yearbook of China* series. Therefore for the purposes of this analysis I rely on the *Statistical Yearbook of China* ratios to generate the labour income share estimates.

Benefits from welfare capital facilities

The annual value of the flows of services from welfare capital facilities is equal to their annual depreciation plus their opportunity cost. We use the firms' own recorded data on depreciation. To estimate opportunity cost, we must multiply the value of the welfare capital stock in each year by an appropriate rate of return. Minami and Hondai used the actual ratio of profits to fixed capital achieved annually by the SOE sector. However, this generates a very skewed estimate, since this ratio declined from 23.2 per cent in 1980 to 4.8 per cent in 1990. This sharp decline dominates Minami and Hondai's estimate and masks the influence of the considerable growth in welfare capital over the reform period. I prefer to use state bank lending

interest rates collected from the China Finance Almanac 1995. Two alternative calculations are examined: (1) using the actual interest rates for each year, and (2) using the geometric mean of interest rates over the whole 1980–1994 period. This second approach produces a constant rate so as to remove any effect from fluctuations in interest rates. Further details regarding the interest rates are provided in Appendix 5.1.

Alternative measures of income

The above three components of total compensation are summed and then divided by firm income to produce the labour share of income. As discussed above (page 158), three alternative measures are available to represent income: Value Added, Net Output and Adjusted Net Output. For reasons explained above I regard Adjusted Net Output as the most appropriate measure of income, but for completeness also present below some results using Value Added and Net Output. In all of the comparative results presented here, the same measure of income is used to calculate both output elasticity and labour income share. However, for the labour share estimates, since we are calculating a ratio, we use nominal values for the denominator income measure as well as nominal values for the wage variables in the numerator. Real variables are required for the production function estimations.

Alternative calculations of labour share

Three alternative methods are used to calculate the all-SOE and sector-specific annual estimates of the labour share of income. The first measure, designated Mean, is the mean of all firm-level ratios. Raiser (1997b) used this measure in his analysis.

$$Mean = \frac{\sum_i (W_1 + W_2 + W_3)/Y}{N}, \text{ where } N \text{ is the number of firms.} \qquad (5.2.4)$$

This measure must be processed for outliers since some firms have very small or even negative Adjusted Net Output, leading to some disproportionately large (positive and negative) ratios. Negative value added observations have already been deleted prior to the production function

estimations since one cannot take logarithms from a negative. To deal with the positive-signed outliers, we delete all firm-level ratios (calculated under Welfare Facilities measure B) exceeding a value of 5.0. The twenty-two resultant deletions are detailed in Table A5.2.14. In the comparative estimates that are presented below, all observations that are deleted in generating production function estimates are also deleted in calculating the corresponding labour income share estimates, and vice versa.

The second measure used is the median of firm-level ratios, after the deletions mentioned above. Because Mean is skewed towards high values, the Median measure is consistently lower than Mean. Mean is preferred to Median as it better reflects the full characteristics of the data.

The third measure, which I designate simply Share, is the measure used by Minami and Hondai (1995). It comprises the aggregate of all three wage components across all firms, divided by the aggregate value added of all firms.

$$Share = \frac{\sum_i (W_1 + W_2 + W_3)}{\sum_i (Y)} \text{, where } i \text{ represents firms.} \qquad (5.2.5)$$

5.3 Output elasticity and labour income share estimates compared

In this section we compare the estimates of the output elasticity of labour as generated from regression results, with estimates of the labour share of income. Observations that are deleted for the elasticity estimations are also deleted for the labour income share estimations, and vice versa, so that the comparisons are carried out on a consistent basis. This results in very slight changes to the regression results as reported above as the data set changes to report different measures.

Figure 5.2 charts the results of the comparison at the meta production function level (all manufacturing SOEs), using Adjusted Net Output.

Corresponding charts for the results using Value Added and Net Output are presented in Figures A5.2.3a and A5.2.3b in Appendix 5.2.

Regardless of the measure of income employed, both Mean and Median show a clear upward tend in the labour income share from the mid-1980s to the mid-1990s. The reported results from the first two years of the period should be interpreted with caution, as the data may be relatively unreliable. Using Adjusted Net Output as the income measure (Figure 5.2), we observe substantial overcompensation of over 20 per cent of income by the end of the period. 'Crossover', the point at which labour share starts to exceed output elasticity, is seen to have occurred in 1991. The use of Value Added suggests a smaller degree of overcompensation while Net Output suggests a larger degree of overcompensation. These results probably reflect the inherent biases in each these two measures of income; Value Added overstates income since not all intermediate costs are deducted, and Net Output understates income since it deducts depreciation.

The charts show that it makes little difference which of the two methods is used for estimating the value of services from welfare facilities. In the lower charts I choose to use the flow of services as calculated with a constant interest rate.

Sectoral results

Sectoral results for five manufacturing sectors are presented in graphic form in Figures 5.3a to 5.3e. On the basis of Mean, each of the five sectors shows substantial overcompensation by the end of the period of analysis, with crossover occurring in the early 1990s. The use of Median suggests roughly 'appropriate' compensation for each sector except Electronics, which shows overcompensation even under this measure.

Let us directly compare these results with the sector-specific results obtained by Raiser (1997b) and Minami and Hondai (1995). Raiser analysed four sectors — garments, textiles, electrical appliances and iron and steel — finding overcompensation in the former two sectors and undercompensation in the latter two. My results for the textile sector agree unambiguously with Raiser's. I do not report results for the garments sector or the iron and steel

sector as the sample size is too small after deletions. The electrical appliances sector is a sub-sector of the electronics sector under standard Chinese classifications. My finding of overcompensation here contradicts Raiser, although the sector definitions are only a partial match.

Minami and Hondai studied only the machinery sector, and found evidence of overcompensation, with crossover occurring in 1988. Using Mean as the income measure, we find overcompensation, although crossover does not decisively occur until 1993. If we employ the Share measure (see Figure A5.2.4e) the finding is similar to Minami and Hondai's with crossover occurring in 1990, but only if we also use pooled OLS estimation to generate the elasticity estimates, as Minami and Hondai did. If we use Random Effects, which our specification tests reveal to be the correct model, the Machinery sector only barely achieves crossover in 1994.

Figures A5.2.4a to A5.2.4f present results using Minami and Hondai's Share measure for all manufacturing sectors, and for the textile, chemical, building materials, machinery and electronics sectors. The calculated Share measures are to be consistently lower than Mean measures, with the result that results based on this measure do not in general support a conclusion of overcompensation. On an all-sector basis, the results indicate *under*-compensation through the whole period relative to elasticity as measured with RE estimation. Using pooled OLS estimation, the results show roughly appropriate compensation. None of the sectors show decisive overcompensation relative to elasticity as measured by RE estimation.

Table 5.7 **Summary of results by other authors: Minami and Hondai (1995) (machinery sector)**

	1980	1985	1986	1987	1988	1989	1990
Labour share — China	.477	.386	--	--	--	--	--
Output elasticity — China	.536	.487	--	--	--	--	--
Labour share — Tianjin	--	.367	.432	.514	.550	.564	.690
Output elasticity - Tianjin	--	.550	.479	.576	.498	.488	.430

Notes: This table presents that set of labour share results that correspond with the approach taken in this chapter — all remuneration divided by all income (not restricted to 'productive' employees).

Table 5.8 **Summary of results by other authors: Raiser (1997b)**

	Labour Share of Income (SOEs only					Output Elasticity
	1980	**1985**	**1990**	**1991**	**1992**	
Textiles	.298	.355	.615	.682	.811	0.57
Garments	.284	.349	.622	.909	.753	0.68
Electrical Appliances	.418	.316	.427	.293	.254	0.91
Iron & steel	.379	.528	.409	.422	.400	0.60

Notes: The labour share figures presented here are calculated similarly to 'Adjusted Mean'. Raiser's elasticity estimates are constant for all years.

Comparative results by size of firm

To gain further insights, we can separate out the data by firm size so as to investigate whether large, medium or small firms were most prone to engage in overcompensation. Chinese industrial statistics categorise all firms as large, medium or small, although the official criteria by which they are categorized differ from sector to sector. A data series is available in the CASS database that identifies firms by these three classes. Of the 769 firms in the total pooled (1980–1994) database, 176 are categorized large, 374 medium and 219 small. After deletions, 661 firms are used in the Adjusted Net Output calculations. Of these, 154 are categorized as large, 326 medium and 181 small. Table A5.2.16 shows the results of a regression which is identical to the model we have used for our main results, except that it features two dummy variables for large and for medium-sized firms (leaving small firms as the baseline group). The firm size dummies are both found to be clearly insignificant. Therefore we may use the same set of elasticity coefficients for all three size categories to examine the extent of overcompensation by firm size.

Figures 5.4a, 5.4b and 5.4c present the results. Based upon the Mean measure, it is very clear that medium-sized firms overcompensated more than large firms, while small firms overcompensated most of all. The Median measure, which is consistently lower than the Mean measure, shows undercompensation by 1994 for large firms, 'appropriate' compensation for medium-sized firms, and overcompensation for small firms. Figure A5.2.5 presents the estimates of Minami and Hondai's Share measure for the three

size categories and also for all manufacturing firms. This chart confirms the finding that small and medium-sized firms paid their employees a higher proportion of Adjusted Net Output than did large firms.

Summary

The results presented in this chapter show strong evidence of overcompensation for the manufacturing sector as a whole, based upon those measures that are seen as the most technically sound. Overcompensating behaviour is found consistently across a range of industrial sectors. Finally, small and medium-sized firms show a markedly stronger tendency towards overcompensation than do large firms.

Figure 5.2 **Elasticity and labour share estimates using adjusted net output**

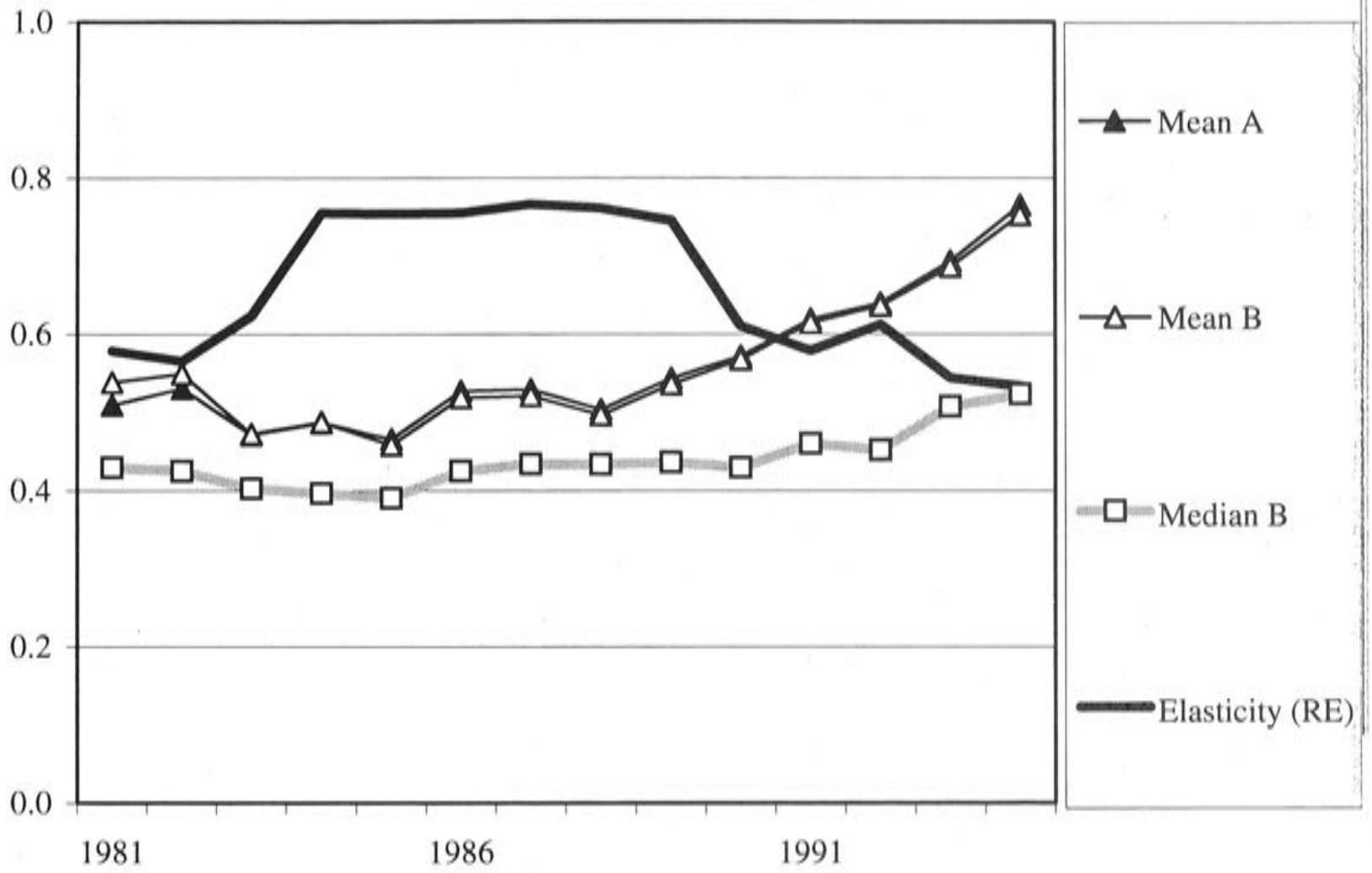


Figure 5.3a **Elasticity and labour share: textile sector**

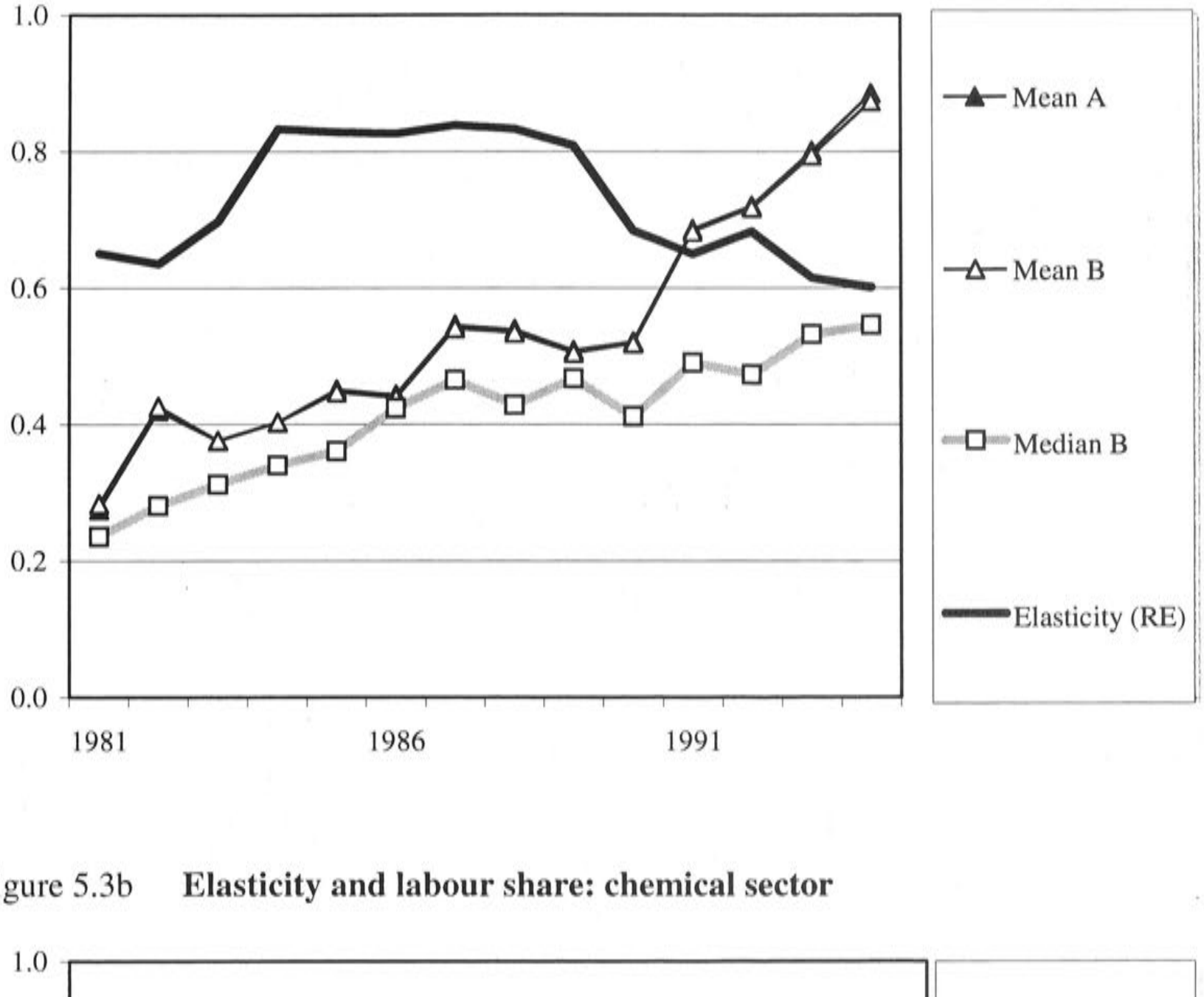


Figure 5.3b **Elasticity and labour share: chemical sector**

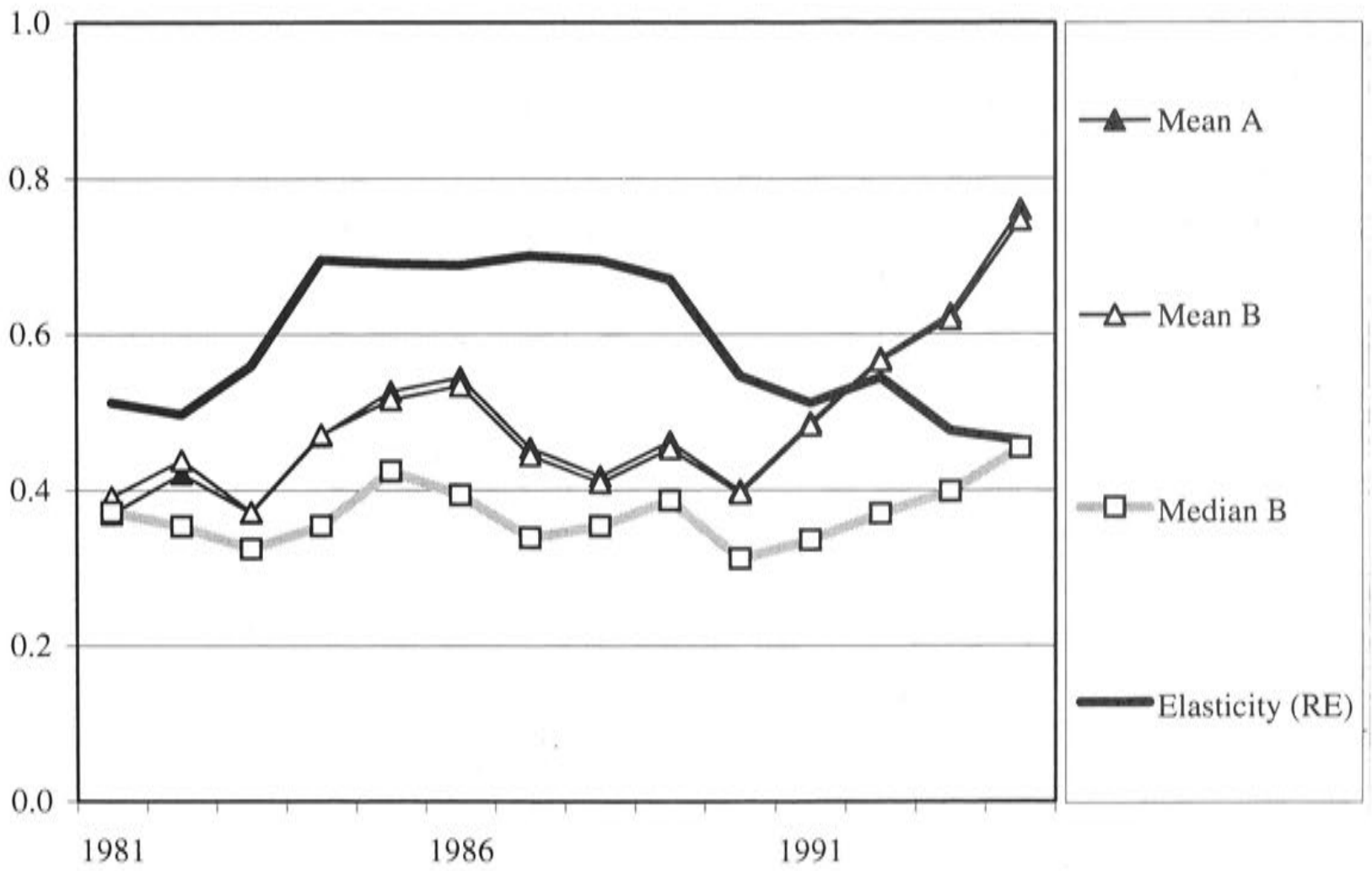


Figure 5.3c **Elasticity and labour share: building materials sector**

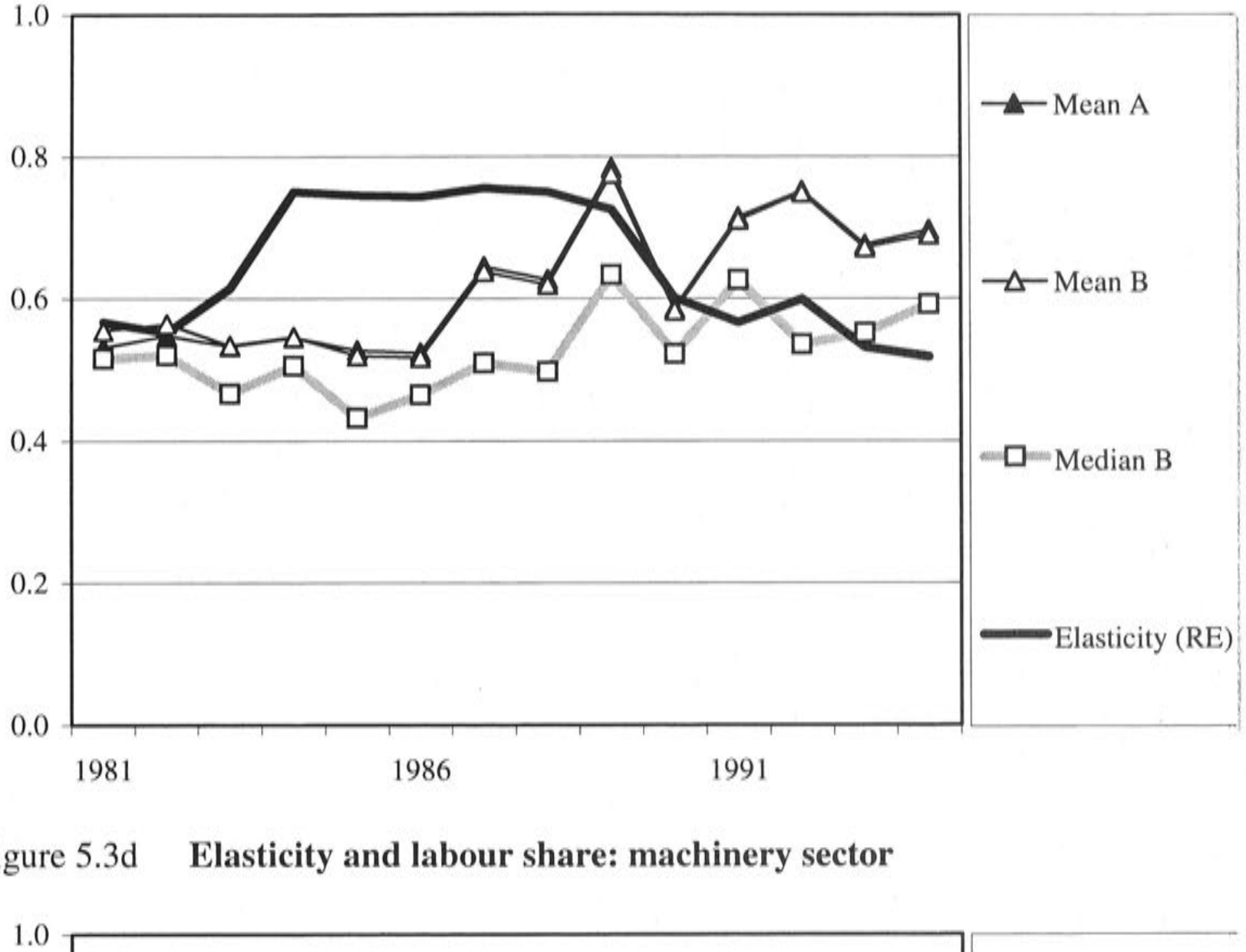


Figure 5.3d **Elasticity and labour share: machinery sector**

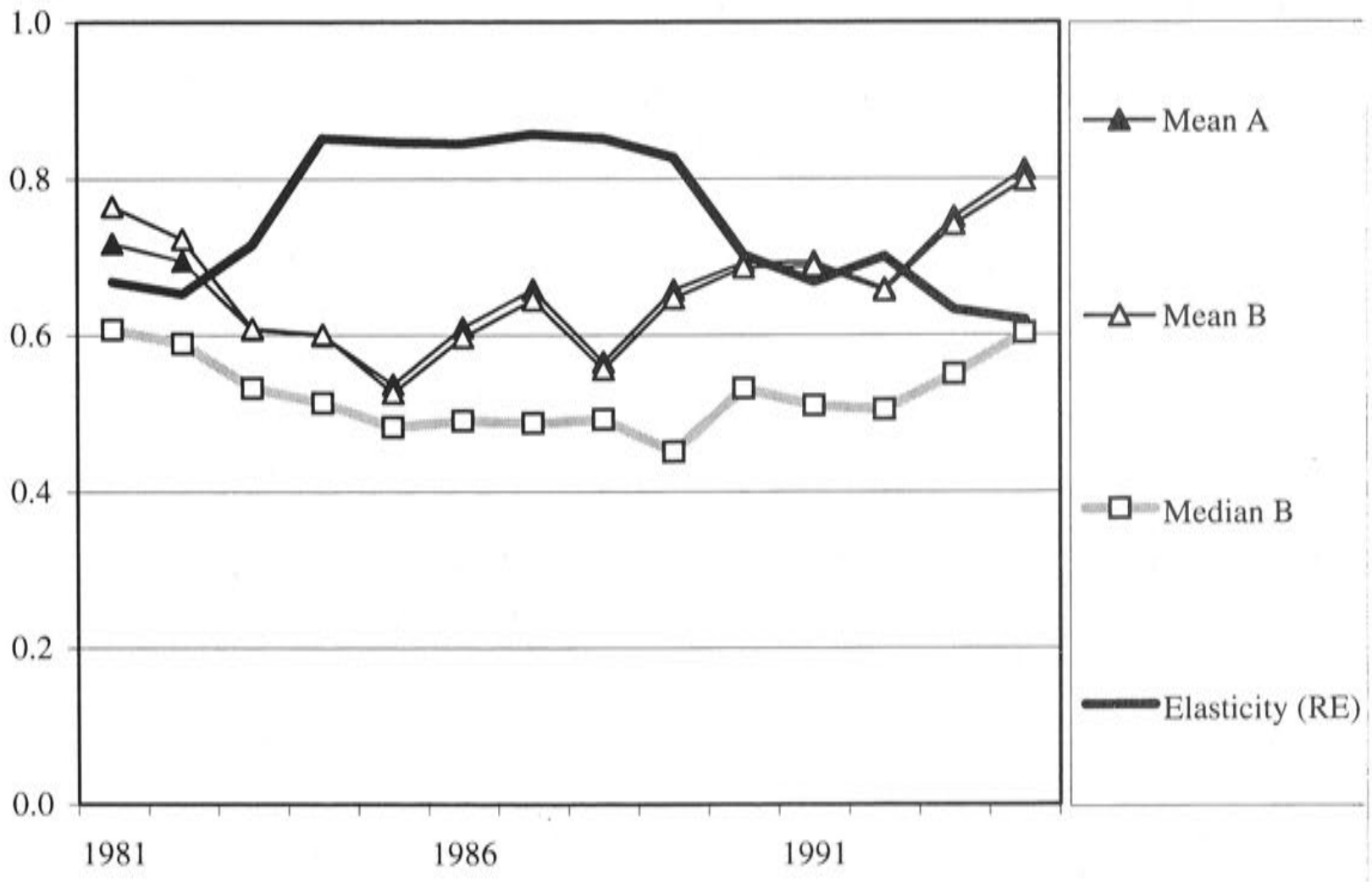


Figure 5.3e **Elasticity and labour share: electronics sector**

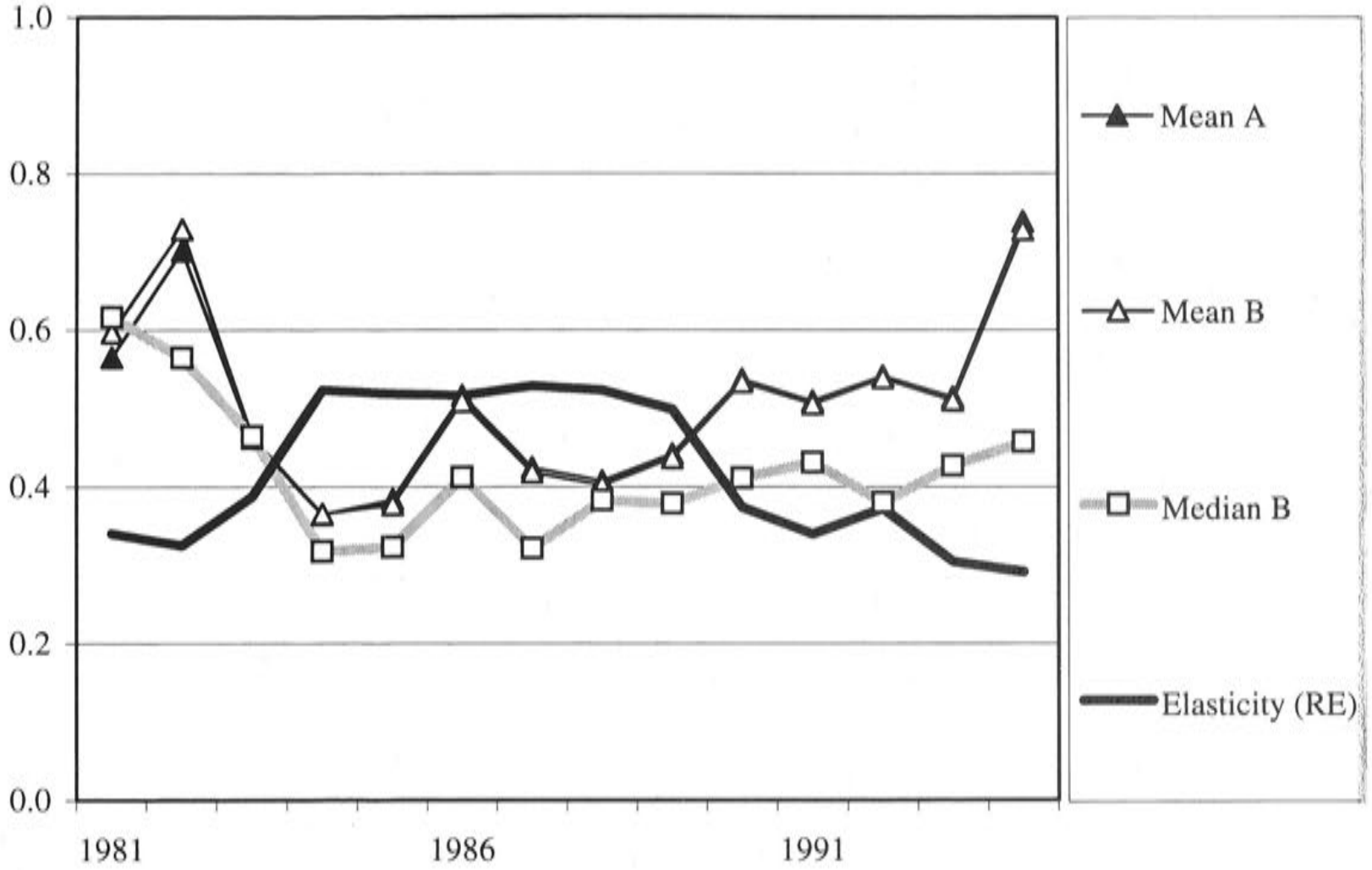


Figure 5.4a **Elasticity and labour share: large firms**

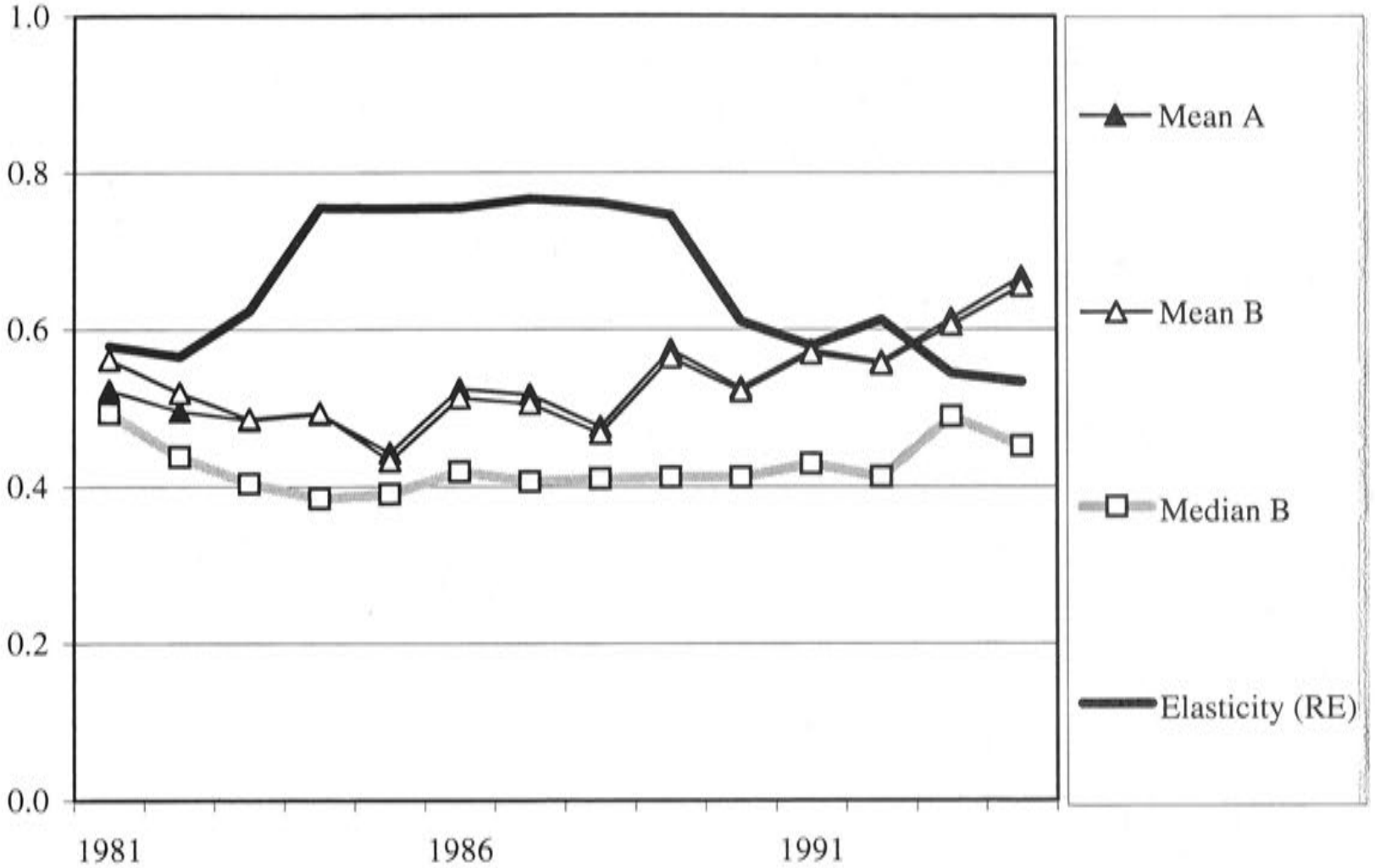


Figure 5.4b **Elasticity and labour share: medium firms**

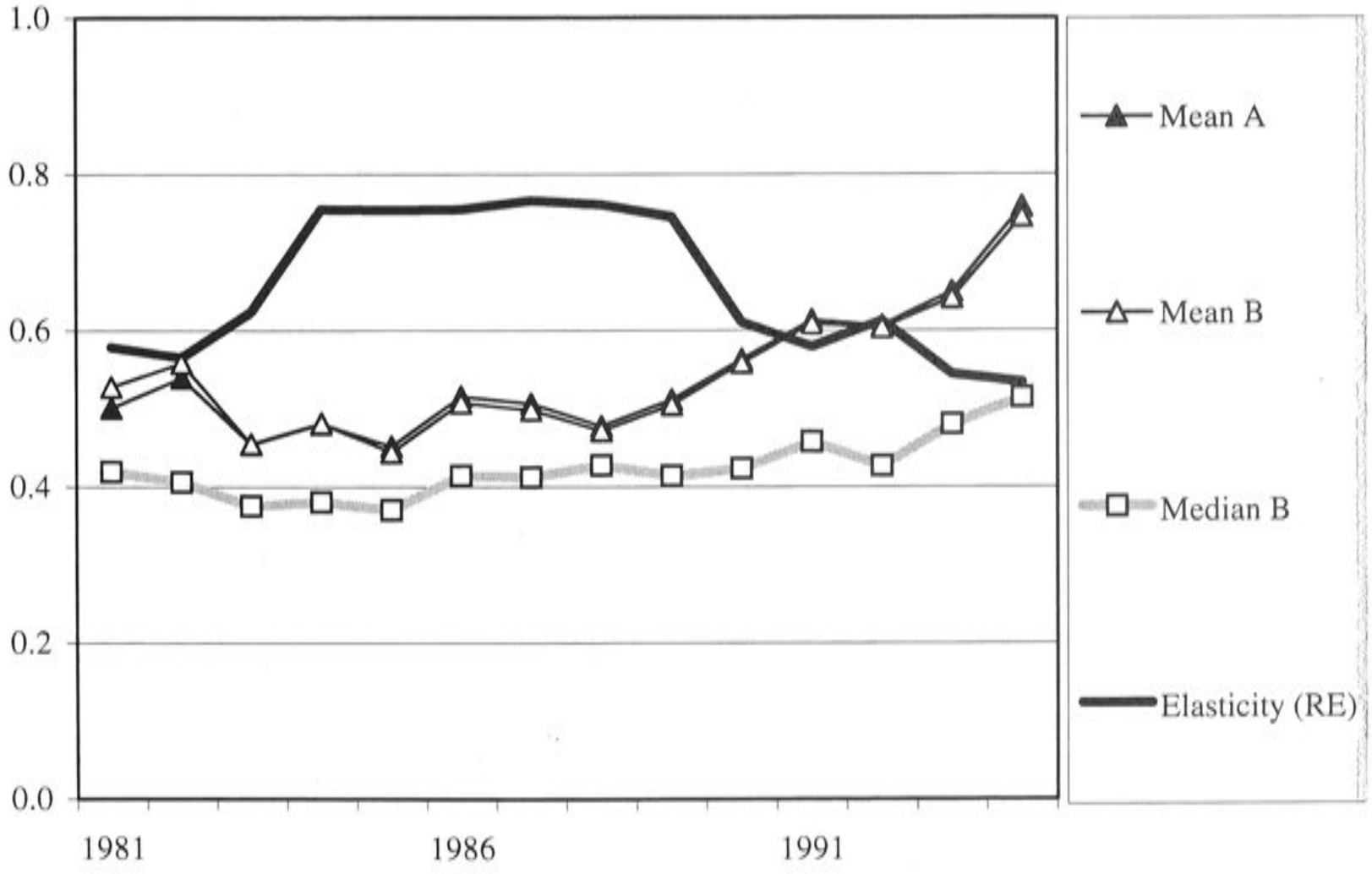
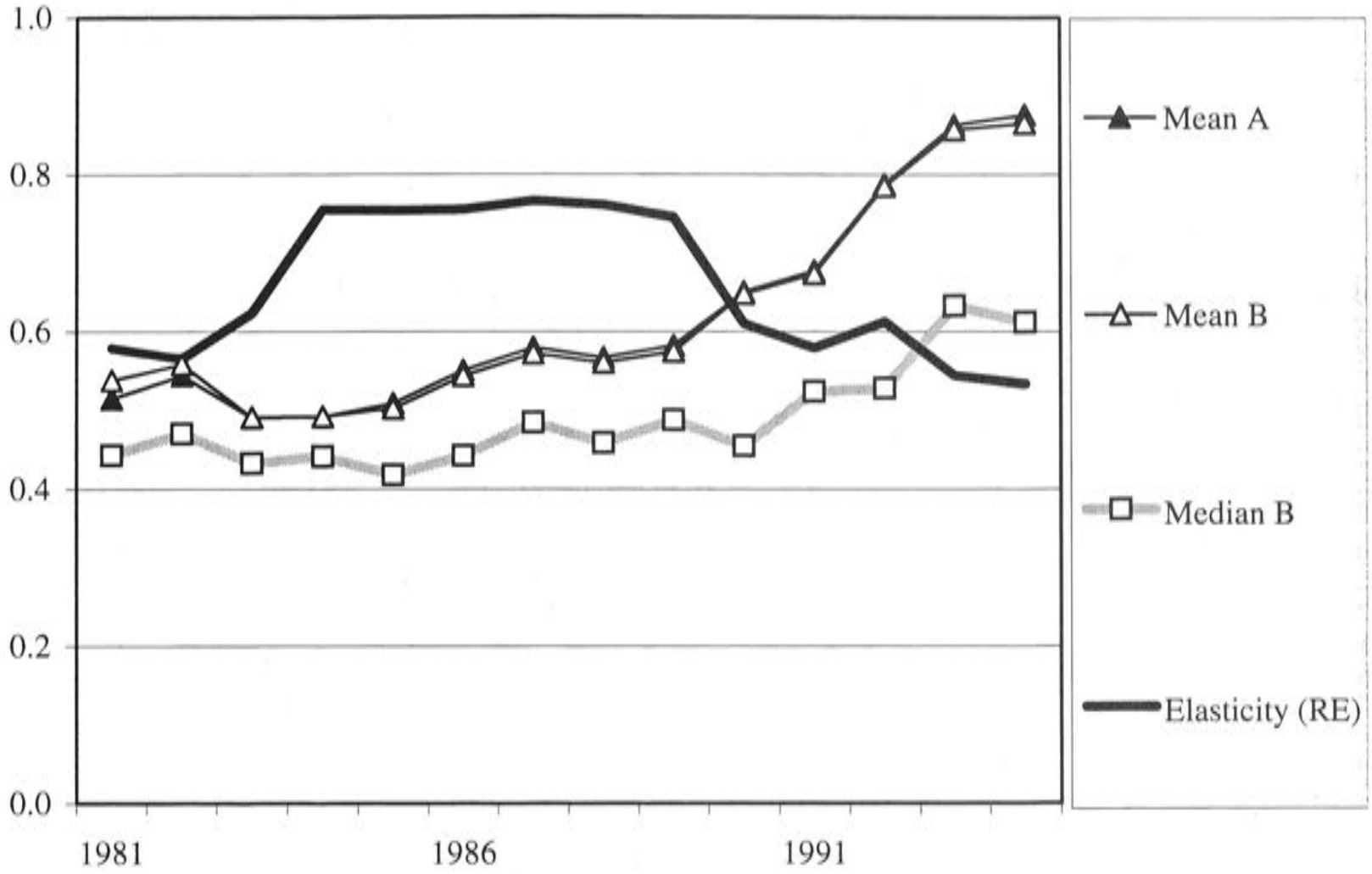


Figure 5.4c **Elasticity and labour share: small firms**



[1] Minami and Hondai refer to this entity as 'output elasticity of labour'. Labour elasticity of output is the more orthodox expression, corresponding as it does to the very familiar 'price elasticity of demand', expressed algebraically as $\frac{dq}{dp}\frac{p}{q}$

[2] Non-line workers also include some miscellaneous types of employees such as political cadres, but these are few in number.

[3] The F statistic for the hypothesis test is

$$F[k, N-k] = \frac{(URSS - RRSS)/k}{RRSS/(N-k)}$$

As an example, the test of translog versus Cobb-Douglas for the total-inputs specification this gives:

$$F[3,5037] = \frac{(1668.86 - 1667.39)/3}{1667.39/5039} = 1.48$$

The critical value at 95% is 2.60, so we do not reject the hypothesis that Cobb-Douglas is appropriate.

[4] Anecdotal evidence suggests that accounting standards were generally deficient in the pre-reform and early reform periods, due to inadequate education and training and the peculiarities of accounting in planned economies. This issue of accounting standards was briefly noted in various parts of Chapter 2, such as Section 2.8 and the anecdote from Purves (1991) mentioned in the Chapter 2 endnotes. Accounting standards no doubt improved over time due to such factors as better training, an aspect that Purves also discusses.

[5] Here, the subscript P denotes productive input variables (capital or labour), while subscript H denotes housing and welfare capital.

[6] We continue to use the fixed-effects estimator, therefore the error term ε in this model incorporates both a firm-specific constant and a purely stochastic error variable with zero mean.

[7] As argued in econometric course notes by Colin Cameron of ANU, 1995.

Appendix 5.1

Description of data and data preparation

The database used for the analysis of Chapters 5 was collected by the Chinese Academy of Social Sciences (CASS). It covers 840 state-owned firms in total and is in two parts, one survey having been carried out to cover the years 1980 to 1989 and a later survey covering the years 1990 to 1994. The sets of firms covered in the two survey datasets are not identical due to some of the firms in the 1980-1989 survey merging, converting to joint venture form and so forth. To replace some of the losses, CASS included some new firms for the second survey. 769 firms participated in the first survey (some of which commenced operations after 1980 and therefore did not have data to report for the whole period) and 752 participated in the second. Of these, 681 firms participated in both surveys.

Each of the two surveys includes one set of questions addressed to the senior accountant of the firm and another set of questions addressed to the manager. The information supplied by the accountant consists of quantitative variables such as output, expenditure on inputs, earnings, and balance sheet data, whereas the information supplied by the manager covers such aspects as the management system, objectives of the firm, relationships with supervisory agencies and the treatment of employees. The 1980-1989 survey features 321 accounting variables and 70 questions addressed to the managing director. The 1990-1994 survey features 153 accounting variables and 85 questions addressed to the managing director.

A number of variables are reported somewhat differently in the first and second surveys, and the quality and reliability of the data appears to be higher for the second survey than for the first. Therefore the data is collated in such a way as to enable analysis to be carried out either on the entire database or on each of the two survey sets separately.

The survey firms come from 35 different industrial sectors. However, only nine specific sectors contributed 20 or more firms to each of the two survey

periods. The firms are therefore classified into these nine sectors, plus a group labeled 'other manufacturing sectors', and a non-manufacturing group that includes mining, forestry and public utilities firms. Tables A5.1a and A5.1b list the numbers of firms in each sector before and after deletions (explained below). After deletions, only five sectors have adequate sample sizes for the empirical analysis: Textiles, Chemicals, Building Materials, Machinery and Electronics. We do not include the non-manufacturing group in estimations since we expect their performance to be influenced by such factors as natural resource endowments in the case of mining and forestry firms and economies of scale in the case of utilities. 16 firms that are reported as being in two different sectors in the two surveys are relegated to the 'other manufacturing' group.

Table A5.1.1a **Number of firms in database by sector**

Code no.	Sector	Firms in 1st Survey	Firms in 2nd Survey
10	Food processing	34	33
14	Textiles	99	102
26	Chemicals	76	71
27	Pharmaceuticals	27	28
31	Building materials	51	52
32	Iron and steel	26	22
35	Machinery	156	148
36	Transport equipment	27	27
38	Electronics	44	45
--	Other Manufacturing	177	173
--	Non-Manufacturing	52	51

Notes: The above numbers indicate the total number of firms in the original database, not subtracting deletions.
'Other Manufacturing' here includes 16 firms originally categorised in two different sectors in the two periods.

Table A5.1.1b **Number of firms by year and sector after deletions**

Sector	81	82	83	84	85	86	87	88	89	90	91	92	93	94
Food processing	11	13	13	14	14	12	15	16	17	17	25	24	23	23
Textiles	54	62	68	73	73	75	74	71	68	70	86	86	84	85
Chemicals	43	45	47	48	44	45	44	46	45	44	64	64	60	60
Pharmaceuticals	16	17	16	17	18	19	19	19	19	19	26	26	25	25
Bldg. materials	25	29	30	32	30	31	30	30	31	32	46	45	45	43
Iron and steel	14	13	14	14	15	15	14	16	16	10	17	17	17	16
Machinery	93	94	95	99	99	96	92	92	93	93	122	120	118	116
Transport Eqpt.	14	14	15	15	15	15	14	13	13	15	22	22	22	22
Electronics	24	24	25	26	28	28	28	27	29	29	38	37	35	35
Other Mfg.	91	95	100	103	104	105	108	101	102	95	140	139	135	132

Notes: The above indicate the total number of firms after deletions, as used for the estimations reported in Figure 5.2c.

A5.1 Data for production function estimations

For the production function estimation we require data variables on output, intermediate inputs, capital and labour. This section describes the preparation processes undertaken for this data.

Close examination of the database reveals numerous instances of missing observations and also some obvious clerical errors in the recording of the data. For example, sometimes an observation would suddenly diverge by a decimal place from the observations immediately preceding and following it, or the sub-categories of a series may not sum correctly to the aggregate series. (For example, 'managers', 'engineers/technicians', 'workers' and 'other employees' may not sum correctly to the recorded figure for total 'employees', suggesting an error either in the total or in one of the categories.) Therefore, all of the data series used in the analysis are carefully screened to identify such errors, and either correct them or delete the offending observations. Zero and negative observations are also deleted where necessary so that the input and output variables could be transformed into logarithmic form for the production function estimation. Unbalanced panel data techniques are used in the analysis, so that firms need not be deleted entirely when observations for one or more years are deleted.

Microsoft Excel was used for the data cleaning and Tables A5.2 and A5.3 provide information on the methods used to check each of the variables. 'Flag columns' were created in Excel to highlight various characteristics of the data that might call for scrutiny. For example, to check for errors in the nominal output series, a column was created to show the year-on-year growth rate of output, but only if the recorded output more than doubled or fell by more than half. The observation would then be cross-referenced against other variables such as real output and raw material usage to ascertain whether the apparent large fluctuation is likely to have actually occurred or whether there may have been an error in the recording of the data. Where the origin of an error can be confidently identified the data is modified back to the correct value, and where this is not possible the observation is marked for deletion. In the cases of capital and labour variables where categories ought to sum to the value of the aggregate variable, the quality of the data is checked by comparing the aggregate variable with the sum of the categories. Such observations are not automatically deleted however, as this would lead to an excessive number of deletions from the database.

For each variable a deletion column vector is created, consisting of zeros (indicating that the data is to be deleted), ones (indicating that it is to be retained) and Ms (indicating that the data has been modified from the raw data and is to be retained). In this way, full records are kept of all deletions and modifications so that the cleaned data series can be compared with the raw data series. Also, different groups of data series can be used for different econometric specifications while discarding only the minimum necessary number of observations.

Tables A5.2 (for 1980–89 data) and A5.3 (for 1990–1994 data) detail the flag columns, summation relationships and cross-references that are used to check each variable in the cleaning process, as well as the number of modifications and deletions. These two tables are laid out such that each variable or group of variables (separated by horizontal lines) corresponds to a single deletion vector. For example, the deletions and modifications for

both B025 Fuels and B028 Energy in the 1980–1989 survey are all recorded in the deletion vector DEL_FE. The deletion counts cited in Tables A5.2 and A5.3 are overlapping in the sense that, for example, Firm #22 in 1986 has zeroes recorded in the deletion columns for Output, Materials and also for Depreciation on B133 and B134. The number of observations actually deleted from the combination of variables used in a particular econometric specification and corresponding labour income share calculation is reported in Table A5.1b for each year and sector.

The data of the 1980–1989 survey is less complete and seems to contain more clerical errors than that of the 1990–1994 survey. Note in particular the high deletion ratios for the sub-categories of Fixed Assets, Depreciation and Labour in the 1980–1989 survey. Almost 25% of firms do not return any data for B70 Line Workers, and in fewer than half of all observations do the data for the labour sub-categories sum exactly to the figure for B65 Total Labour. The data for the 1990–1994 survey is much more complete fewer deletions were required from this data. In addition, the data of the 1980-1989 survey appears to be less reliable in the earlier years than in the later years; there are more missing entries and relatively more deletions are required. Three reasons can be suggested for this. First, accounting and record-keeping standards are likely to have been lower at the start of the reform period, improving thereafter. Second, as the first survey was taken after 1989, by that time some firms may not have retained good records for the early years of the 1980s. Third, for the earlier years any data recorded in nominal money amounts would be more heavily influenced by the prices set under the state plan at that time. Although in theory the data deflation process (described below) adjusts the resulting price distortions, the fact that in the earlier years this deflation process needs to account for both general deflation and price distortions is likely to mean that the resultant deflated data is somewhat less accurate. Because of the lower reliability, empirical results obtained for the earlier part of the survey period should be interpreted with greater caution.

Table A5.1.2 **Data cleaning details for 1st survey nominal data**

Codes	Variable Names	Flags and Cross-References	Modified	Deleted [a]
B004	Gross Output	Growth rate (>100% or <-50%); B001 Output Prices, B002 planned Output, B003 Real Output, B019 Materials.	58 (0.8%)	182 (2.4%)
B011	Net Output	Growth rate (>100% or <-50%); B004 Output and its growth rate; All negative or zero observations deleted.	22 (0.3%)	313 (4.1%)
(B019+ B022)	Materials (plus Ancillary Materials)	B004 Output, B005 Materials; Growth rate (>100% or <-50%); Sum of B020 Materials at plan prices, B021 Materials at market prices.	244 (3.2%)	312 (4.1%)
B025, B028	Fuels, Energy	Growth rate (>100% or <-50%); Sum of B026 and B027 Fuels at plan and market prices, Sum of B029 and B030 Energy at plan and market prices; B006 Fuel & Energy; (B019+B022) Materials.	227 (3.0%)	338 (4.4%)
B129, B132	Total Fixed Assets (Capital): year beginning and year end	Growth rate (>100% or <-50%); Check B129 + B130 Yearly Increase – B131 Yearly Decrease = B132; B129 equal to B132 of previous year; Sum of categories B133 to B137 (productive, non-productive etc.); Sum of B138 Accumulated Depreciation and B143 Net Fixed Assets.	460 (6.0%) [b]	206 (2.7%)
B138	Accumulated Depreciation on B132	Growth rate (>100% or <-50%); B138 = B132 – B143 [Net Fixed Assets]; Ratio B138/B132.	381 (5.0%)	309 (4.0%)
B133, B134	Productive and Non-Productive Fixed Assets	Growth rate (>100% or <-50%) in B133; Large changes (over 10%) in ratio B133/B132; Check sum B132 = B133+B134+B135 [yet unused] + B136 [not required] + B137 [land], and delete if sum differs from B132 by more than 1%.	211 (2.7%)	274 (3.6%)
B139, B140	Accumulated Depreciation on B133 and B134	Check sum B138 = B139+B140+B141 [yet unused], do not use if sum differs from B138 by over 1%. If raw data missing etc., replace with B139 = B138*B133/(B133+B134), B140 = B138*B134/(B133+B134).	B139: 3722 (48.4%) B140: 3734 (48.6%)	348 (4.5%)
B64, B65	Total Labour Force (year ave. and year end)	Growth rate (>100% or <-50%); Flag if B64 deviates from B65 by over 20%, unless B64 lies between the B65 values of the same and the previous year.	B64: 75 (1.0%) B65: 73 (0.9%)	276 (3.6%)
B69 B70 B73 B76 B79	Total Workers Line Workers Engineers/Tech Managers Other Employees	Growth rate (>100% or <-50%) for B69, B70, B73, B76; B70 not to exceed B69; Check the sum B65 = B69+B73+B76+B79, and delete if sum differs from B65 by more than 1%.	B69: 75 (1.0%) B70: 43 (0.6%) B73: 2 B76: 7 B79: 31	2536 (33.0%) [d]

Notes: [a] Some deletion vectors relate to more than one variable. The groupings of variables and the numbers cited for modifications and deletions here each relate to a single deletion vector.
[b] The majority of these modifications are trivial, arising from a decimal rounding issue.
[c] The majority of these modifications arising from the need to replace missing original data; 42.5% of observations in the case of B139 and 43.5% for B140.
[d] The main reason for the high deletion rate here is missing original data — 23.8% in the case of B70.

Table A5.1.3 **Data cleaning details for 2nd survey nominal data**

Codes	Variable Names	Flags and Cross-References	Modified	Deleted [a]
N2	Gross Output	Growth rate (>100% or <-50%); N4 Net Output, N8 Sales Revenue, N14 Materials.	2	0
N4	Net Output	Growth rate (>100% or <-50%); N2 Output, Value Added calculated as N2-(N14+N25+N29+N33). Delete negatives.	36 (1.0%)	85 (2.3%)
N14	Materials	Growth rate (>100% or <-50%); Sum (N18 + N20) Materials Items 1 & 2.	0	5 (0.1%)
N25, N29, N33	Electricity, Coal, Petroleum Fuels	Check sum N23 [Fuel & Energy] = N25+N29+N33; Growth rate (>100% or <-50%) of N23.	1	36 (1.0%)
N102	Total Fixed Assets (Capital)	Growth rate (>100% or <-50%); Check sum N102 = N103 [Productive Fixed Assets] +N106+N107, and delete if sum differs from N102 by more than 1%.	0	40 (1.1%)
N104, N105, N106, N107	Plant & Equipment, Buildings, Housing & Welfare, Other Fixed Assets.	Check sum N102 = N104+N105+N106+N107, delete if sum differs from N102 by more than 10%.	0	59[b] (1.6%)
N108, N109, N110, N111	Total Depreciation, N104 Depreciation, N105 Depreciation, N106 Depreciation.	Check sum N108 = N109+N110+N111. Delete if sum differs from N108 by more than 10%.	0	11 (0.3%)
N37	Total Labour	Check sum N37 = N38+N39+N41+N42+N43+N44, delete if sum differs from N37 by more than 1%.	1	44 (1.2%)
N38, N39, N41, (N42~44)	Managers, Engineers/Tech, Line Workers, Non-Line Workers.	Check sum N37 = N38+N39+N41+N42+N43+N44, delete if sum differs from N37 by more than 1%. [a]	1	69 (1.8%)

Notes: [a] Despite the checking process being the same as for N37, these variables have a different deletion vector from N37. This is because observations with zero values in any of the categories cannot be used in log-form regressions featuring the sub-category data, whereas such observations can be used in regressions featuring only Total Labour.
(b) Also, five zero observations for N105 are deleted for N105 but retained for (N104+N105).

Deflation and depreciation of nominal data

As standard production theory considers inputs and outputs strictly in real terms, all monetary variables in the data set must be deflated by an appropriate price index. It is not necessary to deflate the various labour variables. The variables for Output, Net Output and Materials were all deflated using the producer price indices for industrial products as reported on page 249 of the China Statistical Yearbook (1995). This source provides specific indices for the following sectors; Textiles, Food Manufacturing, Chemicals, Building Materials and Machinery. The Machinery index was also used to deflate the Electronics and Transport Equipment sector data. The Metallurgy index was used to deflate Iron and Steel sector data. The overall producer price index was used to deflate the data for the Pharmaceuticals and 'Other Manufacturing' sectors. The debate over the possible hazards of using the same price indices to deflate both output and material inputs is discussed in the review of total factor productivity studies in Chapter 3. The procedure is accepted here for two reasons. First, here we are seeking to measure not TFP but the output elasticity of labour, which is less sensitive to the procedure. Second, no better information on material inputs is available in this data set.

These producer price indices are also used to deflate the various series for fuel and energy. The Power industry index is used for B028 Energy and N25 Electricity. The Coal and Petroleum industry indices are used for N29 Coal and N33 Petroleum Fuels in the second survey data. Since the first survey reports B025 Fuels as a single variable for first survey firms the deflator for this variable is calculated as a weighted average of the Coal and Petroleum indices. For firms appearing in both surveys, the weights were calculated from the average ratio of coal and petroleum costs for the particular firm in the five years of the second survey. For firms appearing in the first survey only, the weights are calculated from the average ratio of all firms in the second survey (0.770 * Coal + 0.230 * Petroleum).

The deflation and depreciation of the capital variables is a complex integrated procedure. For all first survey capital and depreciation variables

and for N102 Total Fixed Assets and N108 Total Depreciation in the second survey, the following weighted average of the Machinery and Building Materials producer price indices is used to deflate the original data:

$$P_K = (0.75 * P_{MACH}) + (0.25 * P_{BMAT}) \qquad \text{(A5.1.1)}$$

The Machinery index is used to deflate N104 Plant and Equipment and the Building Materials index is used to deflate N105 Buildings.

To deflate the original data, the capital series must first be broken down into vintages by taking annual differences. Each vintage, that is the quantity of new capital added in each year, is then deflated by the price index corresponding to that year. This approach is taken even when the data shows that the annual increment to the gross capital stock is negative. The vintages up to and including each respective year are then summed to calculate real gross capital for that year. All of the capital stock in 1980 is treated as 1980 vintage capital. Since essentially fixed prices prevailed in China prior to this time, it is not necessary to break the 1980 data down into vintages. Accumulated depreciation is broken down into vintages by a different method. It is assumed that depreciation represents the wearing-out of capital and that the oldest capital wears out first. Therefore, all recorded depreciation is assumed to represent the wearing-out of 1980 capital up until the point where the figure for 1980 vintage depreciation equals 1980 vintage capital. Subsequent depreciation is then taken to represent 1981 capital until the accumulated depreciation equals 1980 vintage plus 1981 vintage capital, and so on. Each yearly vintage figure is then deflated by the same index as for capital, and the vintages are summed to calculate real accumulated depreciation for each year. Real accumulated depreciation is then subtracted from real gross capital to derive real net capital. This final variable is the one used in econometric estimation.

For second-survey firms, 1989 real and nominal capital data is compiled from the first survey data to aid in calculating vintages. For N102 Total Fixed Assets this is relatively straightforward. For N104 Plant and Equipment and N105 Buildings, the 1989 value of B133 Productive Fixed Assets is imported and multiplied by the average ratios of N104 and N105

in 1990 to 1994 to estimate the 1989 values of the respective series. This procedure cannot be used for firms that appear only in the first survey. For such firms I employ qualitative survey information on the vintage breakdown of total capital in 1994 and the starting year of the firm. However, this data is very incomplete. Of the 71 firms concerned, 40 are deleted due to missing or inconsistent data. Also, this data only indicates the proportion of capital acquired during each decade, so the vintages 1980 to 1989 must be allocated uniformly as a best estimate. In consideration of these limitations, this procedure is only used for N102 Total Fixed Assets; for N104 and N105 all firms appearing only in the second survey are deleted.

For the capital variables, the process of deflating and depreciating the nominal data yields some negative values for the real net data, which also need to be deleted. The numbers of observations thus deleted are detailed in Table A5.4.

Table A5.1.4 **Deletions arising from deflation and depreciation**

Codes	Variable Names	Modified [a]	Deleted [b]
B132	Total Fixed Assets (year end)	0	323 (4.2%)
B133	Productive Fixed Assets	0	432 (5.6%)
B134	Non-Productive Fixed Assets	0	585 (7.6%)
N102	Total Fixed Assets (year end)	0	342 [c] (9.1%)
N104	Productive Fixed Assets - Plant & Equipment	0	508 (13.5%)
N105	Productive Fixed Assets - Buildings	0	492 (13.1%)
N106	Housing & Welfare Fixed Assets	0	556 (14.8%)

Notes: [a] Refers only to modifications made in the deflation and depreciation processes, i.e. not including those carried out on nominal variables (capital and depreciation) as listed in Tables 5.2 and 5.3.
[b] Refers to all deletions, including those carried out on nominal variables as listed in Tables 5.2 and 5.3.
[c] Deletion rates for the real net capital variables in the second survey are higher than the deletion rates for the nominal variables because (1) 1989 capital and depreciation data is required as an input to the calculations, (2) some observations turn negative once depreciation is subtracted, and (3) firms that appear only in the 1990—94 survey cannot be depreciated.

Second-stage examination of data for outliers

After the creation of clean deflated data series in Excel, the data files were transferred to Stata 7.0 for further processing and econometric estimation. In

the first stage of this process, the data was examined for outliers and any remaining errors. Four previously overlooked zero observations were found during this process (in the 1980s data) and the deletion vectors adjusted accordingly. A typographical error was found in one observation of the 1980s data and corrected. The details in Tables A5.2 and A5.3 include these deletions. Histograms of all variables, both in absolute terms and normalised by total labour, were examined to detect outliers. It was found that the utilities and forestry sectors tended to exhibit large outliers for output and capital variables when normalised by labour. Consequently we exclude these sectors from the 'other manufacturing sectors' grouping and from the analysis altogether. Utilities are typified by substantial economies of scale and enduring market power. The productivity of forestry enterprises, as with the mining sector, depends on the quality of the natural resources to which they have access. For such reasons none of these sectors are appropriate to the analysis here. All other large observations were judged to be valid based upon comparison with associated data.

In the 1990s data, one observation was corrected for typographical errors in total labour and line workers. A small number of zero values were found and deleted; six for total fuel and energy, one for total capital and five for buildings (these latter five were deleted for the buildings variable itself but retained as zero for productive capital, being the sum of plant and equipment and buildings). All large outliers were examined and found to be valid, except that we will again exclude the mining and utilities sectors where numerous outliers are observed.

A5.2 Data for labour share of income calculations

Cleaning details for the various data series used to calculate the labour share of income are provided in Tables A5.5a and A5.5b.

Cash wages

In the 1980~1989 data survey, the series B062 represents the wages of casual employees. It is readily apparent that some firms included this amount in their compilation of total cash wages (B045) while other firms

did not. It would appear that the survey designers intended for casual wages to be included, however since it is quite common practice (for example, in the *Statistical Yearbook of China*) to include only 'regular' employees' wages in measures of the total wage bill, some respondents omitted casual wages from the total. This is clear upon carrying out two summation checks, one for the sum $B045 = B055 + B058 + B061 + B062$, and the other for the sum $B045 = B055 + B058 + B061$. In 7.8 per cent of cases the first summation was correct while the second was not correct (to within a 1 per cent tolerance, the same criterion being used for all summation checks discussed here). In 2.2 per cent of cases the second summation was correct but not the first, in 31.1 per cent of cases both summations were correct (because casual wages were either zero (25.6 per cent of cases) or very small), and in 58.9 per cent of cases neither summation was correct. For those 2.2 per cent entries where only the second summation was correct, the data is modified by adding B062 Casual Employee Wages to B045 Total Cash Wages. For all other entries the Total Cash Wages data is left intact. Since more respondents unambiguously included Casual Wages than unambiguously omitted them, I assume that this is the more common practice for those entries where either neither or both test summations were found to be correct.

Table A5.1.5a **Data for labour share of income calculations – 1st survey**

Codes	Variable Names	Flags and Cross-References	Modified	Deleted
B045 (+B062)	Total (Cash) Wages (plus Casual Employee Wages if required)	Check sum of payment types (B46, B47, B50~B54) Check sum of employee types (B55, B58, B61, B62) Accept if either sum is correct to within 1% tolerance. Also check sum (B55, B58, B61), add B062 if required (see text).	64 (0.8%)	165 (2.1%)
B261 + B063	Payments to Employee Welfare Fund plus Payments to Retirees	Check sum retained profits B259 = (B260~B264) Large changes (+500% or –70%) Blank entries Modify some B063 to correct unit-of-measure errors	62 (0.8%) [11xB261; 51xB063]	1394 (18.1%)
B134 B140	Nonproductive capital Nonproductive depreciation	Calculate flow of services as (interest rate*B134 + (increase in B140 from previous year)) [(a)] All 1980 observations are lost. Series are not deflated. Use deletion vectors from Table 5.2.	As per Table 5.2	1190 [(b)] (15.5%)
B04 B019 B022 B025 B028	Gross output Materials Ancillary materials Fuels Energy	Calculate Value Added as B04 – (B019+B022+B025+B028) Series are not deflated. Use Table 5.2 deletion vectors.	As per Table 5.2	471 (6.1%)

Notes: [(a)] Interest rates are detailed in Table A5.6.
[(b)] Sum of all deletions due to series B134, B140, and lagged B140.

Table A5.1.5b **Data for labour share of income calculations – 2nd survey**

Codes	Variable Names	Flags and Cross-References	Modified	Deleted
N060	Total (Cash) Wages	Check sum of payment types (N061, N062, N063), delete if sum differs by more than 1%.	7 (0.2%)	0 (0.0%)
N64 N65 N66 N72 N74	Welfare Payments: Sum of -Medical Expenditure -Upward Medical Payments -Collective Welfare Expend. -Firm Payments to Retirees -Payments to Retiree Funds	Large fluctuations in Welfare Payments/Total Cash Wages Check sum N72 + N73 Fund Payments = N71 Total Payments to Retirees	12 (0.3%)	5 (0.1%)
N106 N111	Housing & welfare capital Housing & welfare depreciation	Calculate flow of services as ((interest rate*N106) + N111) [(a)] Series are not deflated. Use deletion vectors from Table 5.3.	As per Table 5.3	70 (1.9%)
N2 N14 N25 N29 N33	Gross output Materials Electricity Coal Petrol	Calculate Value Added as (N2 –(N14+N25+N29+N33)) Series are not deflated. Use Table 5.3 deletion vectors.	As per Table 5.3	49 (1.3%)

Welfare payments

The two components of Cash Welfare Payments for the 1980~1989 survey are B261 Payments into Employee Welfare Fund and B063 Payments to Retirees. B261 is one of four accounting items that, in principle, should sum to B259 Retained Profits, the other items being Payments into Investment Fund, Bonus Payments and Emergency Reserves. It appears that this financial rule is not very strictly adhered to; it is satisfied by only 60.0 per cent of observations. Therefore I do not automatically delete those observations that violate the summation. The summation test is nonetheless useful for identifying a number of apparent clerical errors, and for determining whether blank entries for B261 could be accepted with zero value.

Some firms included retiree payments in series B063, while others included them in series B261, leaving B063 blank. A check revealed that the mean ratio of (B261 + B063) to total cash wages is around 11 per cent regardless

of which approach is used to account for retiree payments. As some responding firms used yuan as the unit of measure for question B063 while others used 10,000 yuan, the data was checked and modified accordingly.

Welfare facilities

The value of the flow of services from welfare facilities ('non-productive capital' or 'housing and welfare capital') is calculated as follows:

$$WK_n = (K_n * i) + d \qquad \text{(A5.2.1)}$$

where K_n denotes nominal gross non-productive (or housing and welfare) capital, d denotes nominal yearly depreciation, and i is an interest rate. The capital and depreciation values are as supplied by the firms in the original database, except that for the 1980~89 data survey yearly depreciation must be calculated by differencing the accumulated depreciation.

Two alternative approaches are taken with respect to the interest rate. The first approach is to use an average of state bank loan rates actually prevailing on a year-to-year basis. Table A5.6 shows the basis of the calculation. Published data on state loan rates comprise an upper and lower bound. I calculate the product mean as follows:

$$PM = \sqrt{Upper * Lower} \qquad \text{(A5.2.2)}$$

I use the fixed capital loan rates for each year with the exception of 1990, when due to the unusually low lower bound, the working capital loan rate bounds are used instead.

The second approach is to use a constant interest rate for the whole period. For this rate we use the product mean of all the yearly rates, which is 7.71 per cent.

Table A5.1.6 **Interest rates for calculation of flow of services from welfare facilities**

	Ind. Working Capital Loan Rate		Fixed Capital Loan Rate		Product Mean
	Lower	Upper	Lower	Upper	
1980	5.04	5.04	2.16	4.32	**3.05**
1981	5.04	5.52	2.16	4.32	**3.05**
1982	3.60	7.20	4.32	5.76	**4.99**
1983	3.60	7.20	7.20	7.92	**7.55**
1984	3.60	7.20	7.20	7.92	**7.55**
1985	3.60	7.92	7.92	10.80	**9.25**
1986	7.92	7.92	7.92	10.80	**9.25**
1987	7.92	7.92	7.92	10.80	**9.25**
1988	9.00	9.00	7.92	10.80	**9.25**
1989	9.00	9.00	7.92	10.80	**9.25**
1990	7.92	11.34	3.60	12.00	**9.48** *
1991	8.64	9.36	8.46	11.16	**9.72**
1992	8.10	8.64	8.46	9.72	**9.07**
1993	8.10	10.98	8.46	14.04	**10.90**
1994	9.00	10.98	10.98	14.04	**12.42**

Notes: * The rate used in this analysis is the product mean of the upper and lower Fixed Capital Loan Rates, except for the year 1990 where the product mean is calculated from the Industrial Working Capital Loan Rates, due to the unusually low lower bound for the Fixed Capital Rate in that year.

Source: State Statistical Bureau (1995) *Almanac of China's Finance and Banking*, p. 509.

Appendix 5.2

Miscellaneous results tables and charts

This appendix presents various tables and charts that are referred to in the main text of Chapter 5. The contents are as follows:

Table A5.2.1 **Summary statistics: 1980–1989 survey data**

	1980		1981		1982		1983		1984	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Real Variables:										
Gross output	1793.28	5024.14	1807.84	5025.32	1961.95	5570.35	2260.03	7480.04	2510.43	7684.81
Net output	536.85	1639.55	618.83	2545.50	652.48	2742.58	730.85	3143.92	825.76	3224.99
Adjusted net output	--	--	708.14	3041.74	740.70	3180.09	821.57	3604.84	900.94	3533.62
Value added	617.11	1601.56	683.74	2406.49	756.88	2791.11	818.25	2642.81	909.43	2585.69
Materials, fuel & energy	1109.46	2782.15	1152.43	2943.48	1256.93	3162.61	1475.45	5614.04	1632.83	6174.04
Total capital	--	--	1369.91	5919.56	1459.30	6302.35	1591.91	7464.89	1750.37	8903.37
Productive capital	--	--	1099.58	4806.20	1012.16	3374.62	1258.67	6020.63	1391.33	7339.17
Non-productive capital	--	--	183.30	918.17	174.52	550.20	234.06	1158.23	262.53	1313.91
Labour Variables:										
Total labour	1587.64	4532.70	1682.83	4891.65	1737.16	4984.74	1758.32	5055.29	1779.39	5121.86
Productive labour	1119.38	2479.86	1164.53	2571.25	1211.08	2663.60	1212.12	2611.05	1207.21	2527.17
Non-productive labour	669.23	3085.37	696.18	3383.92	715.40	3376.89	724.77	3484.62	743.83	3654.10
Nominal Variables:										
Cash wages	100.10	131.47	104.08	130.26	110.36	135.99	113.46	137.63	113.46	137.63
Welfare payments	23.30	85.04	26.59	96.88	31.38	115.14	36.63	134.83	36.63	134.83
Welfare facilities A	--	--	21.71	78.08	27.35	78.88	35.83	124.91	35.83	124.91
Welfare facilities B	--	--	33.51	111.51	35.17	101.41	36.36	126.77	36.36	126.77
Net output	536.85	1639.55	615.33	2529.49	644.71	2716.75	718.58	3112.41	718.58	3112.41
Adjusted net output	--	--	704.41	3026.11	732.58	3154.96	808.79	3574.78	808.79	3574.78
Value added	667.76	1747.06	753.86	2952.91	819.83	3291.05	883.70	3235.55	883.70	3235.55

Notes: SD denotes standard deviation.
All variables listed here are in year average terms. 1980 capital observations are lost in the averaging process. Benefits from welfare facilities and adjusted net output cannot be generated for 1980 since these would require 1979 accumulated depreciation data.
Units of measure are RMB 10,000 for monetary variables, persons for labour variables.
Real variables are deflated to 1980 values.

Table A5.2.1 continued **Summary statistics: 1980–1989 survey data**

	1985		1986		1987		1988		1989	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Real Variables:										
Gross output	2713.07	7829.11	2880.79	8440.90	3202.02	9420.60	3478.90	9305.04	3402.93	9056.92
Net output	835.89	2735.84	886.42	3046.26	993.17	3400.50	1034.74	3330.74	955.43	3281.98
Adjusted net output	943.21	3154.00	1014.59	3646.04	1152.37	4229.68	1206.13	3983.25	1145.47	4056.35
Value added	1015.14	2912.29	1094.99	3781.24	1183.61	4026.74	1262.01	3893.12	1165.63	3621.48
Materials, fuel & energy	1718.06	5435.57	1787.46	5000.15	2037.20	5842.99	2251.54	5860.97	2293.15	5845.12
Total capital	1973.44	9791.77	2109.39	10179.3	2286.41	10544.9	2471.21	11101.1	2611.39	11662.0
Productive capital	1586.47	8177.09	1676.34	8307.21	1801.45	8418.83	1931.32	8632.87	2012.18	8890.60
Non-productive capital	291.22	1422.45	327.34	1584.52	358.76	1677.32	404.92	1993.79	442.00	2376.42
Labour Variables:										
Total labour	1818.71	5235.05	1861.18	5057.25	1912.15	4978.11	1947.27	5057.78	2012.82	5383.62
Productive labour	1224.89	2635.19	1248.70	2570.42	1289.65	2487.72	1313.45	2493.49	1356.45	2660.28
Non-productive labour	755.17	3631.98	754.80	3399.43	769.02	3411.58	782.33	3491.24	793.21	3670.28
Nominal Variables:										
Cash wages	148.52	155.36	169.13	163.38	186.93	168.43	224.55	180.55	249.14	192.94
Welfare payments	55.64	194.35	70.78	251.02	85.71	272.66	114.27	346.16	142.68	492.59
Welfare facilities A	60.09	227.77	73.98	304.76	95.88	684.73	84.63	371.53	103.44	458.15
Welfare facilities B	52.92	198.03	65.76	270.68	86.32	645.95	73.31	357.04	91.03	400.92
Net output	900.74	2938.29	990.18	3368.93	1198.06	4127.14	1445.48	4758.56	1601.47	5592.92
Adjusted net output	1009.07	3362.94	1119.72	3966.72	1359.74	4962.78	1623.68	5429.82	1803.24	6391.80
Value added	1181.49	3890.96	1323.50	4904.40	1561.34	5710.26	1957.83	6586.81	2228.14	7665.82

Notes: SD denotes standard deviation.
All variables listed here are in year average terms. 1980 capital observations are lost in the averaging process.
Units of measure are RMB 10,000 for monetary variables, persons for labour variables.
Real variables are deflated to 1980 values.

Table A5.2.2 **Summary statistics: 1990–1994 survey data**

	1990		1991		1992		1993		1994	
	Mean		Mean		Mean		Mean		Mean	
Real Variables:										
Gross output	3277.72	8710.31	3381.91	9084.52	3760.63	10279.3	3836.58	12000.0	3941.14	17284.5
Net output	891.50	2964.14	875.10	2856.13	978.11	3212.44	967.03	3550.15	904.31	4244.23
Adjusted net output	1128.93	3751.58	1150.23	3920.58	1285.88	4257.16	1461.35	6869.85	1399.20	7019.44
Value added	1480.88	3937.69	1343.12	4104.89	1472.39	4662.11	1551.00	5672.09	1618.60	8361.71
Materials, fuel & energy	1789.71	5025.63	2022.61	5271.24	2278.55	5915.92	2270.98	6630.20	2313.74	9188.09
Total capital	--	--	2467.17	10255.2	2519.48	10382.2	2632.67	10739.5	2685.48	11171.2
Productive capital	2181.27	8336.85	2382.85	8575.66	2423.14	8663.59	2499.18	9038.80	2580.48	9479.51
Housing & welfare	--	--	278.89	1766.44	289.07	1858.44	304.17	2041.19	331.09	2323.49
Labour Variables:										
Total labour	--	--	1830.84	3286.50	1848.05	3310.08	1856.30	3321.69	1877.41	3359.10
Productive labour	1482.49	2476.78	1488.74	2603.83	1500.31	2613.38	1501.20	2607.76	1512.07	2622.09
Non-productive labour	--	--	350.61	859.84	356.41	858.68	363.75	890.68	374.18	967.49
Nominal Variables:										
Cash wages	443.48	869.41	487.04	952.27	560.95	1083.85	661.51	1253.89	807.47	1742.32
Welfare payments	141.03	276.47	160.24	313.30	186.23	359.84	224.91	426.32	237.39	512.24
Welfare facilities A	60.40	350.30	67.45	396.73	70.87	410.10	97.17	621.19	124.89	817.37
Welfare facilities B	52.07	300.02	56.92	332.07	63.13	363.37	75.23	475.06	87.04	558.25
Net output	1636.85	5439.52	1674.46	5436.48	1970.19	6359.87	2322.53	8182.27	2508.20	10716.6
Adjusted net output	1805.40	5973.28	1913.29	6353.66	2250.59	7249.66	2845.79	11356.7	3122.39	14390.3
Value added	2751.35	7402.65	2570.86	7802.93	2919.63	9063.47	3562.36	12088.4	4196.62	19319.0

Notes: SD denotes standard deviation.
All variables listed here are in year average terms. Some 1990 observations are lost in the averaging process. Productive capital and productive labour figures for 1990 are as generated for the pooled period (1980–94) regression analysis.
Units of measure are RMB 10,000 for monetary variables, persons for labour variables.
Real variables are deflated to 1980 values.

Table A5.2.3a **Breusch-Pagan Lagrange multiplier and Hausman Tests: 1980–89**

	Breusch-Pagan LM		Hausman	
	Chi^2	Prob >Chi^2	Chi^2	Prob >Chi^2
Cobb-Douglas, value-added, total inputs	6429.63	0.0000	78.94	0.0000
Cobb-Douglas, value-added, productive inputs	4709.52	0.0000	24.27	0.0000
Cobb-Douglas, net output, total inputs	7865.03	0.0000	158.13	0.0000
Cobb-Douglas, net output productive inputs	5555.47	0.0000	34.36	0.0000
Translog, value-added, total inputs	6422.11	0.0000	78.04	0.0000
Translog, value-added, productive inputs	4583.35	0.0000	27.07	0.0001
Translog, net output, total inputs	7871.48	0.0000	137.20	0.0000
Translog, net output, productive inputs	5519.17	0.0000	34.90	0.0000

Note: All input and output variables used in the above regressions are in year-average terms.

Table A5.2.3b **Breusch-Pagan Lagrange Multiplier and Hausman tests: 1990–94**

	Breusch-Pagan LM		Hausman	
	Chi^2	Prob >Chi^2	Chi^2	Prob >Chi^2
Cobb-Douglas, value-added, total inputs	2241.87	0.0000	6.73	0.0346
Cobb-Douglas, value-added, productive inputs	2088.80	0.0000	5.49	0.0642
Cobb-Douglas, net output, total inputs	2096.03	0.0000	16.01	0.0003
Cobb-Douglas, net output, productive inputs	2018.48	0.0000	22.11	0.0000
Translog, value-added, total inputs	2242.89	0.0000	13.37	0.0201
Translog, value-added, productive inputs	2073.94	0.0000	13.18	0.0218
Translog, net output, total inputs	2085.48	0.0000	24.48	0.0002
Translog, net output, productive inputs	1998.44	0.0000	33.21	0.0000

Note: All input and output variables used in the above regressions are in year-average terms.

Table A5.2.4 **Specification test results: 1980–1989 survey**

Specification	Adj R^2	RSS	F Statistic (Crit. value)	D.F.	F test result
Translog: total data	0.8023	1664.123	1.533 (2.60)	3, 5047	Not reject C-D
Translog: prod. data	0.8088	1051.52	0.312 (2.60)	3, 3467	Not reject C-D
CES: total data	0.8022	1665.631	0.023 (3.84)	1, 5049	Not reject C-D
CES: prod. data	0.8089	1051.665	0.459 (3.84)	1, 3469	Not reject C-D
Cobb-Douglas: total data	0.8022	1665.639			(baseline)
Cobb-Douglas: prod. data	0.8089	1051.804			(baseline)
Translog: total data, 1983-87	0.8592	546.892	0.496 (2.60)	3, 2553	Not reject C-D
Translog: prod. data, 1983-87	0.8611	354.078	0.082 (3.84)	3, 1747	Not reject C-D
CES: total data, 1983-87	0.8593	546.864	1.625 (2.60)	1, 2555	Not reject C-D
CES: prod. data, 1983-87	0.8612	354.093	0.171 (3.84)	1, 1749	Not reject C-D
Cobb-Douglas: total data, 1983-87	0.8593	547.211			(baseline)
Cobb-Douglas: prod. data, 1983-87	0.8613	354.128			(baseline)

Notes: [1] All the above results are derived using year-average data.
[2] For an explanation of the format of the F tests, see page 153 and the endnote thereto.

Table A5.2.5a **Specification tests with non-productive input data: 1981–1989**

Variables in Specification	Adj R^2	RSS	F Statistic (95% Crit. Val.)	D.F.	F test result
L_p, L_n, K_p, K_n	0.8100	991.142	21.794 (3.00)	2, 3319	Reject C-D
L_p, K_p, K_n	0.8093	994.939	30.764 (3.84)	1, 3320	Reject C-D
L_p, L_n, K_p	0.8083	999.867	14.248 (3.84)	1, 3320	Reject C-D
$L_p, K_p, (K_p * K_n)$	0.8094	994.494	32.260 (3.84)	1, 3320	Reject C-D
$L_p, K_p, (L_p * K_n)$	0.8093	994.713	31.526 (3.84)	1, 3320	Reject C-D
$L_p, K_p, (L_p * L_n)$, $(K_p * K_n)$	0.8100	990.751	22.457 (3.00)	2, 3319	Reject C-D

Notes: (1) The above specifications are tested against the Cobb-Douglas form with productive inputs.
(2) All regressions here employ data for the full period 1981 to 1989, in year-average terms. 1980 observations are lost due to the averaging process for capital.
(3) All six regressions and the Cobb-Douglas baseline were run on the same sample; observations requiring deletions for non-productive capital or labour were also deleted in those specifications that do not include these variables.
(4) Subscript *p* denotes the productive form of the input, *n* the non-productive form and * the multiplicative function.
(5) F test critical values for $N\text{-}k > 100$ are [at 95%] J=1: 3.84, J=2: 3.00; [at 99%] J=1: 6.63, J=2: 4.61.

Table A5.2.5b **Specification Tests with non-productive input data: 1983–1987**

Variables in Specification	Adj R^2	RSS	F Statistic (95% Crit. Val.)	D.F.	F test result
L_p, L_n, K_p, K_n	0.8622	330.479	5.969 (3.00)	2, 1670	Reject C-D
L_p, K_p, K_n	0.8621	330.858	10.017 (3.84)	1, 1671	Reject C-D
L_p, L_n, K_p	0.8615	332.451	1.963 (3.84)	1, 1671	Not reject C-D
$L_p, K_p, (K_p * K_n)$	0.8621	330.828	10.168 (3.84)	1, 1671	Reject C-D
$L_p, K_p, (L_p * K_n)$	0.8927	330.825	10.181 (3.84)	1, 1671	Reject C-D
$L_p, K_p, (L_p * L_n)$, $(K_p * K_n)$	0.8622	330.496	5.924 (3.00)	2, 1670	Reject C-D

Notes: (1) The above specifications are tested against the Cobb-Douglas form with productive inputs.
(2) All regressions summarised in this table employ data for the years 1983 to 1987 only, in year-average terms.
(3) All six regressions and the Cobb-Douglas baseline were run on the same sample; observations requiring deletions for non-productive capital or labour were also deleted in those specifications that do not include these variables.
(4) Subscript *p* denotes the productive form of the input, *n* the non-productive form and * the multiplicative function.
(5) F test critical values for $N\text{-}k > 100$ are [at 95%] J=1: 3.84, J=2: 3.00; [at 99%] J=1: 6.63, J=2: 4.61.

Table A5.2.6a **Granger causality tests with non-productive capital: 1981–1989**

	Log TFP as Dependent Variable		Log Non-Productive Capital	
Explanatory Variable	**Coefficient**	**T Statistic**	**Coefficient**	**T Statistic**
Log Non-Productive Capital (lagged 1 year)	0.003	**0.22**	0.720	28.09***
Log TFP (lagged 1 year)	0.304	10.67***	0.024	**2.18****
Constant	-1.696	-17.55***	1.422	11.75***
Adjusted R^2	0.7309		0.9496	
Number of Observations	3264		3334	

Note: (1) T-statistics are marked with * if significant at 90% level; with ** at 95% level; and with *** at 99% level.
(2) Estimations summarised in this table employ data for years 1981 to 1989, in year-average terms.
(3) TFP calculated using coefficients from full-period regression; $\ln(V) - 0.89913*\ln(L_p) - 0.40682*\ln(K_p)$.
(4) Equivalent fixed-effects estimation technique employed (OLS with firm dummies).

Table A5.2.6b **Granger causality tests with non-productive capital: 1983–1987**

	Log TFP as Dependent Variable		Log Non-Productive Capital	
Explanatory Variable	**Coefficient**	**T Statistic**	**Coefficient**	**T Statistic**
Log Non-Productive Capital (lagged 1 year)	-0.0656	**-2.68!!!**	0.598	13.06***
Log TFP (lagged 1 year)	0.175	3.90***	0.0616	**3.43*** **
Constant	0.677	5.84***	1.857	9.33***
Adjusted R^2	0.7526		0.9461	
Number of Observations	2034		2083	

Note: (1) T-statistics are marked with * if significant at 90% level; with ** at 95% level; and with *** at 99% level. Non-productive capital in the TFP regression is significant at 99% but with negative sign and is marked with !!!.
(2) Estimations summarised in this table employ data only for years 1983 to 1987, in year-average terms.
(3) TFP calculated using coefficients from 1983-1987 regression; $ln\ (V) - 0.59224 * ln\ (L_p) - 0.38223 * ln\ (K_p)$.
(4) Equivalent fixed-effects estimation technique employed (OLS with firm dummies).

Table A5.2.7 **Specification test results: 1990–1994 survey**

Specification	**Adj R^2**	**RSS**	**F Statistic (Crit. Value)**	**D.F.**	**F test result**
Translog: total input data	0.9238	233.168	6.407	3, 1848	Reject C-D
			(2.60)		
Translog: productive inputs	0.9185	224.712	1.998	3, 1725	Not reject C-D
			(2.60)		
CES: total inputs	0.9232	235.297	2.324	1, 1850	Not reject C-D
			(3.84)		
CES: productive inputs	0.9183	225.489	0.027	1, 1727	Not reject C-D
			(3.84)		
Cobb-Douglas: total inputs	0.9232	235.593	--	--	(baseline)
Cobb-Douglas: prod've inputs	0.9184	225.492	--	--	(baseline)

Note: (1) All estimations summarised here are conducted in year-average terms. Accordingly, 1990 observations are lost.
(2) Equivalent fixed-effects estimation technique employed (OLS with firm dummies).

Table A5.2.8 **Specification tests with non-productive input data: 1990–1994**

Specification	Adj R^2	RSS	F Statistic (Crit.Value)	D.F. (*j*,*N-k*)	F test result
K_p, L_p, K_h, L_n	0.9161	223.661	2.703 (3.0)	2, 1694	Not reject C-D
K_p, L_p, K_h	0.9161	223.699	5.121 (3.84)	1, 1695	Reject C-D at 95%
K_p, L_p, L_n	0.9159	224.334	0.306 (3.84)	1, 1695	Not reject C-D
K_p, L_p, (K_p*K_h)	0.9163	223.248	8.556 (3.84)	1, 1695	Reject C-D
K_p, L_p, (L_p*K_h)	0.9162	223.400	7.397 (3.84)	1, 1695	Reject C-D
K_p, L_p, (L_p*L_n), (K_p*K_h)	0.9162	223.233	4.332 (3.0)	2, 1694	Reject C-D at 95%
K_p, L_p, $(L*L_n)$, $(L*K_h)$	0.9162	223.378	3.780 (3.0)	2, 1694	Reject C-D at 95%
Cobb-Douglas: Productive data	0.9159	224.375	N/A.		(baseline)

Note: (1) The above specifications are tested against the Cobb-Douglas form with productive inputs.
(2) All estimations are conducted in year-average terms.
(3) The subscript *h* denotes housing and welfare capital, *n* denotes non-line labour, *p* denotes a productive input, and * represents the multiplicative function.
(3) F test critical values for $N-k > 100$ are [at 95%] J=1: 3.84, J=2: 3.00; [at 99%] J=1: 6.63, J=2: 4.61.

Table A5.2.9 **Granger causality tests with non-productive capital: 1990–1994**

	Log TFP as Dependent Variable		Log Non-Productive Capital	
Explanatory Variable	**Coefficient**	**T Statistic**	**Coefficient**	**T Statistic**
Log Non-Productive Capital (lagged 1 year)	-0.0043	**-0.07**	0.697	12.74***
Log TFP (lagged 1 year)	0.285	5.12***	0.058	**3.03*** **
Constant	-0.696	-2.87***	1.254	5.82***
Adjusted R^2	0.8346		0.9864	
Number of Observations	1697		1716	

Note: (1) T-statistics are marked with * if significant at 90% level; with ** at 95% level; and with *** at 99% level.
(2) TFP calculated using coefficients from the 1990-1994 regression; $ln\,(V) - 0.602 * ln\,(L_p) - 0.476 * ln\,(K_p)$. For robustness, TFP was also calculated with alternative coefficients and the test repeated, with similar results (not reported). Data is in year-average terms.
(3) Equivalent fixed-effects estimation technique employed (OLS with firm dummies), with robust standard errors. Breusch-Pagan LM and Hausman tests actually indicate the OLS model for the TFP regression and FE for the non-productive capital regression. For robustness, the test was also carried out using OLS, with similar results (not reported).

Table A5.2.10a **Test for constant returns to scale with year dummies: 1981–1994**
Fixed effects estimation, dependent variable value added

Year	$D_Y K_P$		$D_Y L_P$		Sum of β's	F test
	Coefficient	T Statistic	Coefficient	T Statistic		statistic
1981	-0.363	-6.98***	0.294	6.01***	0.828	16.9***
1982	-0.213	-4.23***	0.178	3.72***	0.862	11.2***
1983	-0.172	-3.40***	0.165	3.43***	0.890	7.2***
1984	-0.134	-2.68***	0.144	3.02***	0.907	5.1**
1985	-0.178	-3.57***	0.196	4.06***	0.914	4.4**
1986	-0.165	-3.31***	0.181	3.76***	0.913	4.6**
1987	-0.155	-3.12***	0.176	3.64***	0.918	4.2**
1988	-0.140	-2.79***	0.169	3.44***	0.926	3.5
1989	-0.171	-3.50***	0.176	3.67***	0.902	6.1**
1990	-0.173	-3.19***	0.221	4.14***	0.945	1.9
1991	-0.125	-2.60***	0.139	2.93***	0.911	5.2**
1992	-0.087	-1.83*	0.108	2.29**	0.918	4.5**
1993	-0.051	-1.09	0.062	1.36	0.909	5.6**
1994	(base year)				0.897	7.0***

	Coefficient	T Statistic
lnK_P	0.446	11.98***
lnL_P	0.451	8.56***
Constant	0.176	0.66
Adj. R^2	0.2855	
- within		
- between	0.6424	
- overall	0.5732	
No. of obsns	6725	
No. of firms	658	

Note: (1) The above estimations are carried out with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.
(2) F test critical values are [at 95%] 3.84; [at 99%] 6.63.

Table A5.2.10b **Test for constant returns to scale with year dummies: 1981–1994**
Random effects estimation, dependent variable value added

Year	$D_Y K_P$		$D_Y L_P$		Sum of β's	F test
	Coefficient	T Statistic	Coefficient	T Statistic		statistic
1981	-0.375	-7.26***	0.312	6.41***	0.893	16.71***
1982	-0.231	-4.61***	0.200	4.22***	0.926	8.26***
1983	-0.187	-3.71***	0.184	3.83***	0.954	3.25
1984	-0.147	-2.96***	0.161	3.39***	0.970	1.33
1985	-0.189	-3.79***	0.210	4.37***	0.978	0.78
1986	-0.173	-3.49***	0.192	4.01***	0.975	0.94
1987	-0.161	-3.25***	0.184	3.82***	0.979	0.68
1988	-0.143	-2.86***	0.173	3.54***	0.987	0.28
1989	-0.178	-3.66***	0.185	3.87***	0.963	2.24
1990	-0.169	-3.13***	0.218	4.10***	1.005	0.05
1991	-0.115	-2.4**	0.130	2.74***	0.971	1.43
1992	-0.080	-1.67*	0.101	2.14**	0.977	0.88
1993	-0.048	-1.03	0.059	1.30	0.968	1.76
1994	(base year)				0.956	1.26

	Coefficient	T Statistic
lnK_P	0.492	13.63***
lnL_P	0.465	10.77***
Constant	-0.248	-1.50
Adj. R^2	0.2850	
- within		
- between	0.6441	
- overall	0.5753	
No. of obsns	6725	
No. of firms	658	

Note: (1) The above estimations are carried out with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.
(2) F test critical values are [at 95%] 3.84; [at 99%] 6.63.

Table A5.2.10c **Test for constant returns to scale with year dummies: 1981–1994**
Fixed effects estimation, dependent variable adjusted net output

Year	$D_Y K_P$		$D_Y L_P$		Sum of β's	F test
	Coefficient	T Statistic	Coefficient	T Statistic		Statistic
1981	-0.248	-6.11***	0.209	5.45***	0.865	17.2***
1982	-0.152	-3.85***	0.128	3.43***	0.880	13.6***
1983	-0.135	-3.39***	0.131	3.47***	0.901	9.5***
1984	-0.194	-4.98***	0.206	5.53***	0.916	6.8***
1985	-0.143	-3.55***	0.167	4.33***	0.929	5.0**
1986	-0.151	-3.83***	0.175	4.60***	0.929	5.1**
1987	-0.148	-3.73***	0.179	4.66**	0.936	4.2**
1988	-0.109	-2.72***	0.155	3.99***	0.951	2.5
1989	-0.141	-3.60***	0.171	4.46***	0.934	4.4**
1990	-0.053	-1.26	0.067	1.63	0.919	6.9***
1991	-0.058	-1.55	0.064	1.72*	0.910	8.7***
1992	-0.056	-1.50	0.072	1.97**	0.921	6.7***
1993	0.001	0.03	0.007	0.20	0.913	8.2***
1994	(base year)				0.897	7.0***

	Coefficient	T Statistic
lnK_P	0.399	13.61***
lnL_P	0.506	12.12***
Constant	-0.044	-0.21
Adj. R^2		
- within	0.3532	
- between	0.7442	
- overall	0.6541	
No. of obsns	6549	
No. of firms	661	

Note: (1) The above estimations are carried out with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.
(2) F test critical values are [at 95%] 3.84; [at 99%] 6.63.

Table A5.2.11a **Estimation with CRS imposed and year dummies: 1981–1994**
fixed effects estimation: dependent variable value added

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.5084	13.44***
$D_{1981}.(K_P/L_P)$	-0.032	-0.70
$D_{1982}.(K_P/L_P)$	-0.039	-0.84
$D_{1983}.(K_P/L_P)$	-0.113	-2.44**
$D_{1984}.(K_P/L_P)$	-0.147	-3.16***
$D_{1985}.(K_P/L_P)$	-0.216	-4.52***
$D_{1986}.(K_P/L_P)$	-0.191	-3.98***
$D_{1987}.(K_P/L_P)$	-0.193	-3.97***
$D_{1988}.(K_P/L_P)$	-0.193	-3.88***
$D_{1989}.(K_P/L_P)$	-0.161	-3.30***
$D_{1990}.(K_P/L_P)$	-0.248	-4.54***
$D_{1991}.(K_P/L_P)$	-0.137	-2.81***
$D_{1992}.(K_P/L_P)$	-0.113	-2.33**
$D_{1993}.(K_P/L_P)$	-0.065	-1.39
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.430	-48.92***
Adj. R^2 – within	0.0834	
- between	0.1786	
- overall	0.1507	
No. of obsns	6725	
No. of firms	658	

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Table A5.2.11b **Estimation with CRS imposed and year dummies: 1981–1994**
Random effects estimation: dependent variable value added

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.5423	14.80***
$D_{1981}.(K_P/L_P)$	-0.053	-1.17
$D_{1982}.(K_P/L_P)$	-0.063	-1.38
$D_{1983}.(K_P/L_P)$	-0.135	-2.94***
$D_{1984}.(K_P/L_P)$	-0.167	-3.62***
$D_{1985}.(K_P/L_P)$	-0.234	-4.94***
$D_{1986}.(K_P/L_P)$	-0.207	-4.33***
$D_{1987}.(K_P/L_P)$	-0.205	-4.23***
$D_{1988}.(K_P/L_P)$	-0.202	-4.07***
$D_{1989}.(K_P/L_P)$	-0.174	-3.57***
$D_{1990}.(K_P/L_P)$	-0.250	-4.58***
$D_{1991}.(K_P/L_P)$	-0.132	-2.7***
$D_{1992}.(K_P/L_P)$	-0.108	-2.23**
$D_{1993}.(K_P/L_P)$	-0.064	-1.36
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.446	-16.49***
Adj. R^2 – within	0.0833	
- between	0.1800	
- overall	0.1521	
No. of obsns	6725	
No. of firms	658	

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Table A5.2.11c **Estimation with CRS imposed and year dummies: 1983–1994**

Fixed effects estimation: dependent variable value added

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.478	13.44***
$D_{1981}.(K_P/L_P)$	(dropped)	
$D_{1982}.(K_P/L_P)$	(dropped)	
$D_{1983}.(K_P/L_P)$	-0.111	-2.62***
$D_{1984}.(K_P/L_P)$	-0.145	-3.39***
$D_{1985}.(K_P/L_P)$	-0.221	-5.04***
$D_{1986}.(K_P/L_P)$	-0.195	-4.41***
$D_{1987}.(K_P/L_P)$	-0.199	-4.46***
$D_{1988}.(K_P/L_P)$	-0.207	-4.53***
$D_{1989}.(K_P/L_P)$	-0.169	-3.77***
$D_{1990}.(K_P/L_P)$	-0.271	-5.40***
$D_{1991}.(K_P/L_P)$	-0.151	-3.37***
$D_{1992}.(K_P/L_P)$	-0.126	-2.83***
$D_{1993}.(K_P/L_P)$	-0.073	-1.70*
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.410	-49.30***
Adj. R^2 – within	0.0627	
- between	0.2014	
- overall	0.1666	
No. of obsns	5920	
No. of firms	658	

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Table A5.2.11d **Estimation with CRS imposed and year dummies: 1983–1994**

Random effects estimation: dependent variable value added

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.525	15.32***
$D_{1981}.(K_P/L_P)$	(dropped)	
$D_{1982}.(K_P/L_P)$	(dropped)	
$D_{1983}.(K_P/L_P)$	-0.135	-3.19***
$D_{1984}.(K_P/L_P)$	-0.165	-3.90***
$D_{1985}.(K_P/L_P)$	-0.239	-5.47***
$D_{1986}.(K_P/L_P)$	-0.209	-4.76***
$D_{1987}.(K_P/L_P)$	-0.209	-4.69***
$D_{1988}.(K_P/L_P)$	-0.213	-4.66***
$D_{1989}.(K_P/L_P)$	-0.180	-4.02***
$D_{1990}.(K_P/L_P)$	-0.267	-5.33***
$D_{1991}.(K_P/L_P)$	-0.142	-3.17***
$D_{1992}.(K_P/L_P)$	-0.118	-2.65***
$D_{1993}.(K_P/L_P)$	-0.070	-1.62
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.426	-16.05***
Adj. R^2 – within	0.0625	
- between	0.2024	
- overall	0.1681	
No. of obsns	5920	
No. of firms	658	

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Table A5.2.11e **Estimation with CRS imposed and year dummies: 1981–1994**
Fixed effects estimation: dependent variable adjusted net output

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.428	14.68***
$D_{1981}.(K_P/L_P)$	-0.025	-0.70
$D_{1982}.(K_P/L_P)$	-0.011	-0.31
$D_{1983}.(K_P/L_P)$	-0.071	-2.02**
$D_{1984}.(K_P/L_P)$	-0.206	-5.82***
$D_{1985}.(K_P/L_P)$	-0.208	-5.65***
$D_{1986}.(K_P/L_P)$	-0.212	-5.73***
$D_{1987}.(K_P/L_P)$	-0.226	-6.02***
$D_{1988}.(K_P/L_P)$	-0.223	-5.82***
$D_{1989}.(K_P/L_P)$	-0.205	-5.38***
$D_{1990}.(K_P/L_P)$	-0.084	-2.01**
$D_{1991}.(K_P/L_P)$	-0.056	-1.50
$D_{1992}.(K_P/L_P)$	-0.092	-2.46**
$D_{1993}.(K_P/L_P)$	-0.014	-0.38
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.590	-87.45***
Adj. R^2 – within	0.1101	
- between	0.2545	
- overall	0.1967	
No. of obsns	6527	
No. of firms	661	

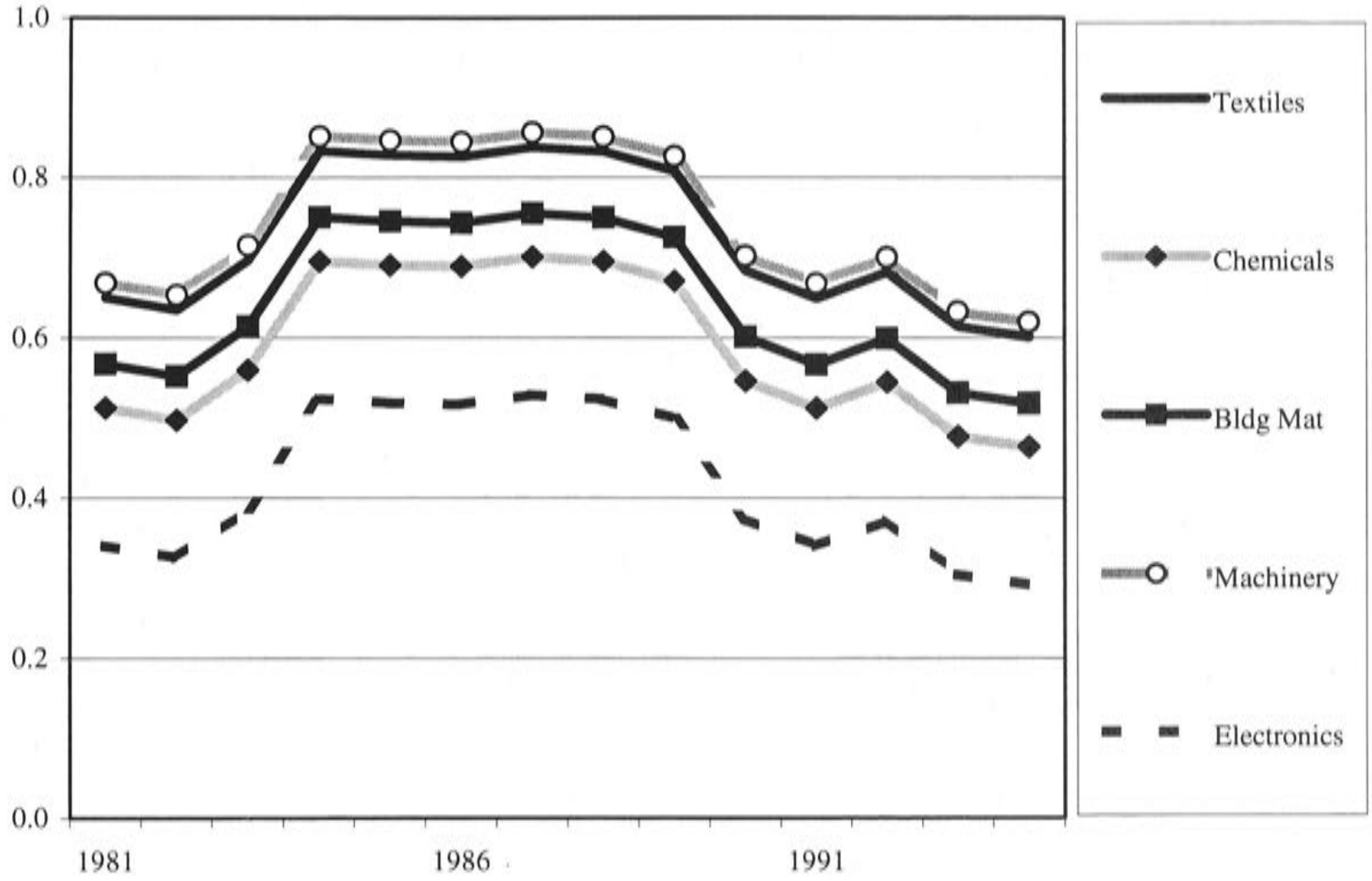
Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Table A5.2.11f **Estimation with CRS imposed and year dummies: 1981–1994**
Pooled OLS estimation: dependent variable adjd. net output

Variable	Coefficient	T Statistic
$ln(K_P/L_P)$	0.610	15.22***
$D_{1981}.(K_P/L_P)$	-0.148	-2.77***
$D_{1982}.(K_P/L_P)$	-0.139	-2.63***
$D_{1983}.(K_P/L_P)$	-0.181	-3.37***
$D_{1984}.(K_P/L_P)$	-0.293	-5.42***
$D_{1985}.(K_P/L_P)$	-0.263	-4.66***
$D_{1986}.(K_P/L_P)$	-0.243	-4.31***
$D_{1987}.(K_P/L_P)$	-0.235	-4.09***
$D_{1988}.(K_P/L_P)$	-0.212	-3.60***
$D_{1989}.(K_P/L_P)$	-0.206	-3.52***
$D_{1990}.(K_P/L_P)$	-0.043	-0.66
$D_{1991}.(K_P/L_P)$	0.000	0.00
$D_{1992}.(K_P/L_P)$	-0.042	-0.71
$D_{1993}.(K_P/L_P)$	-0.014	-0.25
$D_{1994}.(K_P/L_P)$	(base year)	
Constant	-0.552	-60.46***
Adj. R^2	0.2017	
No. of obsns	6527	
No. of firms	661	

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Figure A5.2.1 **Sectoral elasticity estimates**



Note: These elasticity estimates use Adjusted Net Output as dependent variable. Estimates are performed on the same basis as comparative results in Section 5.3; observations are deleted as required by labour income share data. Only sectors with adequate sample sizes after deletions are presented.

Table A5.2.12 **Estimation results with CRS imposed and year and sector dummies: 1981–1994**
Fixed effects estimation

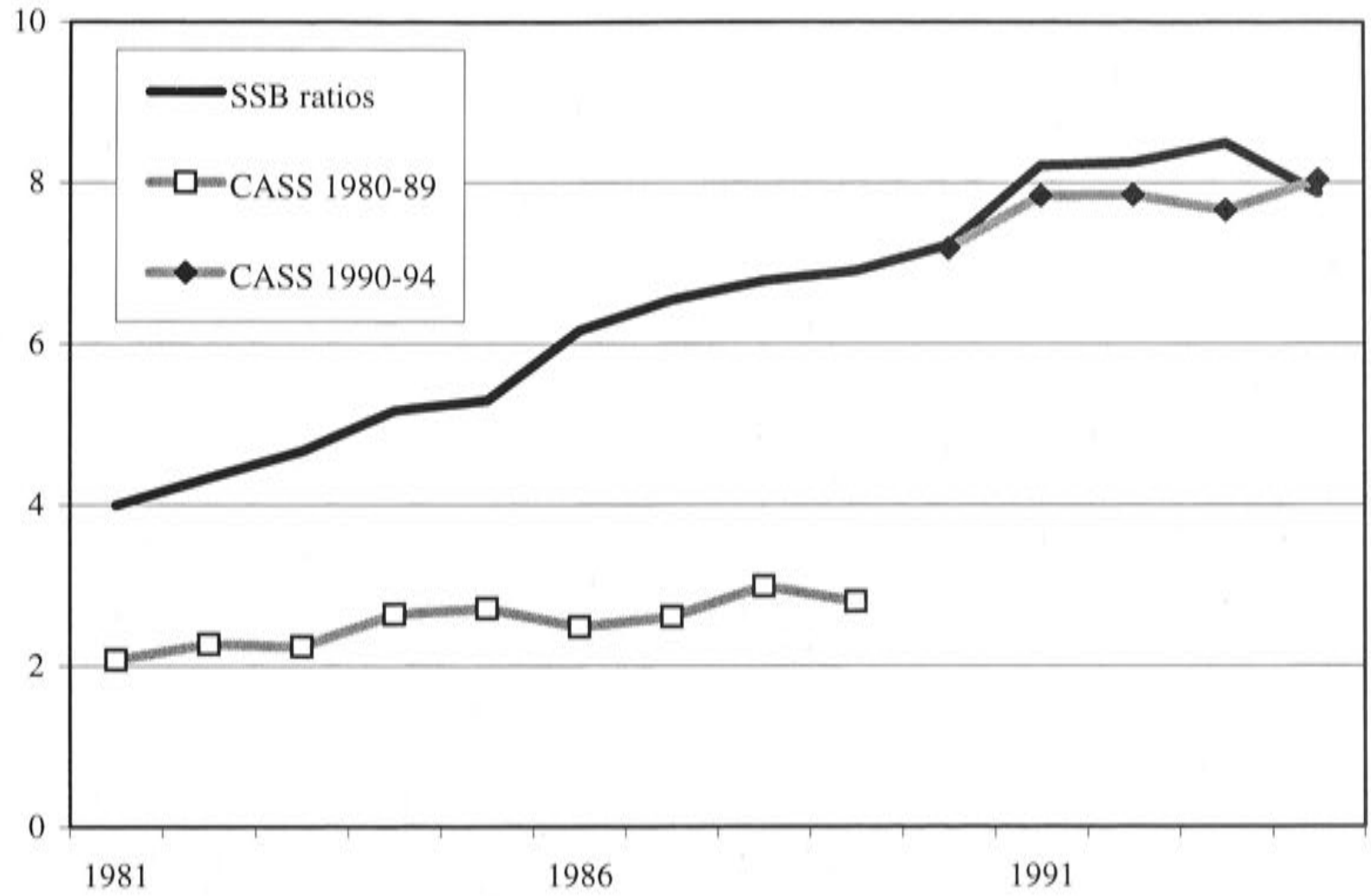
Variable	Coefficient	T Statistic	Prob>|t|
$ln(K_P/L_P)$	0.469	6.97***	0.000
$D_{1981}.(K_P/L_P)$	-0.025	-0.70	0.482
$D_{1982}.(K_P/L_P)$	-0.009	-0.24	0.807
$D_{1983}.(K_P/L_P)$	-0.074	-2.12**	0.034
$D_{1984}.(K_P/L_P)$	-0.215	-6.10***	0.000
$D_{1985}.(K_P/L_P)$	-0.212	-5.76***	0.000
$D_{1986}.(K_P/L_P)$	-0.212	-5.75***	0.000
$D_{1987}.(K_P/L_P)$	-0.227	-6.08***	0.000
$D_{1988}.(K_P/L_P)$	-0.225	-5.89***	0.000
$D_{1989}.(K_P/L_P)$	-0.200	-5.27***	0.000
$D_{1990}.(K_P/L_P)$	-0.090	-2.17**	0.030
$D_{1991}.(K_P/L_P)$	-0.062	-1.66*	0.097
$D_{1992}.(K_P/L_P)$	-0.097	-2.62***	0.009
$D_{1993}.(K_P/L_P)$	-0.017	-0.48	0.628
$D_{1994}.(K_P/L_P)$	(base year)		
Food Processing	(base sector)		
Textiles	-0.134	-1.92*	0.054
Chemicals	0.050	0.64	0.522
Pharmaceuticals	-0.082	-0.98	0.325
Bldg Materials	-0.153	-1.84*	0.066
Iron & Steel	0.239	2.38**	0.018
Machinery	-0.123	-1.77*	0.078
Transport Eqpt.	0.236	2.44*	0.015
Electronics	0.274	3.58***	0.000
Other Mfg.	-0.103	-1.49	0.137
Constant	-0.598	-86.68***	0.000
Adj. R^2 – within	0.1255		
- between	0.1871		
- overall	0.1557		
No. of obsns	6527		
No. of firms	661		

Note: The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs. 1980 observations are lost through the averaging process. Dependent variable is Adjusted Net output.

Table A5.2.13 **Cash welfare payments using alternative measures**

	SSB Ratios	Welfare Payments / Value Added		
		Using SSB Ratios	Using CASS 1980~89	Using CASS 1990~94
1981	18.9	3.99	2.08	
1982	20.5	4.34	2.27	
1983	22.7	4.66	2.24	
1984	22.7	5.17	2.64	
1985	24.0	5.29	2.71	
1986	25.3	6.16	2.48	
1987	27.0	6.54	2.61	
1988	28.2	6.78	2.99	
1989	29.3	6.90	2.80	
1990	31.8	7.22		7.18
1991	32.9	8.22		7.84
1992	33.2	8.26		7.85
1993	34.0	8.49		7.66
1994	29.4	7.87		8.03

Figure A5.2.2 **Welfare payments / income under alternative measures**



Notes: The ratios here are aggregated cash welfare payments across al l firms, divided by aggregate Adjusted Net Output. Adjusted Net Output, an alternative measure of value added, is explained below in the sub-section *Alternative Measures of Income*.

Table A5.2.14 **Deletion of outliers for mean labour share**

	No of Observations	Details
Observations already deleted	3806	
Observations between 0 and 1	5863	
Observations > 1	686	
Observations > 2	173	
Observations > 3	76	
Observations > 5	22	
Observations > 10	4	
Deletions by Sector:		
Food Processing	3	5.25 (1992), 7.98 (1983), 17.05 (1985)
Textiles	2	5.12 (1993), 7.03 (1992)
Chemicals	2	5.60 (1994), 40.85 (1982)
Bldg. Materials	2	5.24 (1990), 5.72 (1993)
Iron & Steel	2	5.50 (1981), 14.96 (1985)
Machinery	2	5.31 (1981), 5.86 (1981)
Other Mfg.	9	5.02 (1989), 5.24 (1991), 5.33 (1992), 5.40 (1993), 5.45 (1993), 6.19 (1984), 6.16 (1993), 7.88 (1993), 11.33 (1994),

Notes: Ratios used here calculated using Welfare Payments incorporating a constant interest rate. Denominator is Adjusted Net Output.

Table A5.2.15 **Cumulative deletion count for main results**

Reason for deletions	Number deleted	Cumulative Deletions	Obsns Remaining
(Full data set)	--	--	11535
Non-manufacturing firms	740 (6.4%)	740 (6.4%)	10795
Loss of 1980 obsns due to averaging	717 (6.2%)	1457 (12.6%)	10078
1990s obsns of firms appearing in 1980s survey only	440 (3.8%)	1897 (16.4%)	9638
Adjusted Net Output	525 (4.6%)	2422 (21.0%)	9113
Productive capital	266 (2.3%)	2688 (23.3%)	8847
Productive labour	2130 (18.5%)	4818 (41.8%)	6717
Cash wages	155 (1.3%)	4973 (43.1%)	6562
Welfare payments	0 (0.0%)	4973 (43.1%)	6562
Welfare facilities B	13 (0.1%)	4986 (43.2%)	6549
Firm labour share > 5	22 (0.2%)	5008 (43.4%)	6527

Figure A5.2.3a **Elasticity and labour share estimates using value added**

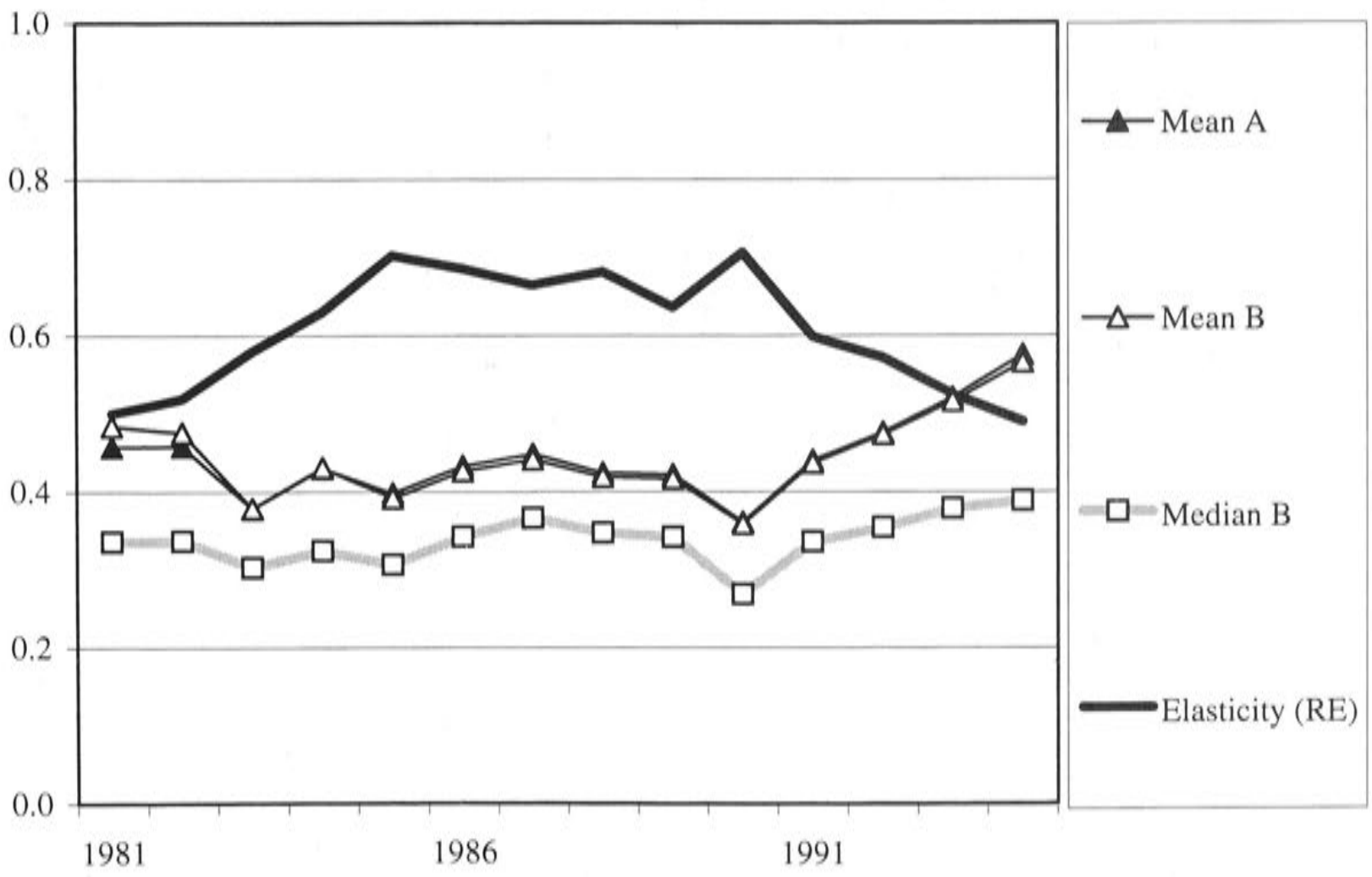


Figure A5.2.3b **Elasticity and labour share estimates using net output**

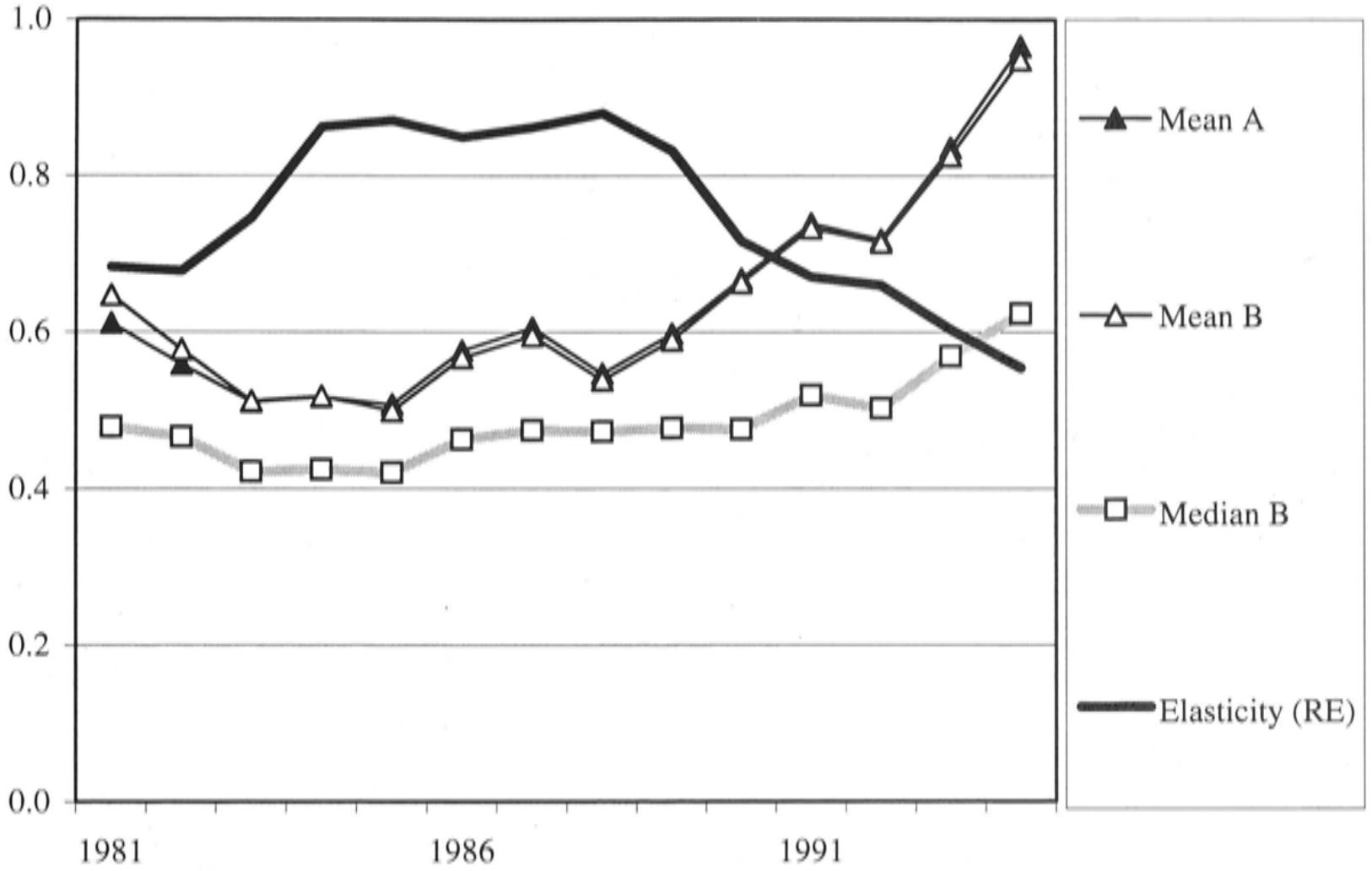


Figure A5.2.4a **Elasticity and labour share: all manufacturing Minami and Hondai (1995) share measures using adjusted net output**

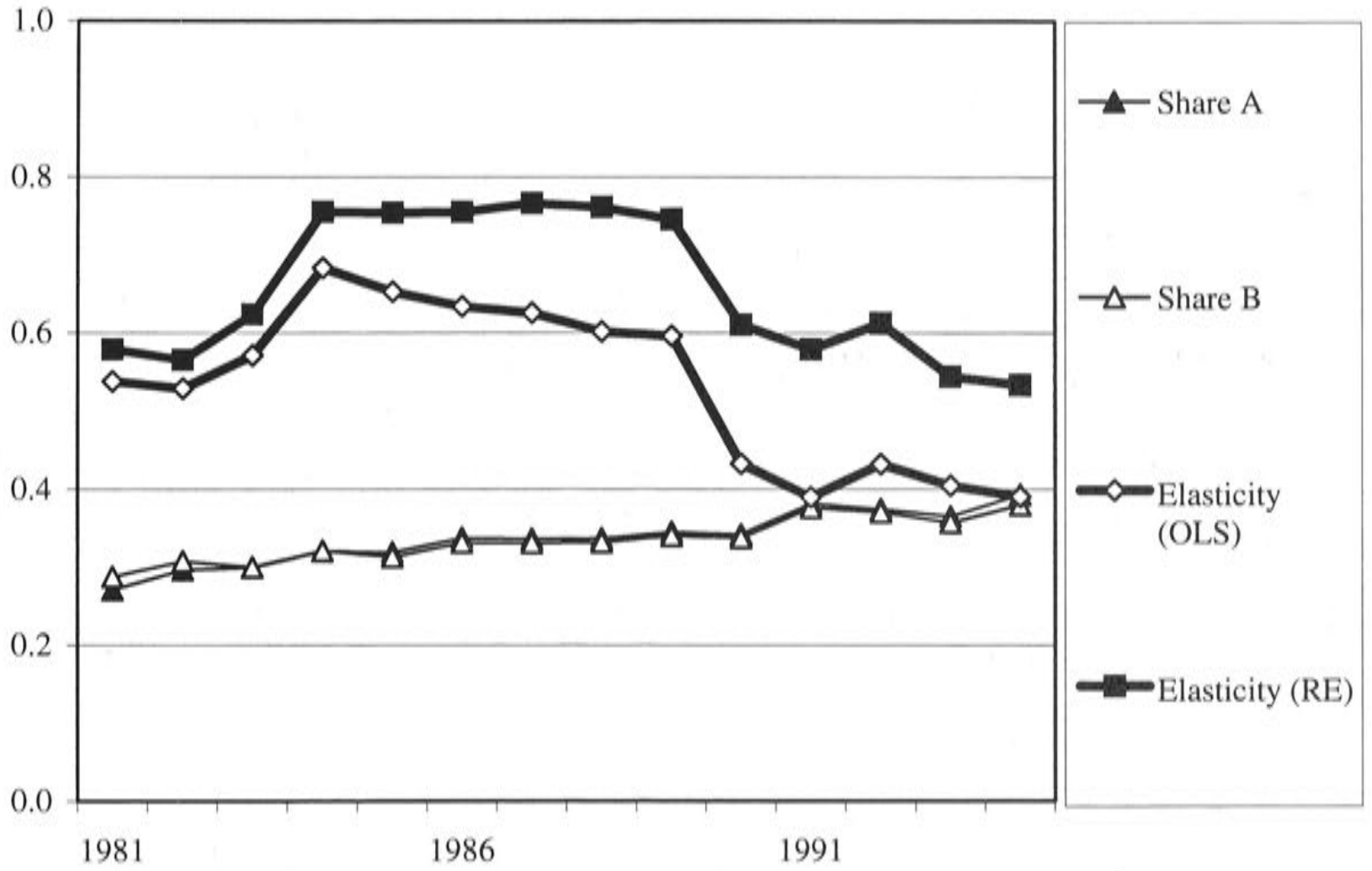


Figure A5.2.4b **Elasticity and Labour Share: Textile Sector Minami and Hondai (1995) share measures using adjusted net output**

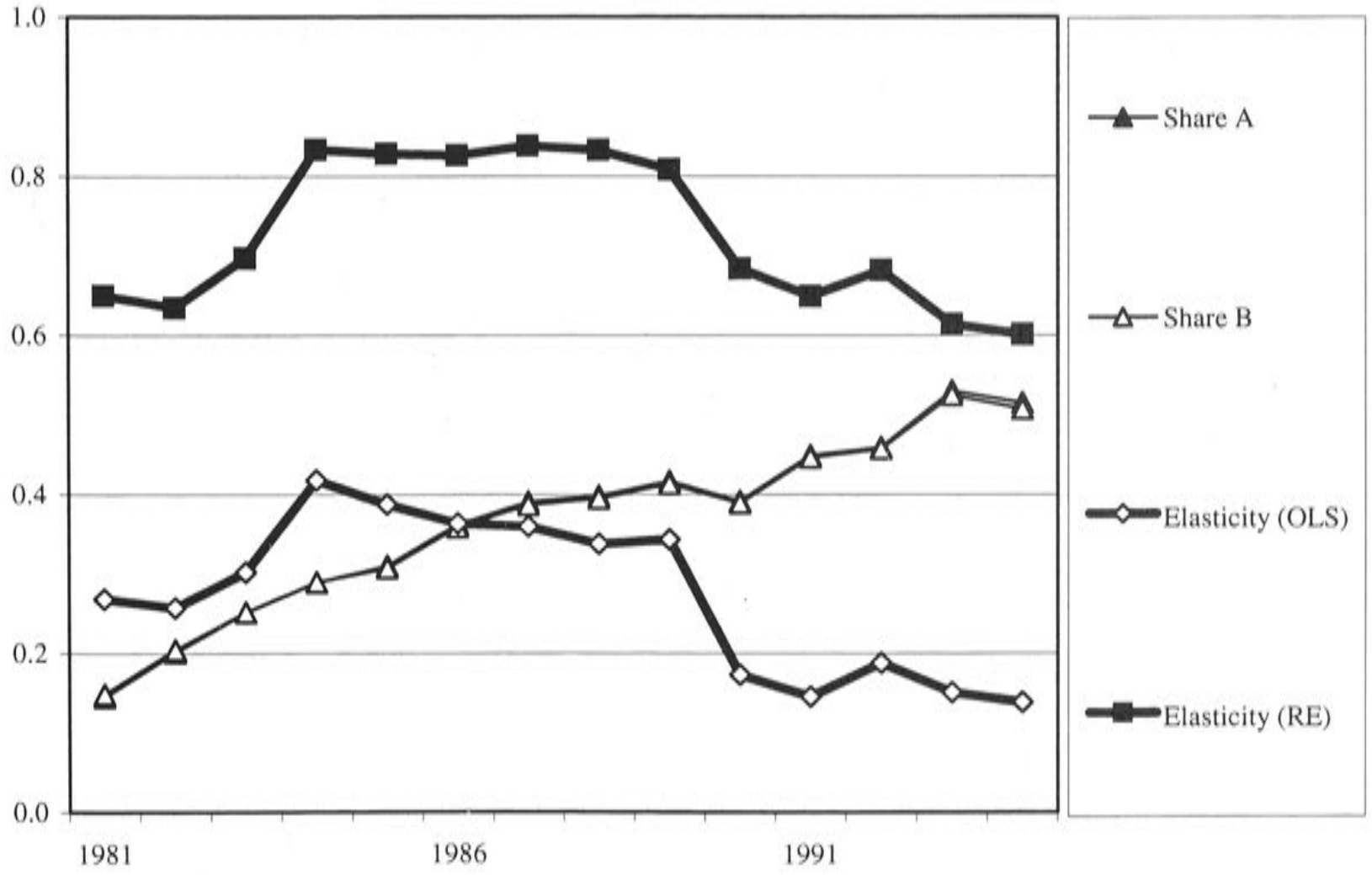


Figure A5.2.4c **Elasticity and labour share: chemical sector Minami and Hondai (1995) share measures using adjusted net output**

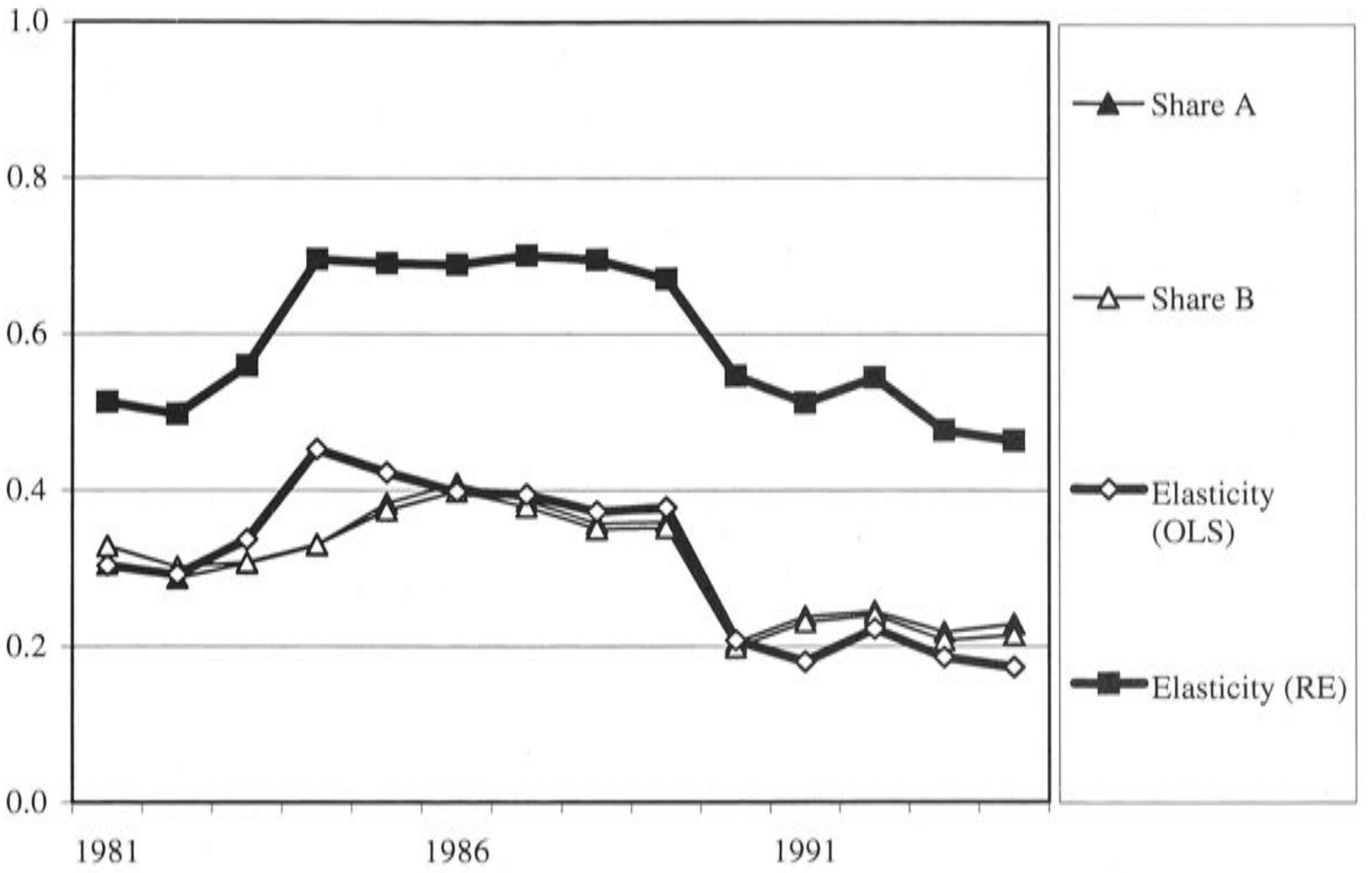


Figure A5.2.4d **Elasticity and Labour Share: Building Materials Sector Minami and Hondai (1995) Share Measures using Adjusted Net Output**

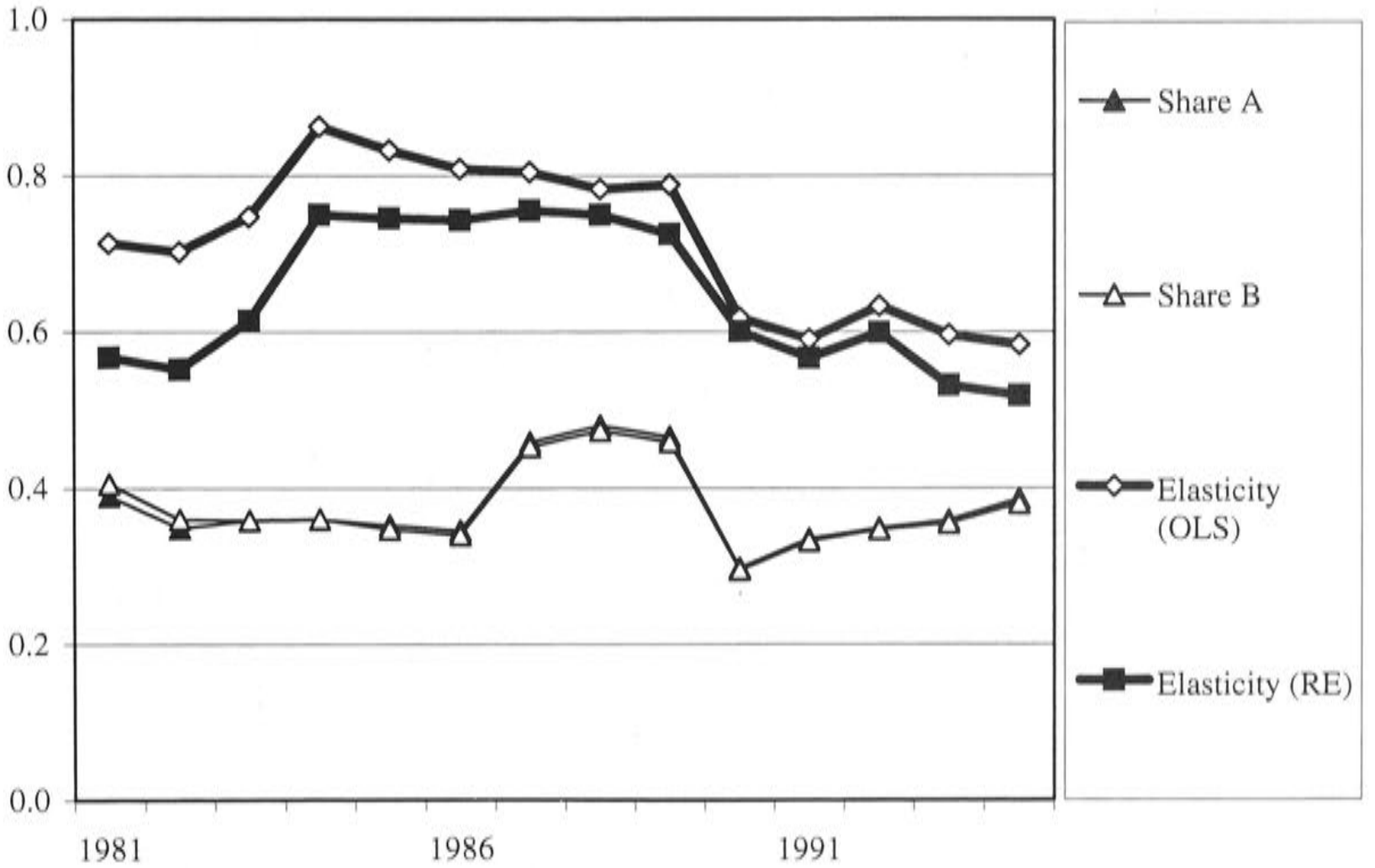


Figure A5.2.4e **Elasticity and labour share: machinery sector Minami and Hondai (1995) share measures using adjusted net output**

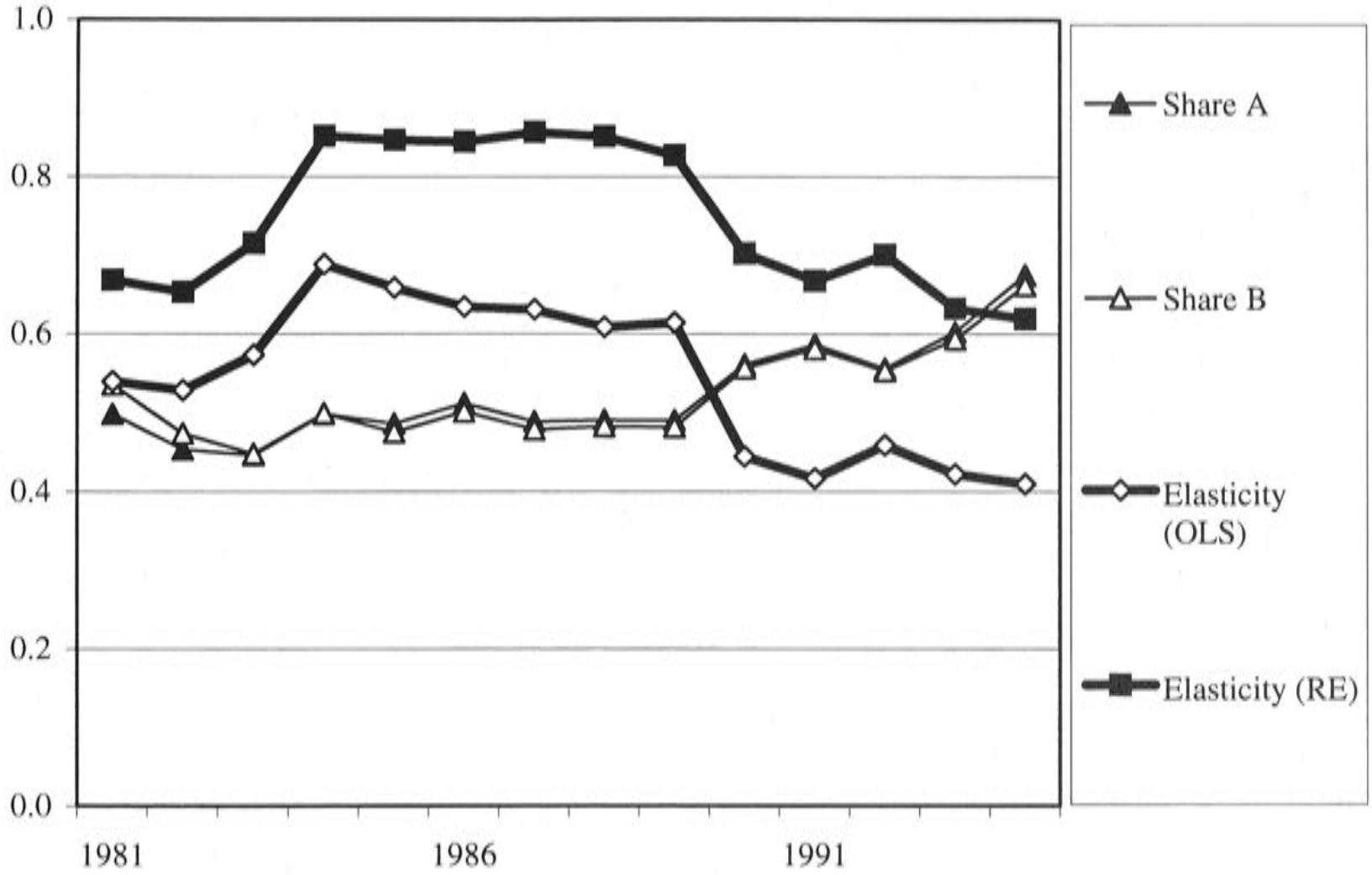


Figure A5.2.4f **Elasticity and labour share: electronics sector Minami and Hondai (1995) share measures using adjusted net output**

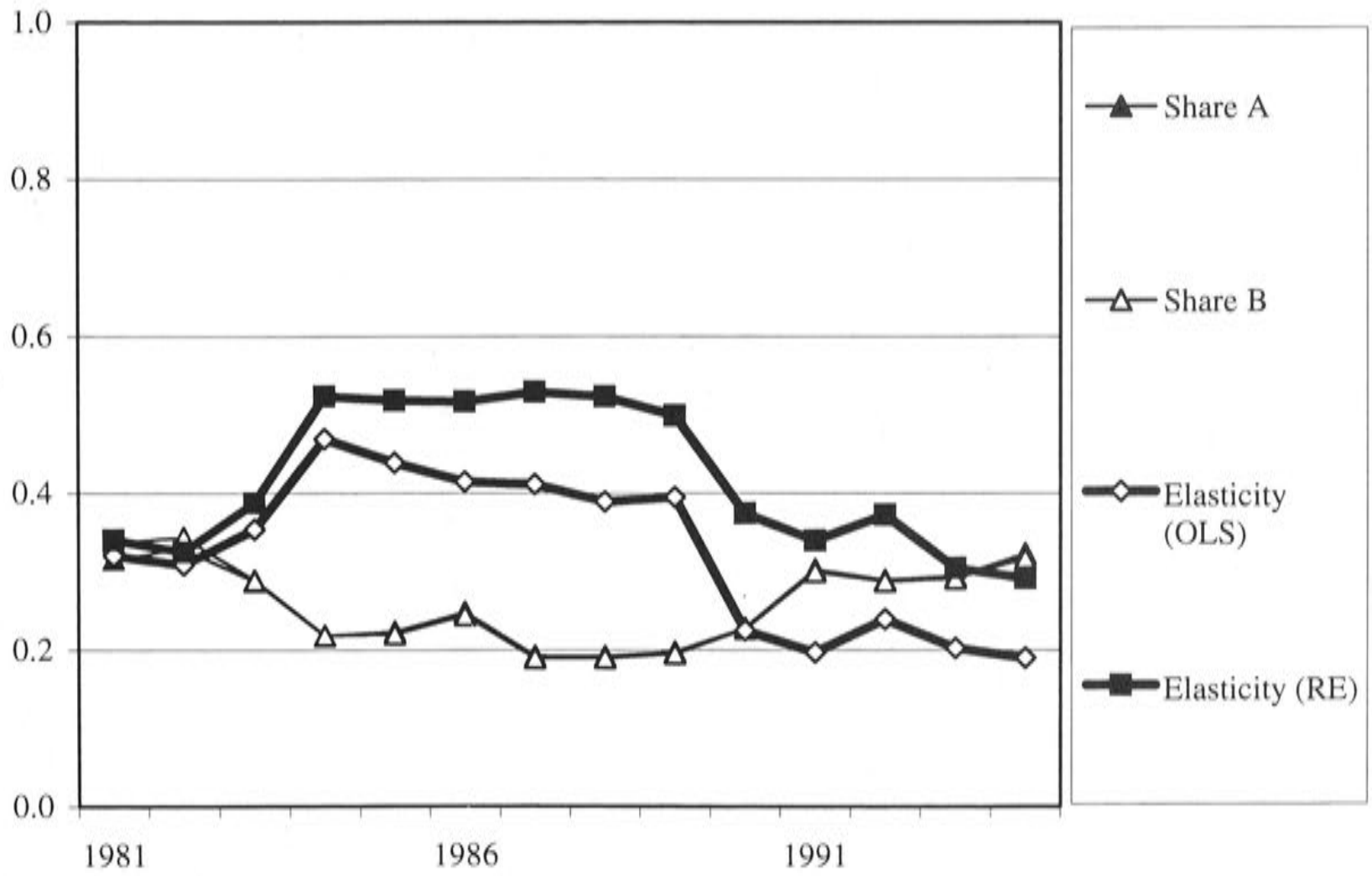
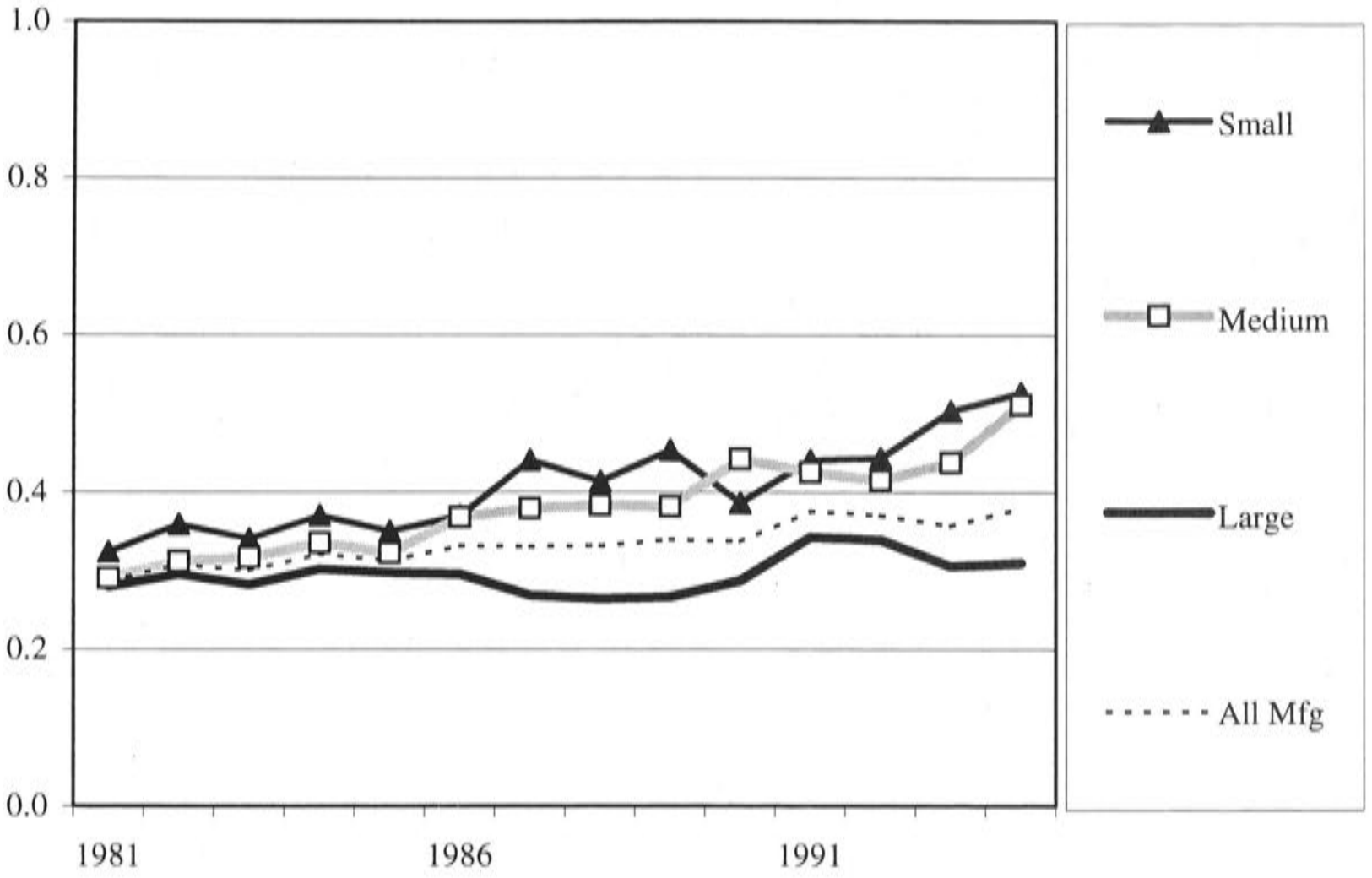


Table A5.2.16 **Estimation to test firm size dummy variables**
RE estimation: dependent variable adjd. net output

Variable	Coefficient	T Statistic	Prob >|t|
$ln(K_P/L_P)$	0.459	12.60***	0.000
$D_{1981}.(K_P/L_P)$	-0.047	-1.33	0.184
$D_{1982}.(K_P/L_P)$	-0.034	-0.97	0.332
$D_{1983}.(K_P/L_P)$	-0.092	-2.59***	0.009
$D_{1984}.(K_P/L_P)$	-0.223	-6.30***	0.000
$D_{1985}.(K_P/L_P)$	-0.222	-6.03***	0.000
$D_{1986}.(K_P/L_P)$	-0.222	-6.02***	0.000
$D_{1987}.(K_P/L_P)$	-0.234	-6.23***	0.000
$D_{1988}.(K_P/L_P)$	-0.229	-5.97***	0.000
$D_{1989}.(K_P/L_P)$	-0.214	-5.60***	0.000
$D_{1990}.(K_P/L_P)$	-0.078	-1.87*	0.062
$D_{1991}.(K_P/L_P)$	-0.046	-1.23	0.220
$D_{1992}.(K_P/L_P)$	-0.079	-2.13**	0.033
$D_{1993}.(K_P/L_P)$	-0.011	-0.30	0.761
$D_{1994}.(K_P/L_P)$	(base year)		
D_large	0.002	0.05	0.964
D_medium	0.017	0.55	0.581
Constant	-0.606	-27.28***	0.000
R^2 – within	0.1099		
– between	0.2557		
– overall	0.1988		
No. of obsns	6527		
No. of firms	661		

Note: (1) The above estimations are carried out as a Cobb-Douglas specification in per-productive-employee terms with productive inputs, in year-average terms. 1980 observations are lost through the averaging process.

Figure A5.2.5 **Elasticity and labour share: all manufacturing**
Minami and Hondai (1995) share measures by firm size



6

Conclusions and policy implications

This thesis has sought to contribute to the debate over the direction of state-owned enterprise reform in China by providing further evidence on the question of employee overcompensation. To this point our focus has mostly been confined to the period of Chinese economic reform up to the mid-1990s, with the data set that is used in Chapter 5 finishing in 1994. Therefore, before discussing the policy implications of the thesis' findings we will briefly review developments in SOE reform since the mid-1990s, a period in which the urgency and scope of SOE reform increased dramatically.

Developments in SOE reform since the mid-1990s.

Recent years have seen a change in the objective of corporate governance from the Contract Management Responsibility System towards the 'Modern Enterprise System', the substantial withdrawal of the state from ownership of small and medium-sized SOEs, and the blurring of the conceptual boundaries between the state and non-state sectors. The shedding of surplus SOE labour has been pursued with determination, even in the face of substantial worker discontent. Capital market reform has proceeded with the separation of policy lending from commercial lending in the state bank sector and the further development of banks outside the Big Four state-owned commercial banks. These recent reforms, while leading to further shrinkage of the state sector's share of output, have nonetheless been rewarded with much improved financial results.

In Chapter 2 it was noted that the Contract Management Responsibility System, introduced around 1986, started to break down amid the recession and the conservative policy regime that temporarily prevailed in the wake of Tiananmen. While the CMRS had been quite effective when firms were profitable, it proved to be no solution when firms ran into financial

difficulty. The return to more intrusive state involvement in enterprise management around 1990 was often met by more creative tactics by SOEs to frustrate the state monitors. A new model of enterprise organisation was needed that could satisfy the often contradictory requirements of establishing genuine enterprise autonomy whilst improving the effectiveness of monitoring. The only viable discernable alternative was the 'modern enterprise system' drawing upon the principles of the limited liability corporation and the shareholding system (Huang 2001). The official definition of the system features the following four principles; (1) clearly defined property rights, (2) clear definition of autonomy and responsibility, (3) separation of state administration from enterprise management, and (4) scientific management. A more cynical definition might refer to wholesale importation of Western corporate governance structures, specifically the limited liability corporation and shareholding, whilst avoiding 'capitalist' language and image wherever possible. Enterprise autonomy was to be finally entrenched, after more than a decade of unfulfilled commitment, through the complete separation of the ownership rights from management rights and the withdrawal of the state administrative structure from the enterprise level. Enterprise monitoring was to be strengthened through the diversification of enterprise ownership through the shareholder system, allowing non-state actors to play a role in the monitoring of management alongside the representatives of the state.

The SOE sector was not only to be internally transformed; it was to be cut back dramatically via the withdrawal of state ownership almost entirely from the small and medium-sized enterprise sector. The slogan of *Zhuada Fangxiao* ('hold the big and release the small') was announced in 1994. It signaled an intention to consolidate the state's position in industry by focusing on a smaller number of large firms, thereby facilitating a more efficient state monitoring effort. The state would seek to concentrate its remaining ownership stake upon strategic and defence-related industries, natural monopolies, 'pillar' industries and high-technology fields. The firms remaining in state ownership are being consolidated into large

conglomerates numbering about 160. Meanwhile, the divestiture of the state's holdings in small and medium-sized firms has proceeded through five main mechanisms: leasing, joint ventures, mergers, bankruptcy and outright sale (privatisation, although for reasons of ideological appearance the term continues to be avoided).

It was not a straightforward matter to find suitable non-state shareholders to buy into SOEs given the size of the SOE sector and China's stage of development; a sufficiently large number of wealthy individuals was simply not available. Instead, a variety of institutional investor types was suggested, including non-bank financial institutions (pension and mutual funds), other enterprises, and state holding companies (Wu 1993, Zhou 1994). Also, the establishment of a modern equity market is a complex piece of institution-building, and the Chinese sharemarkets as of the mid-1990s were still rudimentary. Therefore, the conversion of SOEs into shareholding institutions and the proper functioning of modern corporate governance structures was to take time as institutional capacity was built up over a number of years. Sharemarket listing began with the best-performing enterprises.

The formal adoption of the *Zhuada Fangxiao* policy was preceded by its experimental implementation in the cities of Zhucheng in Shandong, Zhengding in Hebei and Shunde in Guangdong. Zhucheng divested all of its SOEs in 1993, mostly via the sale of shares to employees. Within a year, profits had risen by 159 per cent, tax revenue by 50 per cent and employee incomes increased substantially, largely through the distribution of dividends (World Bank 1996b). Shunde started with 884 SOEs and TVEs in late 1993. By 1995 it had divested 834 of them, retaining in public ownership only firms in such sectors as public transport, utilities and real estate. Of the remainder, 730 were sold or leased to employees, 7 large firms became joint stock corporations, 20 formed joint ventures with foreign partners and 30 were sold to private investors. By 1995 most of the former

SOEs were profitable, and the transition was achieved without social disruption (EAAU 1997).

The new initiatives in SOE reform were pushed from the very top. At the 15th National Congress of the Communist Party in September 1997, President Jiang Zemin signaled the Chinese government's determination to accelerate enterprise reform despite the political difficulties that it would entail, declaring 'We should encourage mergers, standardise bankruptcy procedures, divert laid-off workers, increase efficiency by downsizing staff, and encourage re-employment prospects'. [1] In the same speech, Jiang also pushed back the ideological barriers to ownership reform via a definitional fudge, asserting that 'We cannot say in general terms that the joint-stock system is public or private. The key lies in who holds the controlling share'. The pared-down core of commitment to public ownership was still maintained however, as he stressed that China would 'keep public ownership as the foundation of its economic system'.

Another element of the accelerated reforms that was referred to in the first of the above quotes from Jiang was a genuine drive to achieve flexibility in the input markets, especially the labour market. The 'iron rice bowl' was to be discarded forever as SOEs were permitted to shed their surplus labour, often on a large scale. Appleton *et al.* (2002) estimate that 11 per cent of all urban workers were retrenched between 1992 and 2000, and that 53 per cent of these remained unemployed as of 2000. The political determination that this policy required was considerable; the resultant hardships faced by laid-off workers sometimes provoked resistance campaigns, which boiled over from time to time into violent protest requiring police and military intervention (Cai 2002). The judgment had clearly been made that such reforms were indispensable to China's continued growth. It was recognized that labour-shedding could not proceed without parallel reforms to establish a national social safety net. However, the effort to build pension, unemployment and retraining systems independent of the old SOE linkages is an ongoing project.

In the area of capital and banking, the direction of policy has been to strengthen the commercial orientation of the banks so as to harden budget constraints. To this end, policy lending has been split from commercial lending via the creation of asset management corporations (AMCs). The immediate burden of interest payments on enterprises has been relieved in some cases via debt-equity swaps with the banks. However, given the size of the accumulated liabilities that large SOEs still carry, the full commercialization and financial solidification of the banking sector will take some years to implement (Lardy 1998, Huang 2001).

Table 6.1 **State-Owned Enterprises: Various Indicators 1990-2000**

	Employed Persons, mil [(a)]	Total Invt in Fixed Assets, RMB bil	Income Tax of SOEs, RMB bil	Average wage, RMB
1990	33.95	298.6	60.4	2289
1991	34.82	371.4	62.8	2505
1992	35.26	549.9	62.4	2889
1993	34.44	792.6	58.3	3562
1994	33.21	961.5	61.0	4508
1995	33.26	1089.8	75.9	5352
1996	32.18	1200.6	82.2	5798
1997	30.11	1309.2	79.4	6008
1998	18.83	1536.9	74.4	6981
1999	16.48	1594.8	63.9	7611
2000	14.15	1650.4	82.7	8554

Notes: [(a)] In state-owned manufacturing units.
Source: State Statistical Bureau, *China Statistical Yearbook*, 2001.

The impact of the reforms from the late 1990s on SOE performance appears to have been very positive. Table 6.1 shows that the SOE manufacturing work force has been cut (through redundancies and through the conversion of SOEs into other ownership forms) by more than half from 1995 to 2000. However, the total investment in fixed assets has continued to grow year by year, implying a considerable rise in the capital/labour ratio, which should lead to enhanced labour productivity. SOE financial performance has

recovered quite strongly from the downtrends of the early 1990s, with after-tax profit rising from RMB 42.3 billion in 1996 to RMB 238.9 billion in 2001 (for further data on past years see Table 3.6 in Chapter 3). [2]

Despite this improvement in profitability, the accumulated debts of the SOE sector and the non-performing loan (NPL) ratios of the state banks that service it remain at high levels, and this is complicating reform in other areas such as finance. While there is controversy over the accuracy of official statistics in this area, the overall NPL ratio of the state bank sector was reported as being around 24 per cent as of the end of 2002. The bank sector will be greatly challenged to meet the government's target of reducing this figure to 15 per cent by 2007, the year from which foreign-owned banks will be permitted to compete for RMB retail business under the terms of China's WTO accession. Continued divestment of some SOEs, especially the under-performers, would contribute to the repair of SOCB balance sheets both through stemming the flow of bad loans and through the proceeds from sales of SOE equity.

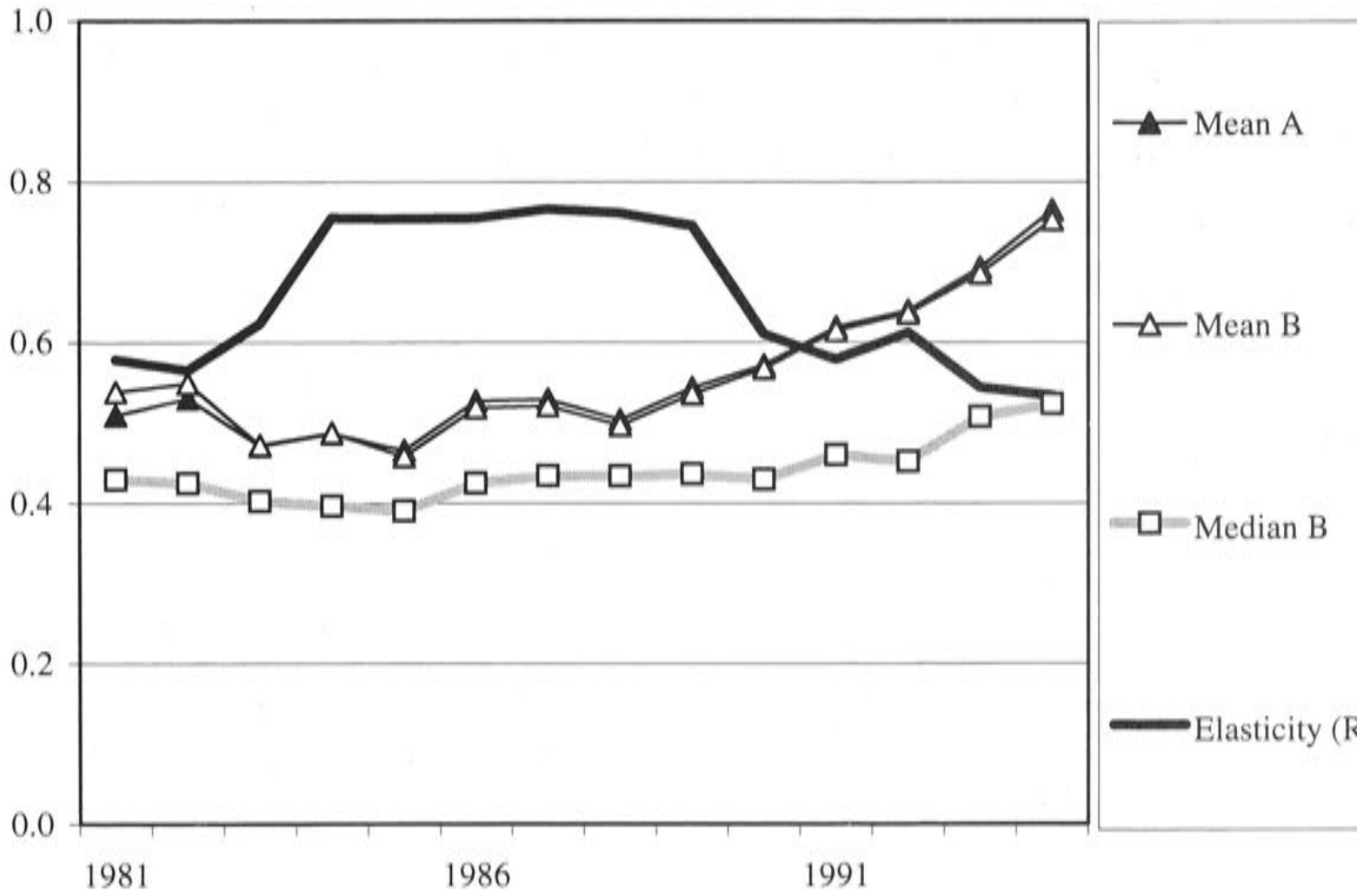
Summary of Empirical Findings and their Policy Implications

This thesis has reviewed the various policy developments that impacted upon China's SOEs during the reform period, especially up to the mid-1990s. It has considered the performance of the sector as regards output growth, productivity and profitability, and the interpretations that have been placed upon that performance by various scholars. In particular, it has identified the rival assertions of the 'optimistic' and 'pessimistic' schools with regard to Total Factor Productivity, profitability, employee compensation and the overall viability of the sector. The thesis has sought to advance this debate by empirically testing the hypothesis that the overcompensation of employees contributed to the poor financial performance of the sector, as argued by the 'pessimistic' school.

At the level of the Chinese SOE sector as a whole, the empirical analysis of Chapter 5 lends weight to the arguments of the 'pessimistic' school.

Figure 5.2, reproduced here as Figure 6.1, indicates that in the early 1980s, undercompensating behaviour was still being exhibited. This is not surprising, since it would represent a hangover from the centrally planned era when the role of the state sector was to extract large surpluses for re-investment, as related in Chapter 2. However, over the course of the period covered by the data, a substantial increase in labour share and a substantial decline in output elasticity of labour are both clearly visible, with neither effect dominating the other. Both trends are especially pronounced from 1989-1990 onwards. By 1994, substantial overcompensation is evident.

Figure 6.1 **Elasticity and labour share estimates using adjusted net output**



At face value, Figure 5.2 might suggest a strong movement towards undercompensation from 1981 to around 1984. However I believe that this impression is misleading. Most of this apparent movement occurs on the output elasticity side of the comparison. Recall Figure 5.1, which charts elasticity estimates generated from several different estimation techniques. The trends in elasticity over time are virtually identical for all six techniques

from 1984 onwards. However, prior to 1984 those estimates where Constant Returns to Scale is imposed differ markedly from those without the imposition of CRS. Essentially, without the imposition of CRS, there is no net change in the elasticity estimate from 1981 to 1984. Furthermore, our various hypothesis tests of the CRS assumption (Tables 5.3 and 5.2.10a to 5.2.10c) indicate that CRS either does not hold or does not hold as strongly for these earlier years as it does in the later years. [3] Also, for reasons explained in Appendix 5.1, the data for the earliest years of the database's coverage appear to be generally less reliable. [4] Therefore I consider it appropriate to draw firm conclusions only from the trends that are visible from 1984 onwards.

One notable aspect of the reported empirical results is the extent to which output elasticity of labour exceeds labour share over the period 1984 to 1989. It strains credibility to suppose that labour was actually under-compensated to the extent suggested by Figure 5.2 during these years. It is more intuitive to believe that labour was under-compensated at the outset of the reform period and moved gradually to over-compensation thereafter. I believe that the substantial under-compensation implied for the period 1984 to 1989 probably reflects a margin of error surrounding the results for the 1980 to 1989 survey period, and that this margin of error is due to such factors as data deficiencies and institutional arrangements that are very different from normal market competition. However, even if we were to suspend judgment over the elasticity results for the 1980s (the first survey period), we could still make the following assertions from the results: (1) labour share of income shows a quite consistent upward trend over the reform period, (2) from 1990 onwards, output elasticity of labour clearly trends downwards, and (3) elasticity lies significantly below the labour share by the end of the period. Therefore, whatever may be the true trend of output elasticity of labour over the 1980s, it is difficult to imagine any circumstance that would overturn the basic conclusion that SOEs moved to over-compensation over the reform period.

It is interesting to consider the question as to why both the rise in labour share and the fall in output elasticity of labour both began in earnest around 1989-1990. As was discussed in Chapter 2, this was around the time of the recession that followed Tiananmen and the temporary reassertion of State controls. All other things being equal, a recession will normally be reflected in overcompensation. A recession will be associated with falls in value added at the firm level, and therefore the total wage would need to be cut in order to keep the labour share of value added constant. But since wages are typically downwardly sticky, this does not occur and labour share can easily rise, creating an overcompensation effect even if the output elasticity of labour were to remain constant. However, in China in the late 1980s and early 1990s, the output elasticity of labour was falling. Therefore the overcompensation effect was exacerbated.

In 1989 industrial production fell sharply in both the investment and consumption goods sectors. The impact on investment of the credit contraction imposed in that year was more severe than intended because authorities overlooked the impact of high inflation on quantitative investment targets that were fixed in nominal terms (Naughton 1995). In addition, consumption patterns soon switched from the hoarding of goods to the building up of precautionary savings. The rise in the labour share in 1989 therefore was driven by falling value added rather than rising labour costs in absolute terms. In 1990 the nature of state intervention changed in reaction to the sharp downturn. The State pushed firms to re-employ workers even where they were not required, and to keep producing regardless of market conditions. This is likely to have precipitated the decline in the output elasticity of labour that is evident from that year. Indeed, 1990 was the year when the bulk of the decline in output elasticity occurred.

But this decline also continued in the years after 1990. The reasons for this trend are likely to include the following:

(1) Compensation from the non-state sector was intensifying at a particularly rapid rate at this time. Once Japan lifted its post-Tiananmen economic sanctions against China, other trading partners quickly followed, and foreign investment expanded rapidly. Other non-state sectors expanded quickly too. As Table 1.1 shows, the share of 'individual' and 'other' enterprise ownership types in gross industrial output grew from 9.8 per cent in 1990 to 24.9 per cent in 1994 — a two and a half-fold increase. SOEs who are pressed by new competition may have difficulty in selling their output even if overall demand is strong, and may therefore suffer from excess capacity.
(2) Although reforms were underway by this time to facilitate labour force flexibility (see Chapter 2), it was still difficult to shed excess labour. It is likely therefore that surplus labour was building up faster than it could be shed, and faster than the accumulation of surplus capital, leading to a decline in labour's output elasticity. [5]
(3) Trends in the quality of inputs may have been unfavourable to SOE labour. Although the labour force was gaining from improving education and training standards, many of the most talented and energetic employees were migrating from SOEs to the growing non-state sector. Meanwhile the quality of capital inputs was improving due to the increased availability of foreign technology imports.

Does the downtrend in the output elasticity of labour that we observe from 1990 agree with the findings of other studies? Of the many production function studies carried out on Chinese SOEs over this period (see Section 3.2) very few include a time-variant labour coefficient. Most researchers were concerned to measure changes in TFP over time, and imposed capital and labour coefficients that were fixed over the period. Three exceptions are Minami and Hondai (1995), Huang *et al* (1997) and Huang and Meng (1997). Each of these sets of findings is only partially comparable to my own.

As reported in Table 5.7, Minami and Hondai (1995) found declining output elasticity in the machinery sector over the years 1987 to 1990.

Huang *et al* (1997) reported mean response coefficients on labour for the years 1980 and 1994, for six sectors; the coefficient on labour declined over that period in four of the sectors (food processing, textiles, building materials and machinery) but rose in the other two (chemicals and electronics). It is not clear from the published results whether most of the decline in labour productivity occurred in the early 1990s, as per my results. Huang and Meng (1997) report estimated output elasticities for capital, skilled labour and unskilled labour for a sample of state firms from 1986 to 1990. The elasticity of skilled labour rose slightly from 0.162 to 0.169 over the period, while the elasticity on unskilled labour fell from 0.483 to 0.465. This analysis ends just before the period of interest in my study. Nevertheless, it suggests that improvements in skilled labour productivity (perhaps through education and training) were counteracted by declines in unskilled labour productivity (perhaps through the accumulation of surplus unskilled labour). Overall therefore, although the evidence from other studies on trends in output elasticity is scanty, it is more in agreement than disagreement with my own findings.

My results indicate that labour share continued to rise through the post-Tiananmen recovery period. This suggests that the early 1990s were the time when wage controls broke down most seriously. The loss of credibility by central monitoring authorities following the Tiananmen downturn [6] may have goaded firms towards more pervasive employee income maximising behaviour at the expense of official objectives. Also, by this time SOEs had become primarily reliant on bank financing, which due to the various flaws discussed in Chapter 2 was prone to soft-credit problems. This and the breakdown of the Contract Management Responsibility System would have combined to create a soft-budget environment by the early 1990s within which employee income maximising behaviour could proliferate.

A comparison of the results across sectors roughly accords with a stylized fact asserted by Derong Chen (1995), that central control mechanisms were withdrawn from labour-intensive light manufacturing industry to a greater

extent than from capital-intensive heavy manufacturing. This would be consistent with a lingering of the Stalinist preference for heavy industry-led industrial development, and with the Stalinist view that rapid growth is best achieved through the planning mechanism. If this stylized fact were accurate, it would lead us to expect a greater propensity to overcompensate in light industry as opposed to heavy industry, as a lesser degree of state monitoring in light industry would have provided more opportunities for income-diverting behaviour. Of the five sectors featured in our analysis, clearly the greatest tendency towards overcompensation is exhibited by the textile sector, a labour-intensive sector. The weakest tendency towards overcompensation is exhibited by the capital-intensive machinery sector. The remaining three sectors, building materials, electronics and chemicals, lie within these two extremes and are not clearly ranked. Recall that Raiser (1997b) also found a greater propensity to overcompensate within the labour-intensive garment and textile sectors (see Section 5.3).

A few more specific, minor comments can be made regarding the pattern of the sectoral results. First, in comparing the trends in labour share versus output elasticity for each sector, it should be borne in mind that although the labour share measurements are entirely specific to the sector, the output elasticity measurements are not; the intertemporal patterns of the output elasticity measurements represents the pattern for the all-sector sample imposed on each individual sector, since sector-specific estimations did not show sufficient statistical significance. Only the intercepts on Figures 5.3a to 5.3e vary between the sectors. Therefore the year-to-year divergences between labour share and output elasticity for each sector should not be interpreted too dogmatically.

Second, there is an apparent sharp decline in labour share in the electronics sector from 1981 to around 1984. I believe that this impression may result from the particular circumstances of that sector at the time. In the early 1980s the consumer electronics sector was something of an infant industry in China. The pre-1980s planned economy had placed little emphasis upon

the consumer goods sectors, although it may have placed somewhat greater emphasis on the military applications of electronics. Also, in the decades of virtual autarky leading up to 1980, China was largely cut off from the rapid developments that had been occurring in the international consumer electronics industry; in Japan and the West this was the era of the transistor and colour television and the eve of video recorders and the PC revolution. By 1980, the Chinese electronics sector faced a considerable technological gap relative to international competitors. As Western electronics goods became more accessible with the commencement of reform and openness in the early 1980s, Chinese electronics firms would have had many opportunities to change and expand their product lines and improve their technical designs and quality, for example through reverse engineering or the importation of key components or equipment. Therefore it is reasonable to expect that Chinese firms in the early 1980s would have had opportunities for rapid growth in value added through improvement in product lines, without the need to expand labour costs at the same rate. Examination of the database confirms this; aggregate total remuneration in electronics sector firms grew by 51.0 per cent from 1981 to 1984 whereas value-added grew by 134.8 per cent. The decline in labour share over this period seems to result from value-added starting from a low base. The sharp decline in labour share in the electronics sector from 1981 to 1984 contributes to the slight decline in the full-sample measurement of labour share in the same period (Figure 5.2). This contributes in turn to the impression of a trend towards under-compensation across all sectors from 1981 to 1984, which I have argued above to be misleading. Why the electronics sector commenced the 1980s in an apparent position of heavy overcompensation is less clear. To fully answer this question would require a detailed knowledge of the circumstances of that particular sector in the 1970s and 1980s and is beyond the scope of this thesis.

There is a rough correlation between factor intensity and firm size; labour-intensive sectors tend to feature firms of smaller average size than capital-intensive sectors. Furthermore, it can be argued that state monitoring is

more effectively carried out with a small number of large firms than with a larger number of small firms. Therefore, to some extent the sectoral results and the results with respect to firm size are delivering the same message.

The results on the basis of firm size indicate clearly that small and medium-sized firms were more prone to overcompensating behaviour than were large firms. As such, they provide some measure of endorsement to the *Zhuada Fangxiao* policy of commencing ownership reform in the smaller-scale end of the SOE sector. Since overcompensation is greatest in the smallest firms, the marginal gains from ownership reform of small firms in terms of improving the financial position of the State ought to be high, a point that has been borne out by the improved financial performance of the SOE sector as noted earlier in this chapter. This justification of the *Zhuada Fangxiao* policy stands beside two others; the corporate governance argument that the state can more effectively monitor a small number of large firms, and the political economy argument that *Zhuada Fangxiao* allows substantial ownership reform to proceed whilst satisfying the political constraint of not flying too brazenly in the face of Marxist ideology.

This endorsement of *zhuada fangxiao* should not be construed as arguing that the larger SOEs should never undergo ownership reform. This can always remain an option for a still later stage in the reform process. Furthermore, successful ownership reform of large SOEs would require considerable development of corporate governance capacity in areas such as stock market infrastructure, the development of financial institutions that can serve as effective institutional investors, and development of the accounting and legal professions. These considerations are not so serious for SOEs that are small enough to pass into the hands of owner-operators. The *Zhuada Fangxiao* strategy need not be seen as freezing all progress on ownership reform in large SOEs but could rather be seen as allowing time for the infrastructure of ownership reform to be built up. The joint stock ownership system provides a mechanism whereby ownership reform in

large SOEs could be accomplished in an evolutionary way by gradually reducing the state's equity share; the World Bank (1996b) has argued for a strategy whereby the State's ownership presence in large firms recedes to that of a passive minority shareholder over time.

Contribution of the Thesis, Implications and Avenues for Further Research

This thesis has contributed to our knowledge of Chinese SOEs in three principal respects:

1. The theoretical analysis of Chapter 4 has shown that the most appropriate empirical test for both labour-managed firm type behaviour and over-compensation is a comparison of the output elasticity of labour with the labour share of income.
2. Chapter 5 has enriched the body of evidence available to contemplate the over-compensation issue. This study compares favourably with the existing literature for comprehensiveness in terms of its coverage over time and across industrial sectors, and in terms of testing with a number of different statistical techniques. At an overall level, the results support the claims of the convergent or 'pessimistic' school that over-compensation was behind the decline in profitability up to 1994, thus supporting their prescription for more fundamental reform.
3. This is the first empirical study to consider the over-compensation question by large, medium and small firms separately. The finding that over-compensation has been concentrated at the small-scale end of the SOE sector lends support to the *Zhuada Fangxiao* strategy of pursuing 'big bang' reform of small SOEs whilst retaining a more gradualist approach to the reform of large SOEs.

What do the findings of this thesis imply for the future prospects of the SOE sector in China? First, we have found evidence that in an environment where SOEs are made to compete in a market setting, although improved efficiency may result, the phenomenon of firm capture and income

maximization by SOE employees is problematic. Moreover, no solution involving a permanent and dominant SOE presence has yet been found. Indeed, despite the improvement in SOE financial performance since 1994, the ongoing macroeconomic strains caused by SOE loss-making require continued reform. The direction of that reform appears to have been set by the *Zhuada Fangxiao* strategy — to divest poorly performing firms where there is capacity to do so and to build up such capacity where it does not yet exist. Therefore, the endpoint for the SOE sector is therefore likely to feature a still smaller relative presence for the SOE sector in the Chinese economy. The pace of its rationalisation will be governed by such factors as the speed with which capacity (in the form of well-functioning capital markets, accounting and legal services and regulatory capacity) can be built up, the extent of SOE underperformance and the systemic pressures created by that underperformance. The SOE sector will not disappear entirely, but increasingly those SOEs that remain will predominantly represent those special cases that are familiar in market economies, such as public goods, natural monopolies and defence industries. The Chinese experience to date has not demonstrated any special *raison d'etre* for state ownership beyond these familiar ones; any 'Third Way' remains elusive. That said, joint-stock enterprises with both state and private ownership shares are likely to be a feature for some time.

It has often been said that in economics it takes numerous empirical studies to establish the validity of a sound hypothesis, although sometimes a false hypothesis can be convincingly disproved with a single argument. Although this thesis has added to the stock of evidence on overcompensation in Chinese SOEs, there is still ample room for further research on this topic. Given the difficulties that have been encountered with the available data, it would be constructive to repeat the analysis of Chapter 5 with other suitable data sets that might be available. In particular, the exercise should be repeated on more recent data representing the post-1994 period of more radical SOE reform. The methodology of such empirical analysis could be refined by measuring the productivity and income shares of different types

of employees — for example by level of skill or education, or segregating permanent from contract employees — along the lines of Meng and Zhang (2001); the CASS data set did not have sufficient detail for this approach. It may also be possible to examine explicitly the capital side of the factor income equation, to analyse the question of whether capital was apparently under-compensated while labour was being over-compensated. This approach presents a number of difficult methodological problems however, such as in differentiating between profits and the rental costs of capital (when the state is the ultimate recipient of both) and in correctly measuring interest costs in an environment of soft credit. (Certainly this author could see no remedy to such problems contained within the CASS data set.) Further analysis could also examine the extent to which measured overcompensation in SOEs actually reflects the costs of surplus labour. More research is also needed to analyse the impact on SOE performance of the *Zhuada Fangxiao* reform process; such research could use various approaches and encompass both the divested firms and those that were corporatised while remaining under state ownership. The potential in this direction would appear to be considerable.

This point brings me to a final note, which is that this thesis does not tell a comprehensive tale of SOE reform in the period under the *Zhuada Fangxiao* slogan. What it does is to inform the current-day scholar of SOE reform by presenting evidence on employee overcompensation in the period up to 1994. This defines the main boundary of the topic and therein lies its contribution.

Endnotes

[1] Quoted in Asiaweek.com, 26 September 1997.

[2] The source for this data is a briefing by Minister in charge of the State Economic and Trade Commission Li Rongrong on 19 September 2002, as reported by the *People's Daily* on 2 September 2002.

[3] The fact that CRS does not hold strongly in the early years of the reform period may be due to some lingering effects of central planning. As note in Chapter 2, under central planning the firm does not truly choose its levels of inputs and outputs; these are set by the plan. Therefore, measured production functions could be quite different form those that would have prevailed under market conditions. Also, Stalinist central planning both exercised a preference for large, heavy industrial enterprises and exhibited 'investment drive'. Therefore, a tendency to over-invest resources in larger enterprises would be likely to arise; such a tendency would manifest itself in declining returns to scale.

[4] In addition to the consideration of data quality, the production characteristics of planned economies may make the interpretation of production function results in the early 1980s difficult. Centrally planned economies tend to suffer from extensive supply bottlenecks due to the frequent failure of upstream suppliers fail to deliver required inputs. This would tend to complicate the interpretation of production function results, since a bottleneck arising in one sector (coal for example), would impact upon production in another sector (such as power generation or steel). As reforms progressed and SOEs were permitted to obtain inputs from non-plan sources, the severity of supply bottlenecks would certainly have lessened.

[5] As the empirical analysis has been carried out with CRS imposed, our measures of the output elasticity of labour reflect the *relative* productivity of labour with respect to the productivity of capital.

[6] See the quote from Derong Chen (1995) on page 36.

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