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The Diverging Patterns of Profitability, Investment and Growth of China and India During 1980–2003

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Summary. — This paper documents the diverging patterns of capital accumulation, profit rates, investment rates, capital productivity, and technological progress of China and India between 1980 and 2003. The two Asian economies have followed very different growth patterns and, today, they face different challenges. India's is how to accelerate growth, while China's policy makers debate between the need to maintain a high growth rate to generate employment and the imperative to reduce it to cool the economy. India must address impediments to investment. China must deal with the question of whether investment can continue being the main source of growth. © 2008 Elsevier Ltd. All rights reserved.

Key words — Asia, capital accumulation, China, growth-distribution schedule, India, profit rate

1. INTRODUCTION

The People's Republic of China (China hereafter) and India are two of the most dynamic economies of the world today. During the last three decades, they have followed different paths in moving from backward and poor nations with very little weight in the international arena to what they are today: the two largest emerging economies in the world, positioned to rival today's largest economies in the next few decades. [1]

China has registered impressive economic growth since the initiation of economic reforms in the late 1970s. The result is that hundreds of millions of people have been lifted out of poverty in the most rapid and far reaching economic transformation in history (Angang, Linlin, & Zhixiao, 2005). Net Domestic Product

at factor cost (NDP) growth increased from an annual average of 5.4% per annum during 1961–78 to 9.6% during 1979–2003.[2] In recent years, accelerating economic growth in India has also caught the attention of the world. During 1951–80, India's annual average NDP growth rate was a lackluster 3.6%, known famously as the "Hindu" rate of growth (Singh & Bery, 2005). The annual average growth rate during 1981–91 (the years reforms were introduced) was significantly higher at 5.4%. This rate further strengthened to 6.0% during 1992–2003. India's robust growth has given rise to hopes that another major economic transformation may be underway in Asia. Figure 1 shows the growth rates of both countries.

However, despite India's much improved economic performance during the last decade, it still lags China in many economic indicators. Since 1992, India's GDP per capita, measured in US$2,000 constant prices, has grown by 4.2% a year, compared to 8.7% in China. As a result, while GDP per capita stood at $322.5 in India and $441.8 in China in 1992, by 2003, the latter's income per capita of $1,067 was nearly twice as high as that of the former, $510.8. These differences naturally beg the question of why India has lagged behind China in economic growth.[3]

Both Asian giants opted for a strategy of development based on heavy industrialization in the 1980s, although with important differ-ences: while China followed more the Soviet model more until the 1970s, India relied largely on the private sector. In 1978, China started a series of modernizations, including greater openness. India too sought to modernize its industrial sector and started loosening controls on domestic output and investment around 1980. In the early 1990s, China increased its efforts to introduce market reforms, and to acquire modern technology and organization to compete in the world market. India too in 1991 introduced further economic reforms, partly as a result of the recognition that China was growing faster and had begun looking like the Asian Tigers. The result, as noted above, is that the economic outcomes in the two countries have varied significantly.

The list of papers analyzing different aspects of the two economies independently is very long. For China, Chow (1993), Chow and Li (2002), Felipe and McCombie (2002), Heytens and Zebregs (2003), Gylboy (2004), Holz (2005a), OECD (2005), Blanchard and Gia-vazzi (2005); for India, Ahluwalia (1999, 2002), Balakrishnan and Babu (2003), DeLong (2003), Lewis (2004), Rodrik and Subramanian (2004a, 2004b), Banerjee (2005), Kochhar, Kumar, Rajan, Subramanian, and Tokatlidis (2006), just to mention some recent work. However, detailed empirical comparative analyses of different aspects of the two economies are still rare: Nagaraj (2005), who links growth and
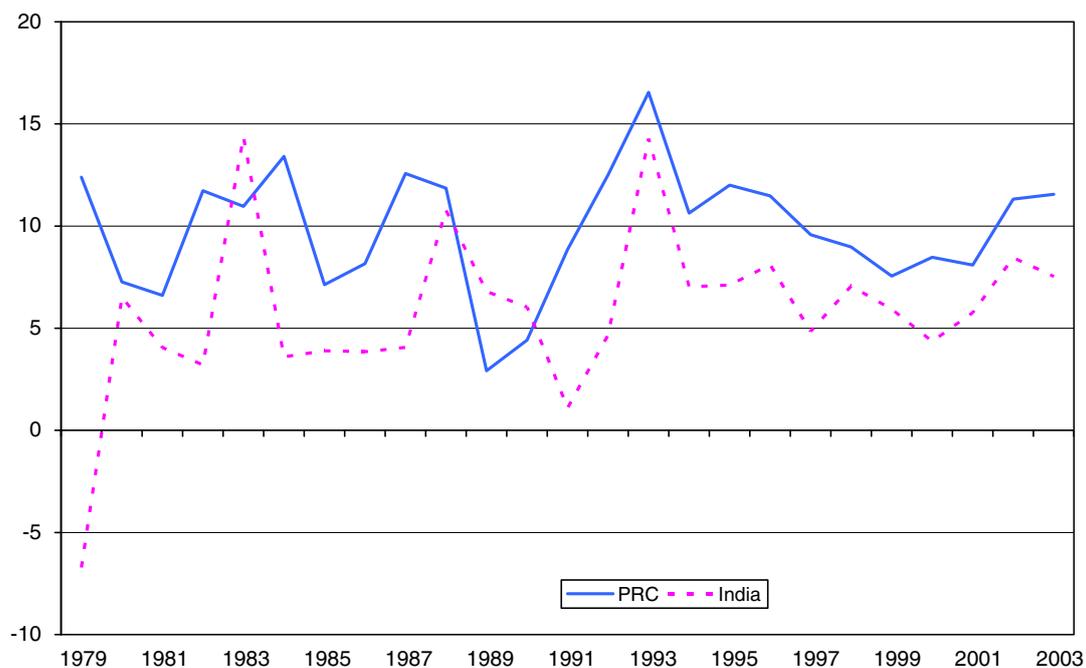

Figure 1. *Net Domestic Product (NDP) growth rate at factor cost China and India, 1979–2003 (%). Source: Authors' estimates. See Appendix.*

the functional distribution of income; Row-thorn (2006) studies the implications of these two economies for the advanced countries; Wu (2006) uses growth accounting; Morgan Stanley (2004, 2006) and Deutsch Bank Research (2005/2006) offer very comprehensive analyses of both economies. [4] This paper makes an attempt at contributing to this literature by providing a firmer empirical basis for comparing the performance of the two countries since 1980. This is done by documenting and contrasting the evolution of a number of key economic variables that reflect stylized facts of the two economies. In particular, we ask: what is the main factor underlying the difference in growth between the two economies? There are a number of other related questions with important policy implications that we attempt to shed light on. First, we ask why the investment share is substantially higher in China than in India. Second, we delve into the question of whether India can match China's performance. Third, we ask whether China can sustain its impressive growth rate. And finally, we explore the direction of technical change. Given the depth of these questions, it is impossible to provide definite answers. However, the straightforward approach we follow brings to light significant aspects of the two economies that are surely part of the answer.

The analysis concentrates exclusively on one macroeconomic aspect of growth, namely, the role of capital accumulation and its determinants as a major factor shaping the difference in performance between the two economies. Certainly there are many other factors and policies that affect growth in both countries, but we do not consider them here. Economic theories (e.g., see Scott, 1989) acknowledge that capital accumulation is a most important ingredient of output growth. Capital plays the double role of being an important component of demand via investment and through the multiplier; and the source of capacity, that is, the supply side, as a factor of production. Following the Classical economists, we argue that a major cause of capital accumulation (though not the only one) is the rate of profit. We use in our analysis two facts: (i) that capital accumulation can be expressed as the product of the investment-to-output ratio and capital productivity; and (ii) that the profit rate can be written as the product of the capital share in output and capital productivity. Therefore, the five variables that constitute the core of our analysis are: capital accumulation, invest-ment–output ratio capital productivity, profit rate, and capital share. The study reveals stark contrasts between India and China, which provide some answers to the questions above, but also raise some puzzles.

The study reveals diverging patterns of capital accumulation and growth in India and China, and concludes that the two countries face very different challenges in their respective quests for economic growth and prosperity. India must address impediments to investment so as to increase its investment share. China must deal with the question of whether investment, the engine of growth, can continue running at full steam. This question is posed in the context of the fact that China has experienced Marx-biased technological change, which is not sustainable. Hence, there is a limit to growth in China. However, while continuous high growth is not a feasible strategy any longer, it is needed to generate much needed employment. India has experienced growth in profitability but its capital growth is too low, which has led to substantially lower growth than in China. India's problem is how to make productive use of its large untapped investment potential.

The rest of the paper is structured as follows: In Section 2 we document the major differences between the two countries from the income and demand sides of the economy. From the latter, the main difference is the contribution of capital formation (i.e., investment) to output growth; and from the income side, the contribution of capital accumulation. Clearly, these two aspects are the two sides of a coin. Section 3, describes the methodological framework. In Section 4, we look at profitability and its determinants, namely the capital share and capital productivity. We also study the investment potential of the two economies. Section 5 inquires about the causes of the decline in capital productivity in China and links it to the direction of technical progress through the notion of Marx-biased technical change. Section 6 discusses the challenges that the two economies face within the context of the discussion of this paper. Section 7 offers some conclusions.

2. WHERE DO CHINA AND INDIA DIFFER?

To understand the major factors contributing to the growth differences between India and China, we examine the structure of the two

economies from the income and expenditure sides. From the income side, the growth rate of output equals the sum of the growth rates of the wage and profit rates plus the sum of the growth rates of employment and the capital stock, each weighted by the corresponding factor share. This decomposition is shown in Table 1.

The results indicate that the main difference between China and India lies in the higher growth rate of the capital stock in the former,

more than double. Figure 2 shows the growth rate of the capital stock in these two economies. The decomposition also indicates that while India has a higher rate of employment growth and a higher growth rate of the profit rate, these are not sufficient to lift its output growth rate and approximate that of China. In a later section, we address why the growth rate of the profit rate has negative contribution to output growth.

From the expenditure side, the growth rate of GDP is equal to the weighted sum of the

Table 1. *Decomposition of the growth rate of NDP at factor cost (%)*

Country	Year	π^{a}	$\widehat{K}^{b}$	$\hat{r}^{c}$	$1 - \pi^{d}$	$\widehat{L}^{e}$	$\hat{w}^{f}$	$\widehat{NDP}^{g}$
China	1980–2003	30.2	11.3	−1.9	69.8	1.6	8.4	9.9
	1992–2003	28.8	11.9	−1.2	71.2	1.1	9.7	10.8
India	1980–99	43.2	4.8	1.8	56.8	2.1	4.0	6.3
	1992–99	44.1	5.5	1.7	55.9	1.9	5.4	7.3

Source: Authors' estimates based on data from the United Nations National Accounts Statistics; GDP 1952–95 and GDP 1995–2003-Historical Data on China's Gross Domestic Product.

Algebraically: $\widehat{NDP}_t \equiv \pi_t \hat{r}_t + (1 - \pi_t)\hat{w}_t + \pi_t \widehat{K}_t + (1 - \pi_t)\widehat{L}$. This expression states that the growth rate of Net Domestic Product ($\widehat{NDP}$) equals the sum of the growth rates of the factor prices ($\hat{w}_t$ and $\hat{r}_t$) plus the sum of the growth rates of employment ($\widehat{L}$) and the capital stock ($\widehat{K}$), each weighted by the corresponding factor share. Details of the derivation are provided in Section 3.

[a] Capital's (profits) share in Net Domestic Product.
[b] The annual growth rate of capital stock.
[c] The annual growth rate of profit rate.
[d] Labor's (wage bill) share in Net Domestic Product.
[e] The annual growth of employment.
[f] The annual growth of the wage rate.
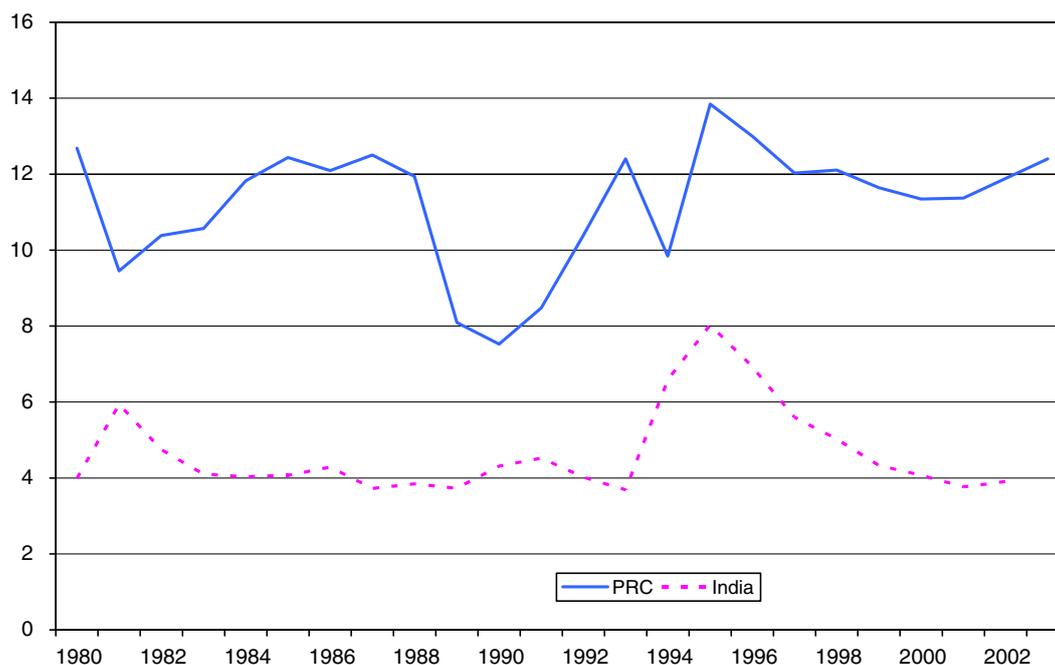[g] The annual growth rate of the Net Domestic Product.

Figure 2. *Growth rate of the net capital stock (%). Source: Authors' estimates. See Appendix.*

growth rates of the aggregate demand components. The decomposition is shown in Table 2. India and China differ both in the shares of each component and the growth rates.

The main difference between China and India lies in the relative importance of investment. [5] Investment has played a much more important role in propelling economic growth in China. Gross fixed capital formation in China as a share of GDP stood at a staggering 42.5% in 2003, while the comparable figure for India was substantially lower at 27.7%. During 1980–2003, investment grew at an annual average rate of 11.7% in China, compared to 6.8% in India. Due to the higher growth rate, as well as to the higher proportion of investment in total output, the contribution of investment to overall growth in China far exceeds that in India (this is calculated as the product of the share of investment in GDP times the growth rate of investment, divided by the growth rate of GDP). During 1980–2003, investment contributed on average about 40% of total growth in China, while its contribution in India was 25.5%. [6] Figure 3 shows the investment shares of the two economies.

The importance of investment in China seems to mirror the experience of some of the East Asian newly industrialized economies. Young (1995, pp. 644–645), for example, noted that investment shares in these economies rose substantially during the years of rapid growth. Singapore's investment to GDP ratio (measured at constant local currency prices), stood at 10% in 1960, before going on to reach 39% in 1980 and 47% in 1984, after which it declined to below 30% by 1988, only to begin another rise in the late 1980s and reaching almost 40% in 1997. In Korea, investment shares were around 5% in the early 1950s, but climbed to 20% in the late 1960s and to 30% by the late 1970s. They were approaching 40% by 1991. In Taiwan, the share was around 10% in the early 1950s, from which it grew steadily to 27% in 1975, after which it has fluctuated at around 22%. [7]

We conclude that the major factor explaining the difference in growth rates between the two economies lies in the differentials in the share of investment and in the rate of capital accumulation. In fact, these two variables are related. The next section shows the nature of this relationship and provides a simple methodological framework to examine the factors associated with investment and capital productivity in China and India.

3. METHODOLOGICAL FRAMEWORK

Our methodological framework consists of two related pieces. First, following the classical tradition, profit rates play a central role in determining investment and capital accumulation. Through their role on capital accumulation, classical economists like Smith, Ricardo and Marx argued that the profit rate shapes

Table 2. *Decomposition of the growth rate of GDP at market prices (%)*[a]

Country	Year	$\left(\frac{I}{GDP}\right)$[b]	$\widehat{I}$[c]	$\left(\frac{G}{GDP}\right)$[d]	$\widehat{G}$[e]	$\left(\frac{C}{GDP}\right)$[f]	$\widehat{C}$[g]	$\left(\frac{X}{GDP}\right)$[h]	$\widehat{X}$[i]	$\left(\frac{M}{GDP}\right)$[j]	$\widehat{M}$[k]	$\widehat{GDP}$[l]
China	1980–2003	32.5	11.7	12.9	9.1	48.5	9.6	17.9	11.5	16.7	13.4	9.5
	1992–2003	36.5	14.5	12.6	8.7	45.5	8.5	24.1	16.4	21.6	17.8	9.8
India	1980–2003	21.4	6.8	11.5	6.2	67.2	5.4	9.1	9.7	10.5	9.6	5.7
	1992–2003	22.3	7.5	11.8	6.4	66.2	5.1	11.8	13.2	12.8	13.3	6.0

Source: Authors' estimates based on data from the World Bank World Development Indicators.

Algebraically: $\widehat{GDP} = \left(\frac{C}{GDP}\right)\widehat{C} + \left(\frac{I}{GDP}\right)\widehat{I} + \left(\frac{G}{GDP}\right)\widehat{G} + \left(\frac{X}{GDP}\right)\widehat{X} - \left(\frac{M}{GDP}\right)\widehat{M}$, where C is private consumption, I is investment (or gross fixed capital formation), G is government consumption expenditure, X is exports, and M is imports. Variables with a hat denote growth rate.

[a] Shares do not sum to 100% because changes in stocks are not included.
[b] The share of gross fixed capital formation.
[c] The annual growth of gross fixed capital formation.
[d] The share of government expenditure.
[e] The annual growth of government expenditure.
[f] The share of private consumption expenditure.
[g] The annual growth of private consumption expenditure.
[h] The share of exports.
[i] The annual growth of exports.
[j] The share of imports.
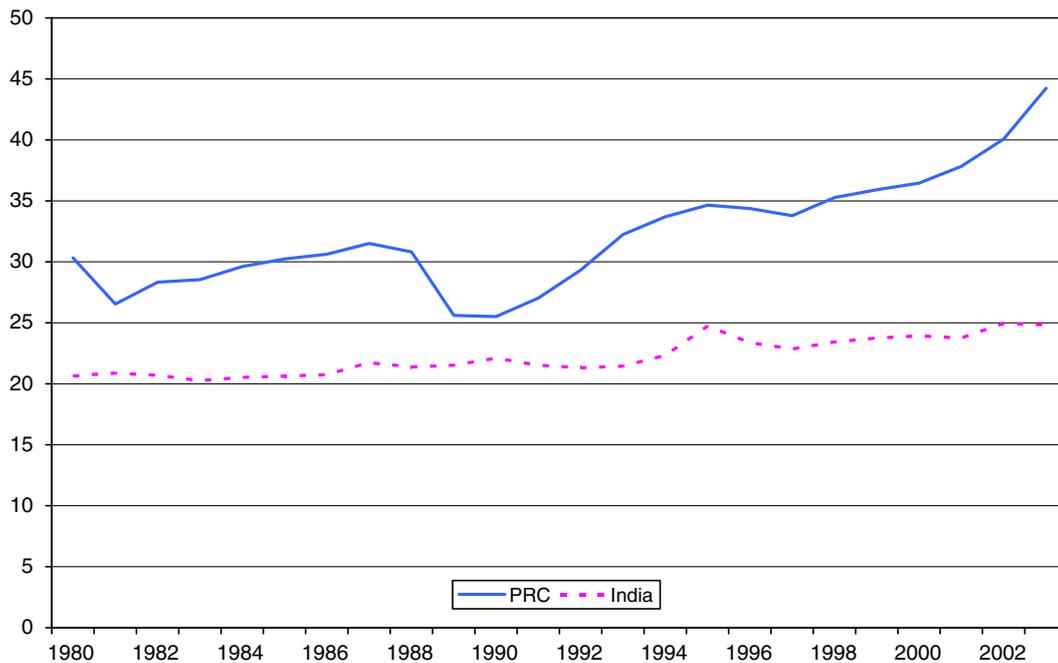[k] The annual growth of imports.
[l] GDP's annual growth rate.

Figure 3. *Gross fixed capital formation as a share of GDP (%). Source: World Bank: World Development Indicators.*

the growth rate of the economy. [8] Thus, we posit that causality runs from the profit rate to the rate of capital accumulation and from the latter to output growth.

The profit rate is, by definition, the ratio of the operating surplus (in short, profits) to the stock of capital, that is,

$$r_t = \frac{\Pi_t}{K_t},\tag{1}$$

where Π denotes profits and K is the constant-price value of the capital stock. [9] For the purposes of this paper, profits are computed as the difference between real Net Domestic Product (NDP) at factor cost and the wage bill (total labor compensation) also in real terms. Defined this way the profit rate is a real rate return net of indirect taxes and depreciation. Data on profits are taken from the National Income and Product Accounts (NIPA). [10] We computed China's capital stock, while that of India was taken from the Central Statistics Office. Detailed information on data and how the different series were computed is provided in the Appendix.

To better understand movements in r_t we decompose it as follows:

$$r_t = \frac{\Pi_t}{K_t} \equiv \frac{\Pi_t}{Y_t} \times \frac{Y_t}{K_t},\tag{2}$$

where $\pi_t = \dfrac{\Pi_t}{Y_t}$ is the share of profits in NDP (Y) and $\theta_t = \dfrac{Y_t}{K_t}$ denotes the productivity of the

capital (i.e., the inverse of the capital–output ratio). From this point of view, the rate of profit is *determined* by two factors, namely, the evolution of the capital share in the economy and the pattern of technical change, which affects θ. We will examine both factors in the next sections of the paper. Although decomposition in (2) is an identity (not a behavioral model), we use it in a somewhat causal way, implying that causality runs from the right-hand side to the left-hand side, that is, from the capital share and the productivity of capital to the profit rate. [11]

Why is the profit rate important? The profit rate, defined as the ratio of total profits to the capital stock, is a measure of the return to capital, and it is the key variable that shapes investment and capital accumulation. It influences investment via its impact on both expectations and the availability of finance. Kalecki's investment theory, for example, explicitly states the importance of profit rates and retained profits in determining the level of investment (Arestis, 1996). A high return on capital not only provides firms with incentives, but also with financial capacity to carry out investment. While a firm has several sources of financing, it often views retained earnings as the preferred source of financing, ahead of debt and equity (e.g., Brealey & Myers, 1991). In China and India, in particular, microeconomic evidence indicates that firms fund investment mainly out of retained earnings, a part of profits, due to under-developed financial markets (Dollar, Hallward-Driemeier, &

Mengistae, 2004).[12] Furthermore, even though a firm can raise funds through debt and equity, eventually it must rely on its profits to repay debt, and must provide returns to its share holders. Thus, it is natural to expect that profits play a major role in determining investment and capital accumulation. For these reasons, we concur with Balakrishnan and Babu (2003, p. 3997) who indicate that "...the rate of profit appears to us central to what drives entrepreneurs or their late capitalist avatar, the corporation." They go on to observe that "While we remain convinced of the importance of 'animal spirits,' acting to make investment an autonomous factor in macroeconomics, we believe that sustained investment cannot really be divorced from profits in any meaningful way" (Balakrishnan & Babu, 2003, p. 4001).

Recall that the growth rate of the net capital stock $\widehat{K}_t$ is given by the expression $\widehat{K}_t \equiv \frac{I_t - \delta K_t}{K_t} \equiv \frac{I_t}{K_t} - \delta$, where δ is the depreciation rate. For purposes of our calculations, since we use NDP (i.e., depreciation is subtracted), this expression for $\widehat{K}$ can be written as

$$\widehat{K}_t \equiv \frac{I_t}{Y_t} \times \frac{Y_t}{K_t} \equiv \tau_t \times \theta_t, \qquad (3)$$

where $\tau_t = \frac{I_t}{Y_t}$ is the investment share and $\theta_t = \frac{Y_t}{K_t}$ denotes the productivity of the capital.

The second piece of the methodological framework is the National Income and Product Accounts (NIPA) accounting identity from the income side. This relates the variables above and allows us to construct consistent data sets for both economies. The NIPA accounting identity is as follows:

$$Y_t^N \equiv P_t Y_t \equiv W_t^N + \Pi_t^N \equiv w_t^N L_t + r_t^N K_t, \qquad (4)$$

where Y^N and Y are nominal and real NDP at factor cost, respectively; P is the output deflator; W^N is the wage bill in nominal terms; Π^N denotes total profits. The right-hand side of the accounting identity decomposes the wage bill and total profits into the products $W^N = w^N L$ and $\Pi^N = r^N K$, where w^N is the nominal wage rate; L is the number of workers; r^N is the nominal profit rate; and K is the constant-price value of the stock of capital.

In real terms this expression becomes:

$$Y_t \equiv W_t + \Pi_t \equiv w_t L_t + r_t K_t, \qquad (5)$$

where $Y \equiv (Y^N/P)$, $W \equiv (W^N/P)$, $\Pi \equiv (\Pi^N/P)$, $w \equiv (w^N/P)$ and $r \equiv (r^N/P)$. Also note that $\pi \equiv \frac{\Pi}{Y} \equiv \frac{rK}{Y}$ is the share of profits in NDP and $1 - \pi \equiv \frac{W}{Y} \equiv \frac{wL}{Y}$ is the share of wages in NDP.

In per-worker terms, expression (5) can be written as

$$y_t \equiv w_t + r_t k_t, \qquad (6)$$

where $y = \frac{Y}{L}$ is the productivity of labor and $k = \frac{K}{L}$ is the capital–labor ratio, which can be rewritten as

$$w_t \equiv y_t \left[1 - \frac{r_t}{\theta_t} \right], \qquad (7)$$

which is known as the *real wage-profit rate* or *growth-distribution schedule* (Foley & Michl, 1999). It will allow us to analyze the direction of technical change. At the macroeconomic level, technical change from period to period is reflected in movements in the growth-distribution schedule. This schedule indicates that in an economy there is a trade-off between wage and profit rates, given labor and capital productivity. Moreover, it indicates that the maximum value of the wage rate is given by labor productivity (when the profit rate equals zero) and the maximum profit rate is given by capital productivity (when the wage rate is zero). The growth-distribution schedule can be used to characterize the bias of technical progress (Hahn & Matthews, 1964, p. 830). Any pattern of technical change can be decomposed into a combination of labor-saving and capital-using (or saving) technical changes. Technical change that $\hat{y} > 0$ (labor-saving) and $\hat{\theta} < 0$ (capital-using) is referred to as Marx-biased technical change. The case where $\hat{y} > 0$ (labor-saving) with $\hat{\theta} = 0$ (neither capital-saving nor capital-using) is referred to as Harrod-neutral technical progress (pure labor-saving). The case $\hat{y} = \hat{\theta}$ (equally labor and capital-saving) is referred to as Hicks-neutral technical change. And when $\hat{y} = 0$ (neither labor-saving nor labor-using) and $\hat{\theta} > 0$ (capital-saving), and is referred to as Solow-neutral (pure capital-saving).

In growth rates the accounting identity (5) becomes

$$\widehat{Y}_t \equiv \pi_t \hat{r}_t + (1 - \pi_t)\hat{w}_t + \pi_t \widehat{K}_t + (1 - \pi_t)\widehat{L}_t. \qquad (8)$$

This expression states that the growth rate of output equals the sum of the growth rates of the factor prices ($\hat{w}_t$ and $\hat{r}_t$) plus the sum of the

growth rates of employment $(\widehat{L})$ and the capital stock $(\widehat{K})$, each weighted by the corresponding factor share. It is again important to stress that this expression is an accounting identity.

Our methodology possesses the merit of being simple, yet analytically sound. Still, a number of caveats must be born in mind:

(i) The analysis is restricted to long-run trends. Thus, it leaves aside the short-term impact of profitability changes on many macroeconomic variables.

(ii) Comparability of profit rates across countries may be an issue, though no more serious and potentially problematic than that of comparing the GDP per capita of these two countries. Differences in measurement of capital stocks in particular raise questions about the comparability of profit rates and growth rates of capital stocks. We have been as careful as possible in constructing the series (see Appendix). Nevertheless, data availability and reliability for India and China are nowhere near those for more advanced economies. For the time being, we have to be content with the basic information available from which we construct our series and we hope to improve our measurements in future research.

(iii) The analysis is carried out at the level of the total economy. This masks important differences between agriculture, industry and services as well as between private and public sectors.

(iv) As noted in the Introduction, the paper focuses on the nexus among a small number of macroeconomic variables. It does not address, at least directly, many other issues and policies that are related to economic growth in China and India, such as employment and labor market reforms (and economic reforms in general), demography, macroeconomic stability (e.g., fiscal situation), education, institutions, or the political situation in both countries.

4. PROFITABILITY AND THE INVESTMENT POTENTIAL IN CHINA AND INDIA

To trace the factors behind the differences in capital accumulation and investment between China and India, in this section we look at profitability, the investment potential of the two economies and capital productivity. In the next subsection, we calculate the profit rate according to the definition in identity (1), and then we analyze its determinants according to decomposition (2). Of the two determinants, capital share and capital productivity, in this subsection we analyze the first one. We also compute an additional measure of profitability, namely, the incremental profit rate. In the second subsection, we analyze the investment potential of the two economies. Finally, in the third subsection, we analyze capital productivity in both economies.

(a) *Profitability*

Figure 4 shows the average profit rates for the two economies. The obvious difference between the two series is that they have moved in opposite directions. In China, the profit rate has declined from 13.5% in 1980 to 8.5% in 2003, while in India it has increased from 11.5% in 1980 to 16.5% in 1999. China's profit rate averaged 10.9% for 1978–2003, and India's 14.3% for 1980–99.

Is the decline in Chinese profitability a robust finding? Lardy (2002, p. 14), for example, provided estimates of China's profit rate for the State Owned Industry for 1978/1999. His estimates show a very large decline in profitability, from about 25% to about 5%. An update of this result is provided in Lardy (2002–03). [13] Also, Lin (2001, Table 7.2, p. 185) has documented the sharp decrease in average profit rates in China across a number of products during 1985–95, such as bicycles (from 44.9% to 0.2%), motor cycles (from 18.4% to 8.6%), sedan cars (from 41.6% to 18.3%), buses (from 40.1% to −0.3%), refrigerators (from 32.2% to 8.1%), washing machines (from 30.0% to 2.9%), air-conditioning units (from 30.0% to 6.4%), and beer (from 24.2% to 2.5%). [14]

Likewise, Balakrishnan and Babu (2003, Table 8) document the evolution of profit rates across 15 Indian manufacturing industries. They compared the average annual rates for 1973–74 to 1990–91 to the average annual rate for 1991–92 to 1999–2000. The average of the 15 industries is almost identical, 13.06% in the first period and 13.93% in the second, and in eight industries the profit rate increased. [15]

It is not easy to explain why China's profit rate has declined while that of India has increased. Different theories would provide different insights. [16] In the context of our analysis, the profit rate can be written as the product of the capital share in output times the productivity of capital, identity (2) above. [17] Figure 5
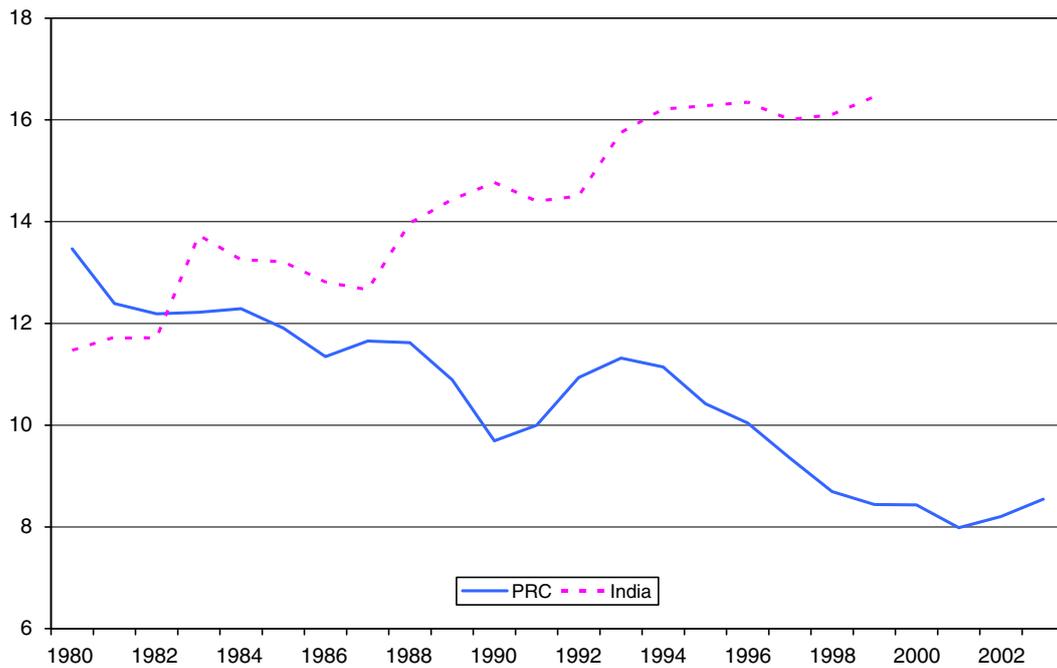
Figure 4. *Profit rate, China and India (%). Source: Authors' estimates. See Appendix.*

shows the capital shares of the two countries. The difference in the evolution of this series explains (at least partially) why the profit rate has declined in China while it has increased in India. During 1980–2003, capital lost about 7% points in China, from about 36% to about 29%.[18] Naturally, this implies that labor's share increased by that much. On the other hand, India's capital share has increased from about 41% to about 44%.

To further explore the relationship between profitability and investment, we look at another measurement of profitability, the incremental profit rate (ICPR). This is calculated as the ratio of the change in profits between two periods to investment of the initial period, that is

Figure 5. *Capital share, China and India (%). Source: Authors' estimates. See Appendix.*

$$ICPR_t = \frac{\Pi_t - \Pi_{t-1}}{I_{t-1}},\qquad(9)$$

where I denotes real investment, and Π denotes real profits. The ICPR measures changes in profits between two periods relative to recent investment. Expectations of future returns are sensitive to the evolution of profits in relation to past recent investments. The dynamics of the increm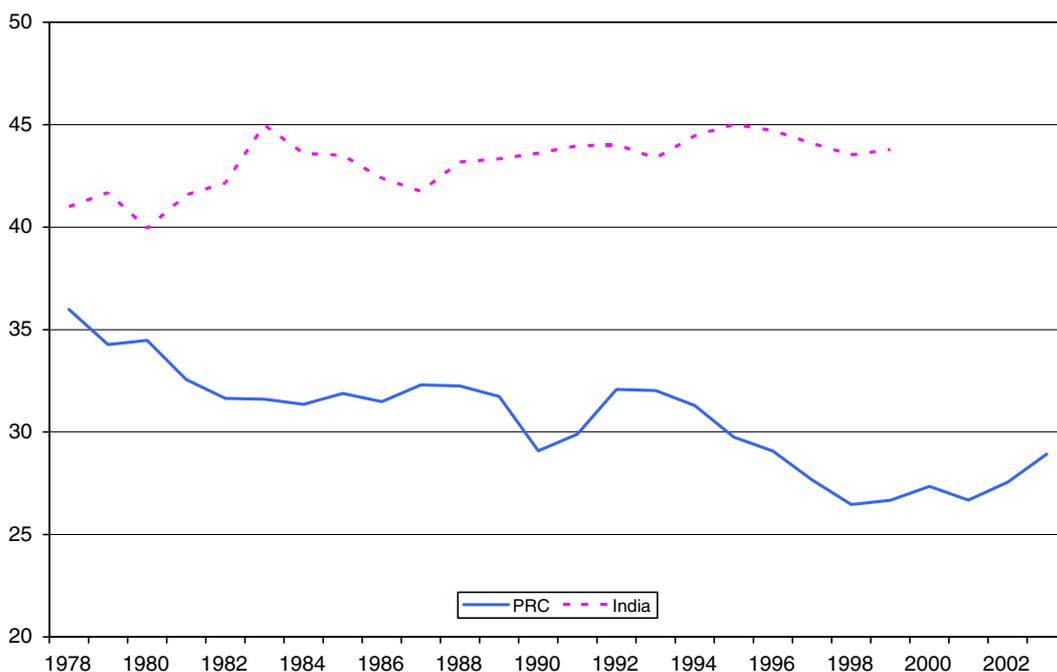ental profit-rate provides an indication of the movement of the average profit rate and leads future expectations driving investment growth. While the average profit rate is important in the long term, the ICPR is more a measure of short-term profitability. The change in profits produced by recent investments is a thermometer shaping businesses' immediate expectations and investment plans. Indeed, rising profits signal healthy economic conditions, which are likely to make firms adopt a more optimistic stance and thus proceed with their investment plans. The opposite holds if profits are falling. Therefore, planned investment growth is likely to be influenced by the dynamics of recent profit changes. That is, the growth of profits produced by recent investments is the indicator that shapes businesses' future profit expectations as plans for the future are, to some extent, shaped by the current outcome of near past expenditures.

Econometric analysis for China shows that the ICPR is an important factor influencing investment growth and capital accumulation. In particular: (i) Granger-causality tests indicate that the ICPR Granger-causes investment growth and capital accumulation; (ii) changes in the profit rate are important in explaining capital accumulation and the growth rate of the investment share, but only in the short run; (iii) the same occurs when the two components of the profit rate, that is, capital share and capital productivity, are introduced as separate regressors: both help explain capital accumulation and the growth rate of the investment share, but only in the short run.

Given China's much higher investment growth, documented in Table 2, one would expect China's ICPR to be higher than that of India. However, data once again reveal some unexpected results (Figure 6). India's ICPR averages 10.4% for 1981–99, compared to an average of 6.6% for 1978–2003 for China.

The fact that India's average profit rate and incremental profit rate are higher than those of China is intriguing. Given the expected positive correlation between accumulation and investment and the profit rate, one would expect the differences to be in the other direction. Though certainly there are other factors influencing investment decisions, the fact that average profitability and ICPR are lower in China poses the interesting question of why investment is so high in China compared to India.[19]
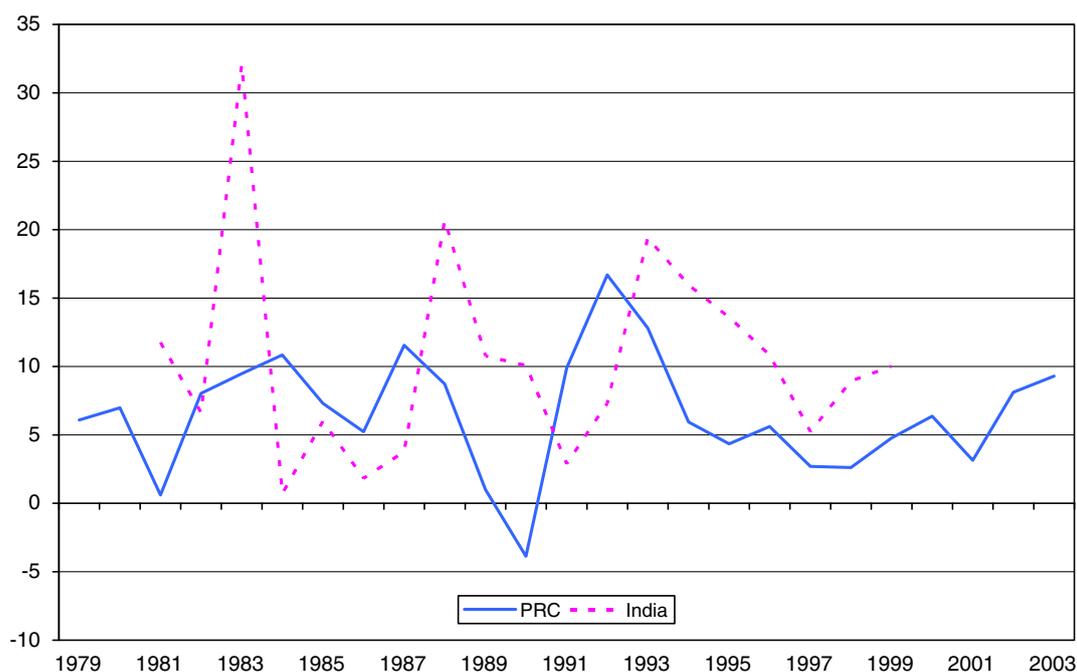

Figure 6. *Incremental profit rate, China and India (%). Source: Authors' estimates. See Appendix.*

(b) *Investment potential*

To shed some light on the question in the previous paragraph, we investigate the investment potential of the two economies. Theoretically, the maximum sustainable growth rate of an economy occurs when all profits are reinvested as productive inputs (Kaldor, 1937; Von Newman, 1945–46). [20] This occurs when the growth rate of capital equals the rate of profit. This result can be derived from the "Cambridge equation" (Pasinetti, 1962) or simply from a Harrodian warranted growth (i.e., the rate of growth necessary to absorb society's saving in investment projects) path with a Kaldorian classical savings function, which implies that $I = s_c \Pi$, where s_c is the propensity to save out of profits. Dividing both sides by K, it follows that $(I/K) = \widehat{K} = s_c(\Pi/K) = s_c r$. [21] An implication of this relationship is that, in the long-run, the highest possible investment (I_{max}) will be achieved when all available enterprise profits (Π) are plowed back as productive inputs, and this occurs when all profits are saved, that is, $s_c = 1$. This implies that, in the long-run, the maximum rate of capital accumulation ($\widehat{K}_{max}$) cannot exceed the profit rate (r), without affecting the rate of inflation (Shaikh, 1999). Algebraically

$$I_{max} = \Pi \text{ so that } \left(\frac{I}{K}\right)_{max} = \left(\frac{\Delta K}{K}\right)_{max}$$

$$= \widehat{K}_{max} = \frac{\Pi}{K} = r. \tag{10}$$

Thus, one can interpret the ratio of the actual growth rate of capital accumulation ($\widehat{K}_{ACT}$) to the profit rate, or *throughput coefficient*, $\zeta = (\widehat{K}_{ACT}/r) = (I/\Pi)$ as an indicator of the degree to which the growth potential of the economy is being utilized (Shaikh, 1999). [22] A ratio below 1 indicates that the country's capacity for investment is not fully utilized. The more this ratio approaches 1, the higher the probability that excess demand will end up accelerating inflation rather than boosting growth. In some sense it is an indicator of the tightness of the economy.

Figure 7 plots the ratio between the growth rate of the capital stock and the profit rate in China and India. The chart reveals a remarkable contrast between the two economies. In China, the rate of capital accumulation has been close to, or exceeded, the profit rate. The average ratio from 1979 to 2003 was 1.1. The rate has been especially high since 1995 with the ratio averaging 1.4 during 1995–2003. [23] India exhibits a very different picture. The ratio between the growth rate of capital stock and profit rate averaged 0.3 from 1980 to 1999, with very small fluctuations.

These results indicate that India differs from China in terms of how much profit has been plowed back into investment. In China virtually all profits are reinvested, with the consequence that actual investment has outstripped the capacity provided by profit and has led to the creation of overinvestment and overcapacity. [24]
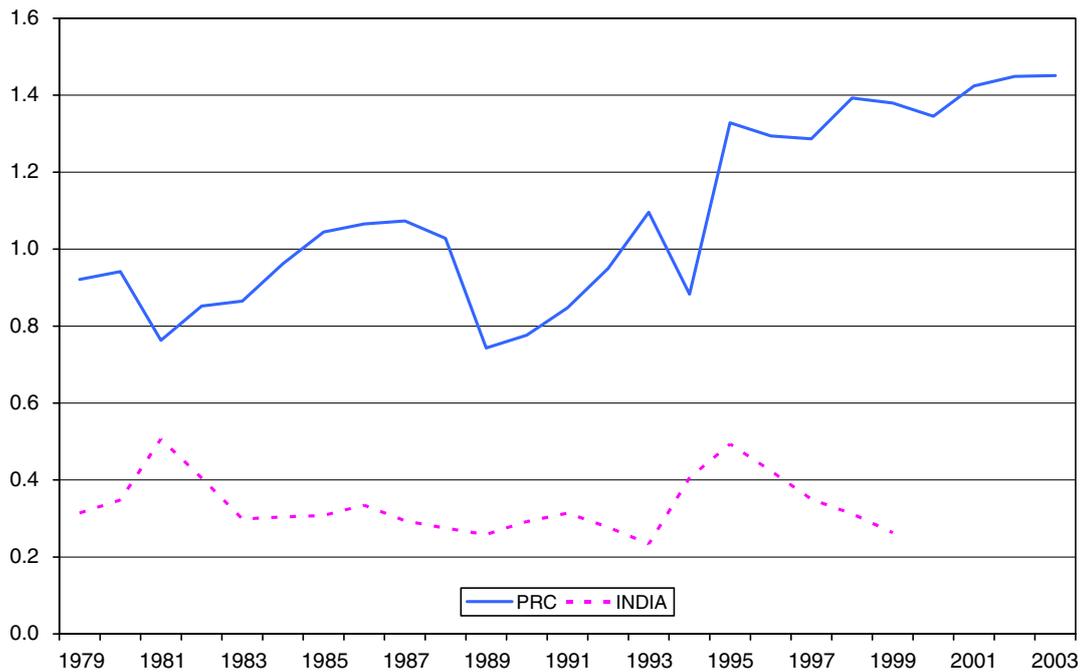

Figure 7. *Ratio growth rate of the actual capital stock to the profit rate. Source: Authors' estimates. See Appendix.*

Why is so much profit reinvested in China? A large part of these profits come form State Owned Enterprises. These companies do not pay dividends and face incentives that are biased toward investment, as local officials are promoted largely on their success in generating economic growth, which comes through investment. Thus, a large part of these profits is used for capital expansion (as much as 20% of all investment in China comes from local governments) without efficiency considerations.

In India, however, investment represents about two thirds of profits. While profit provides a means and capacity for investment, whether this capacity is utilized depends on other factors. For example, in their analysis of India, Banerjee, Cole, and Duflo (2005, p. 139) argue "that there is clear evidence that socially and even privately profitable lending opportunities remain unexploited in the current environment." [25] Why are not more profits reinvested? The fiscal deficit is one reason. Another one is India's relatively poor investment climate that affects the performance of the manufacturing sector. More will be said in Section 6.

It is worth noting that Keynes (1936, p. 323) distinguished between two different types of overinvestment, *strict* and *relative*. The former takes place when the rate of return is negative, and the latter when investments "are destined to disappoint the expectations which prompted them" (Keynes, 1936, p. 320). These investments lead to a positive rate of return but lower than that expected at the time they were decided. It would be incorrect to assert that China, as a whole, today suffers from a problem of overinvestment in the strict sense. The true state of affairs reflects overinvestment in the relative sense. New investment during last few decades has been on so enormous a scale that the prospective yield of further additions is falling rapidly. Indeed, this situation is typical of a prolonged phase of high investment.

The contrast between China and India points to two very different challenges confronting the two economies. China's chief issue is how long such a high growth of investment can be sustained. China's success story to date is very much related to high investment growth. How can this continue without any major destabilizing effect is a question that policy makers must face. For India, the data indicate that there is tremendous scope to increase investment to fulfill the potential provided by profit. The importance of understanding why investment falls short of the potential that profits provide and addressing the impediments to investment cannot be over-emphasized. [26]

(c) *Capital productivity*

As shown above, the other important variable explaining variations in the profit rate and capital accumulation is the productivity of capital (see identities (2) and (3)). Capital productivity measures the amount of output produced per (monetary) unit of capital and can be interpreted as an indicator of the efficiency with which capital is used. [27] A comparison of capital productivity between India and China once again reveals a major difference between the two countries (Figure 8). While capital productivity has increased in India, it has declined in China. During the two decades examined, capital productivity fell from over 40% per annum to about 30% per annum in China. In India, however, it increased from about 30% per annum to about almost 40% per annum.

This is a very important and revealing finding, which attests to the inefficiency, or poor utilization, of China's capital resources *vis-à-vis* India's. Though this aggregate measure of capital inefficiency may hide many factors such as the sectoral composition of investment, and the high rate of urbanization in China, which requires capital-intensive physical infrastructure, at least the findings raise legitimate doubts as to the productivity of the capital being used. Indeed, it seems that India allocates capital substantially more efficiently than China, which reflects greater transparency, better corporate governance, and more developed domestic capital markets. A probable cause of why this has happened in China but not in India lies in the recent Chinese industrialization effort, which is leading to an oversupply of infrastructure services, housing, and consumer goods in the urban areas. Nevertheless, "capital productivity [in China] is probably still high, however, for investment in social capital (health, education, etc.) especially in rural areas. It is, therefore, hard to say whether China is investing too much, but it is certainly misallocating at least some of its investment" (Blanchard & Giavazzi, 2005, p. 9). [28] Why does this matter if growth remains robust? The flip side of the fact that a significant portion of China's high growth in recent years has come from investment is that a good share of this investment is likely to prove unproduc-
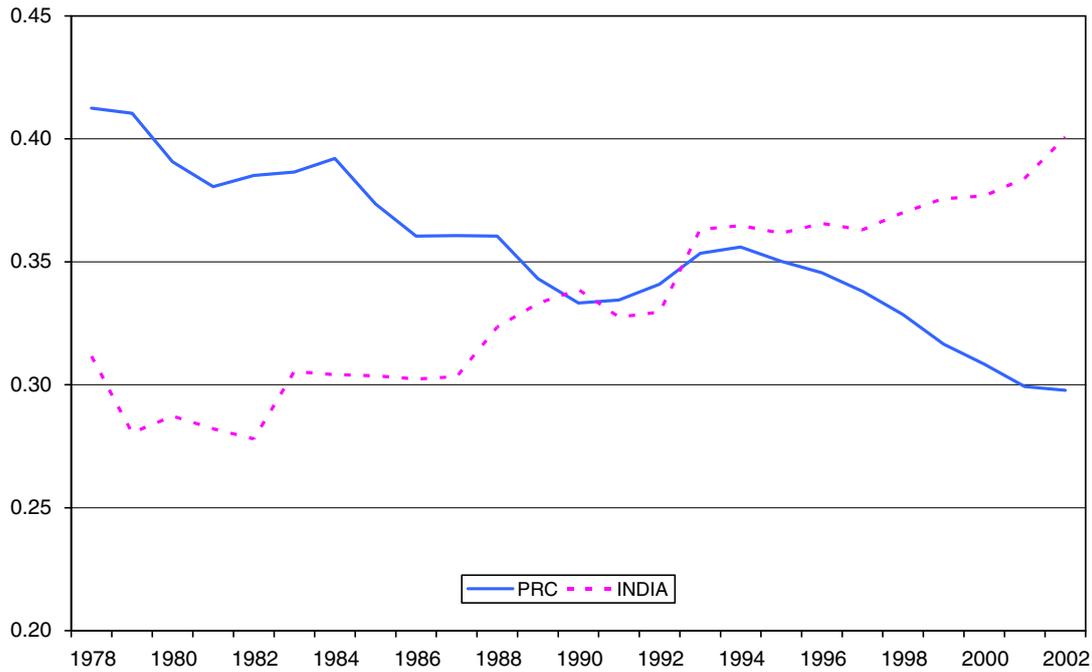
Figure 8. *Capital productivity, China and India. Source: Authors' estimates. See* Appendix.

tive in the long-run. "Even building bridges to nowhere can raise output in the short term but is hardly a good use of resources" (Prasad, 2005, p. 46).

The above findings indicate the following:

(i) the decreasing capital productivity in China is lessening the contribution of a high and increasing investment share to the rate of capital accumulation, expression (3). In the case of India, on the other hand, the increasing capital productivity is playing a positive role. However, the differential in the investment share between the two countries is so large that India's increasing capital productivity cannot compensate its much lower investment share, resulting in a much smaller growth rate of the capital stock [29];

(ii) the declining capital productivity adds to the declining capital share as an explanation for the declining profit rate in China. The opposite happens in India; and

(iii) with declining capital productivity (i.e., $\widehat{K}_t > \widehat{Y}_t$), a falling profit rate (i.e., $\hat{r}_t < 0$) is needed to open room for the wage rate growth ($\hat{w}_t$) to equal or exceed the labor productivity growth rate ($\hat{y}_t$) (i.e., $\hat{w}_t \geqslant \hat{y}_t$), and *vice versa*. This is what is happening in China. Algebraically, this can be shown by rearranging identity (8) [30]

$$(1 - \pi_t)(\hat{w}_t - \hat{y}_t) \equiv -\pi_t[\hat{r}_t + (\widehat{K}_t - \widehat{Y}_t)]. \quad (11)$$

As shown in Table 1, the growth rate of the profit rate was negative. This has to be the case in an economy where capital productivity is declining, given that the growth rate of the real wage rate was above that of labor productivity. The opposite happened in India, namely, capital productivity and the profit rate have increased, but real wages have not grown faster than labor productivity.

Figures 9 and 10 graph the series ($\hat{w} - \hat{y}$) and $\hat{r}$ for the two countries. The two series move, in general, in opposite directions, although this is much clearer in the case of China, where capital productivity is decreasing.

5. DECLINING CAPITAL PRODUCTIVITY AND MARX-BIASED TECHNICAL CHANGE

Is China's declining capital productivity a puzzle? While the relevance of labor productivity is well established theoretically and documented empirically in the literature for it is an important determinant of important variables like long-run growth, living standards and inflation, much less is known about capital productivity. The relevance of the latter, nevertheless, has been raised by some authors. The "general belief" is, probably, that capital productivity should, like labor productivity,
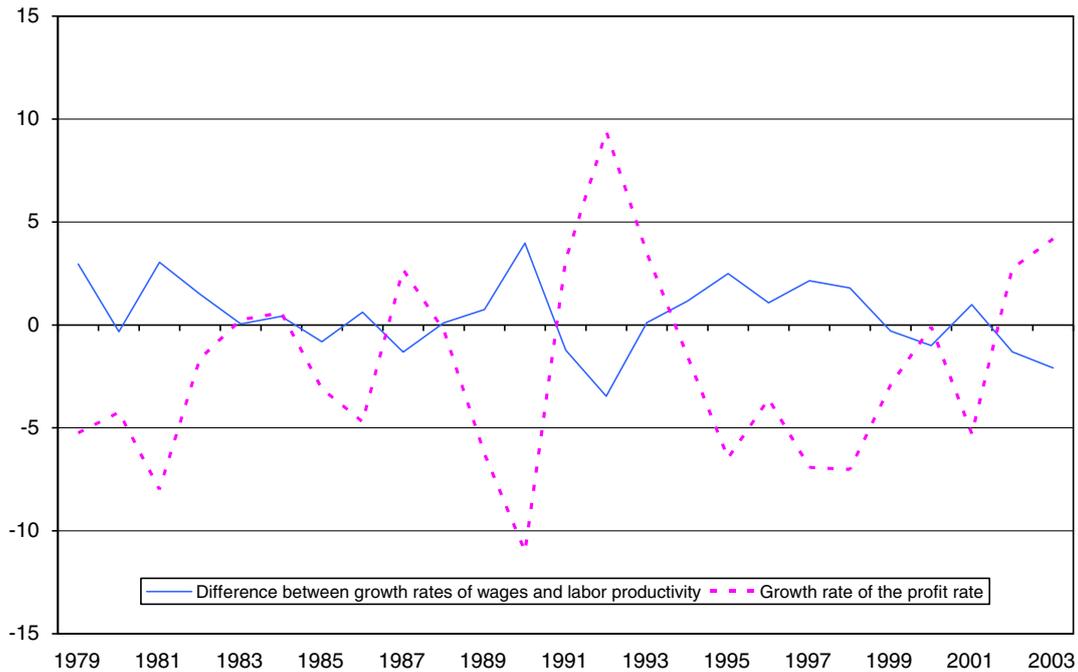
Figure 9. *Growth rate of wage rate minus that of labor productivity and growth rate of the profit rate (%). China. Source: Authors' estimates. See Appendix.*
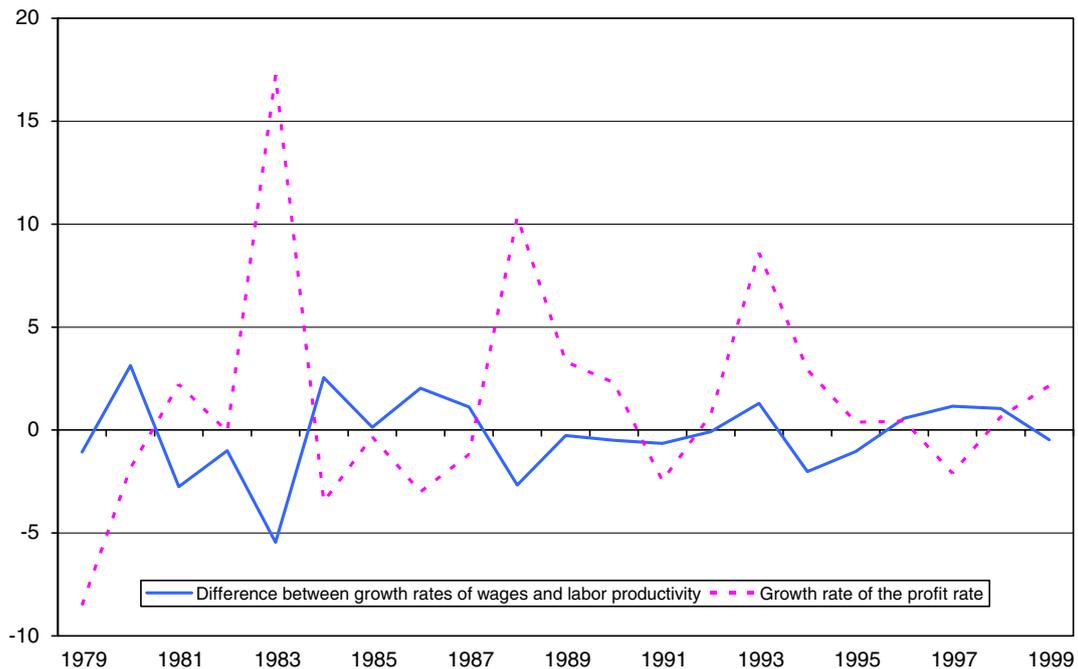
Figure 10. *Growth rate of the wage rate minus that of labor productivity and growth rate of the profit rate (%). India. Source: Authors' estimates. See Appendix.*

increase. For example, Lewis (2004) has indicated that

"To understand growth potential, you have to understand two things. You have to understand how fast labor productivity can grow and whether adequate capital is available for additional capacity. Labor productivity always tells you the amount of goods and services produced by the people who are working. If we just increased labor productivity and added no capacity, then the amount of goods and services produced would stay the same and lots of people would be unemployed. We have to build new factories and office buildings to provide places for these people to work. That requires additional capital. *Since capital also can be applied with different*

efficiencies, we have to understand capital productivity and how fast it can increase. The more efficiently we use capital, the less capital we need to create additional capacity and new jobs for growth." (Lewis, 2004, p. 253; italics added). [31]

To place the India–China experience in an international perspective, Figure 11 graphs the capital productivity of these two countries alongside those of Hong Kong, Japan, Korea, Singapore, Taiwan and the United States for 1970–2000. [32]

Figure 11 reveals an interesting pattern. This is that capital productivity has not increased over time in any of the economies graphed. Either it has declined or stayed approximately constant. India had one of the highest capital productivities in 1970, together with China and Taiwan. But unlike the latter two countries, India's has stayed approximately constant. Moreover, in 2000 India had a level of capital productivity that was two to three times that of the other countries in the graph, including China which, together with Taiwan, had undergone a sharp decline.

This seems to indicate that declining capital productivity is the "norm" across the world. Falling capital productivity, alongside rising labor productivity has also been noted by other researchers. For example, Foley and Michl (1999) have documented that while labor productivity has increased persistently over the last two centuries, capital productivity has declined in many countries, including the United States, Japan and across the European Union. At a theoretical level, perhaps the first economist to note this path of economic development was Marx. Technical progress characterized by labor-saving and capital-using, which leads to a higher capital labor ratio, higher labor productivity, and decreasing capital productivity is referred to as *Marx-biased technical change* (Foley & Michl, 1999). [33] Foley and Marquetti (1999) and Marquetti (2003) have documented the prevalence of the Marxian bias across developed and developing economies.

This pattern of technical progress stems from the interplay between the capital–labor ratio (k), capital productivity (θ), and labor productivity (y) (note that $y = \theta \times k$). A rising capital–labor ratio leads to higher labor productivity. However, when the rate of capital accumulation rises faster than output growth, capital productivity falls. This raises the vexing question of whether falling capital productivity combined with rising labor productivity is an *unavoidable* path of economic development. The available empirical evidence for many countries seems to suggest so (Marquetti, 2003).

When one considers a cross-section of countries, there appears to be a negative correlation between labor productivity and capital productivity, as shown in Figure 12.
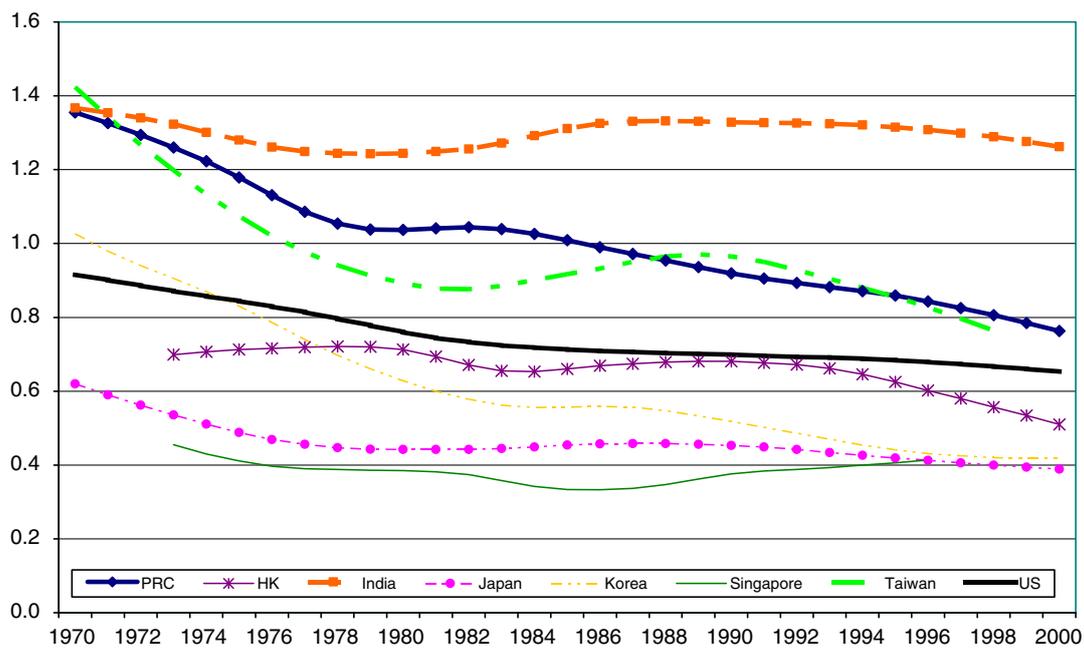

Figure 11. *Capital productivity of selected countries (PPP 1996 US$ prices). Source: Extended Penn World Table.*
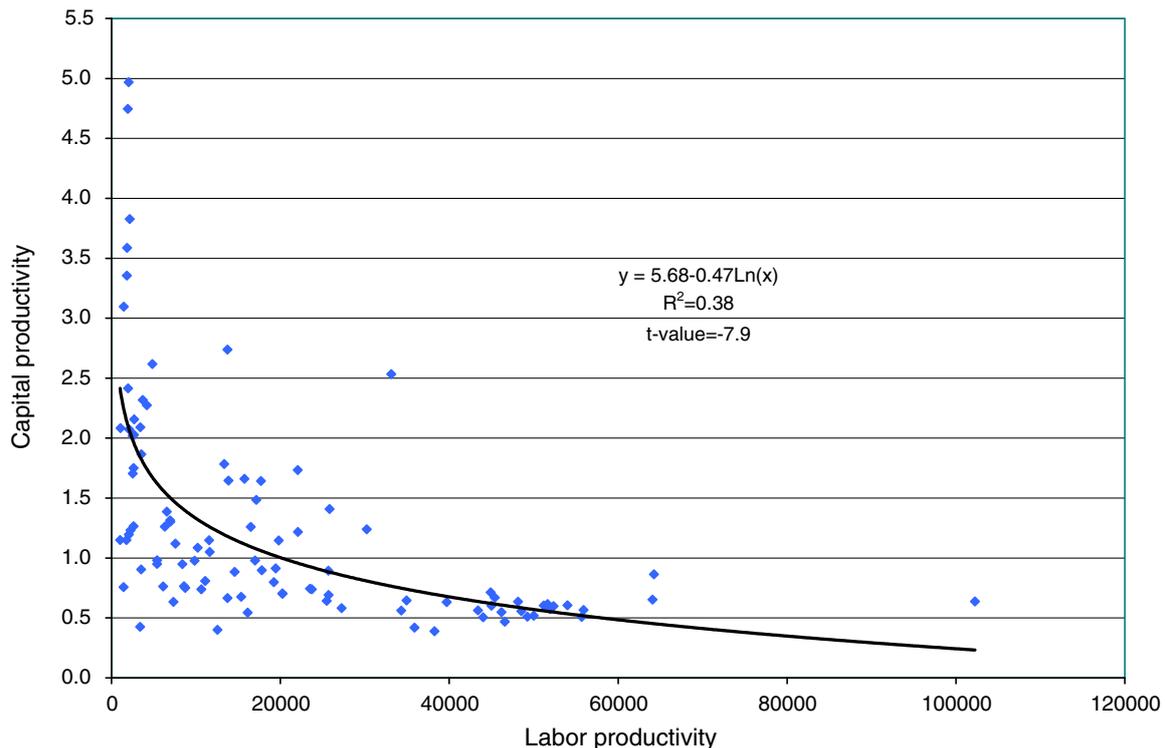
Figure 12. *Capital productivity and labor productivity in 2000 (PPP 1996 US$ prices). Source: Extended Penn World Table. The variable used is capital productivity adjusted for the business cycle.*

And likewise, there is also a negative relationship between the capital–labor ratio and capital productivity, as shown in Figure 13.

Figures 14 and 15 plot labor and capital productivity and the capital–labor ratio for China and India. Figure 14 shows that, in China, capital productivity and labor productivity, as well as the capital–labor ratio, move in the opposite directions. Figure 15 for India indicates that the three variables move in the same direction. During 1980–2003, China's labor productivity rose at an annual average rate of 8.0% and the capital labor ratio at a rate of 9.5%, while capital productivity decreased at a rate of 1.3% per annum. In contrast, during 1981–99, India's labor productivity increased at an annual average rate of 4.1%, the capital labor ratio at a rate of 2.6%, and capital productivity at a rate of 1.5%.

The analysis indicates that, perhaps, the *anomalous* path of capital productivity seems to have taken place in India, and not in China. China has witnessed the process of a rising capital–labor ratio, rising labor productivity, and declining capital productivity experienced by many other countries.

The degree of labor-saving technological progress can be measured by the percentage increase in labor productivity ($\hat{y}$). Likewise, the degree of capital-saving technical change can be measured by the percentage increase in capital productivity ($\hat{\theta}$). As argued in Section 3, expression (7), that is, $w_t \equiv y_t \left[1 - \dfrac{r_t}{\theta_t} \right]$ can be used to analyze the direction of technical progress in a country. This expression can be plotted in the (w, r) space. This is a straight line with its horizontal intercept equal to capital productivity (θ) and its vertical intercept equal to labor productivity (y). The growth-distribution schedule graphed at different points in time can help discern the direction of technical progress. In the (w,r) space, the Marx-biased technical change corresponds to a clockwise rotation of the schedule around the horizontal intercept. Given that the slope of the schedule ($\partial w/\partial r$) is given by the (negative of) the capital–labor ratio ($\partial w/\partial\ r = -(y/\theta) = -k$), this movement implies an increase in capital intensity.

Figure 16 reveals that Marx-biased technical change has taken place in China. India, on the other hand, seems to be better characterized possibly by something that resembles Hicks-neutral technical change (Figure 17). [34] China has experienced substantial increase in labor productivity, wage rates, and capital labor ratio
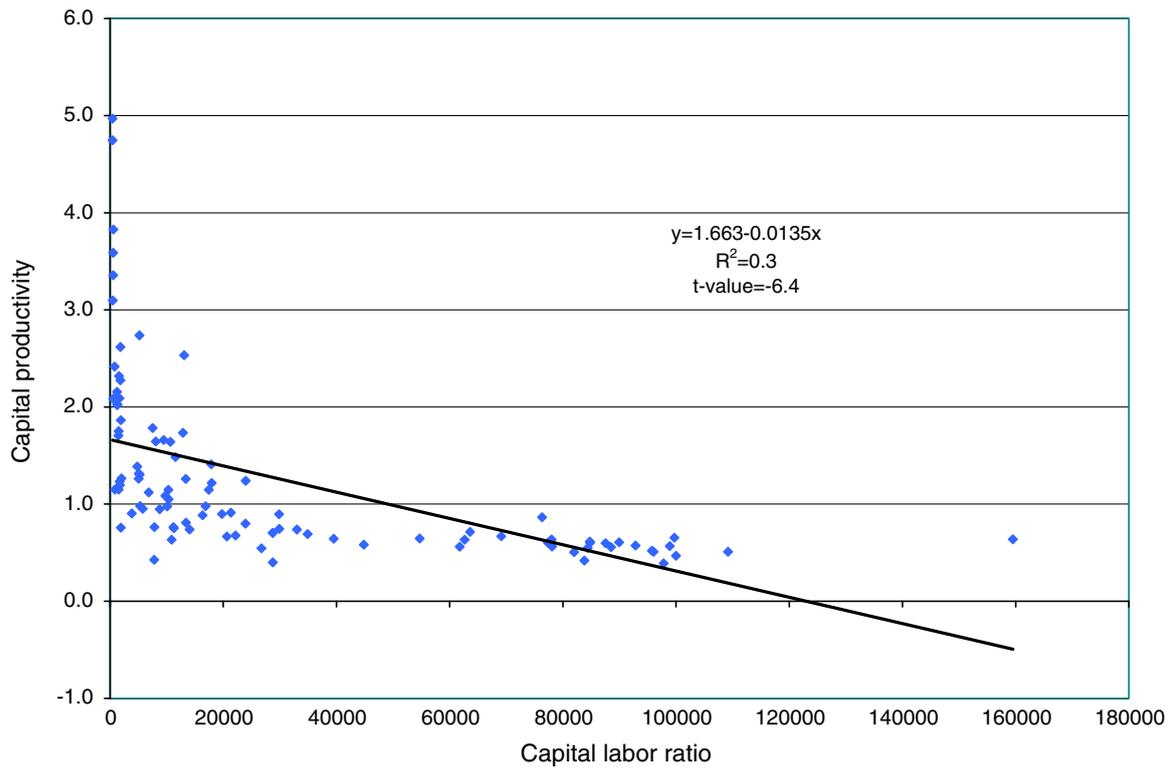
Figure 13. *Capital–labor ratio and capital productivity in 2000 (P 1996 US$ prices). Source: Extended Penn World Table. The variable used is capital productivity adjusted for the business cycle.*
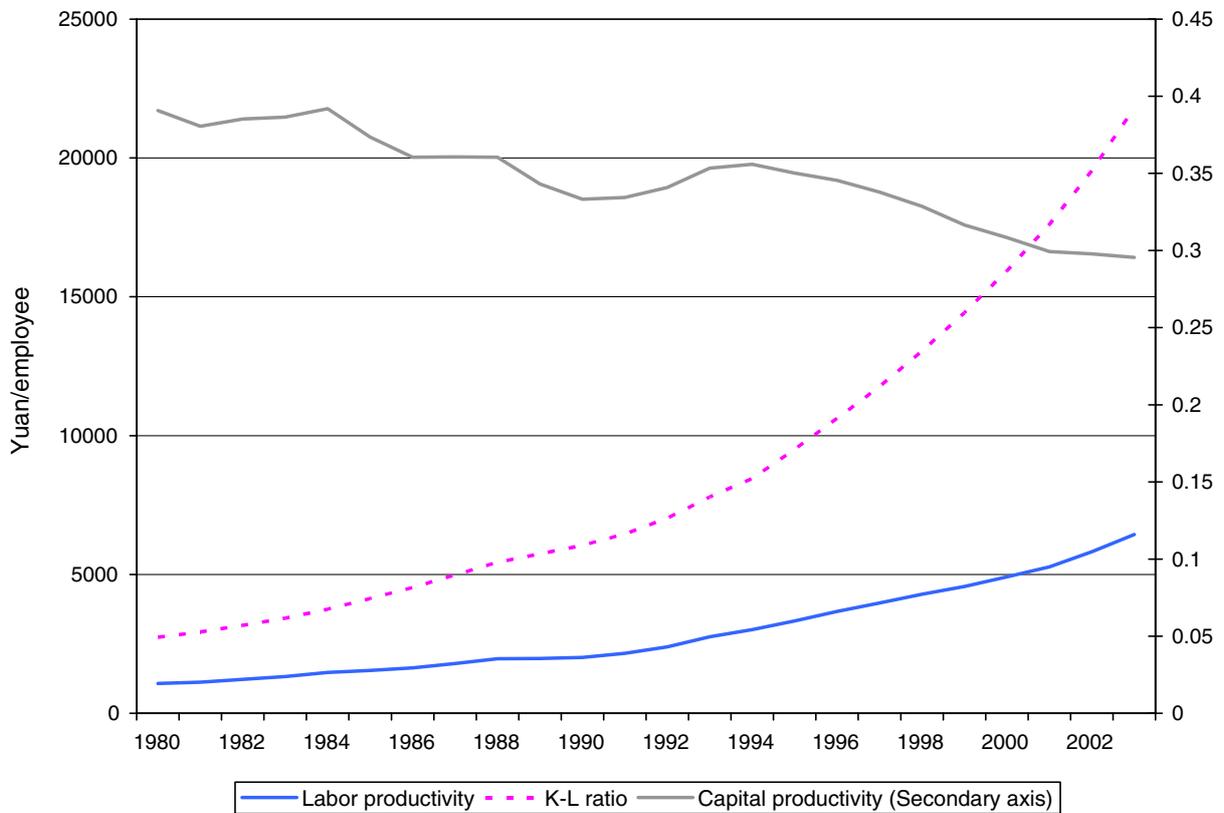
Figure 14. *Labor productivity, capital productivity, capital–labor ratio (K/L), China. Labor and capital productivity are measured in Yuan/employee in the left scale. Capital productivity: right scale. Source: Authors' estimates. See Appendix.*
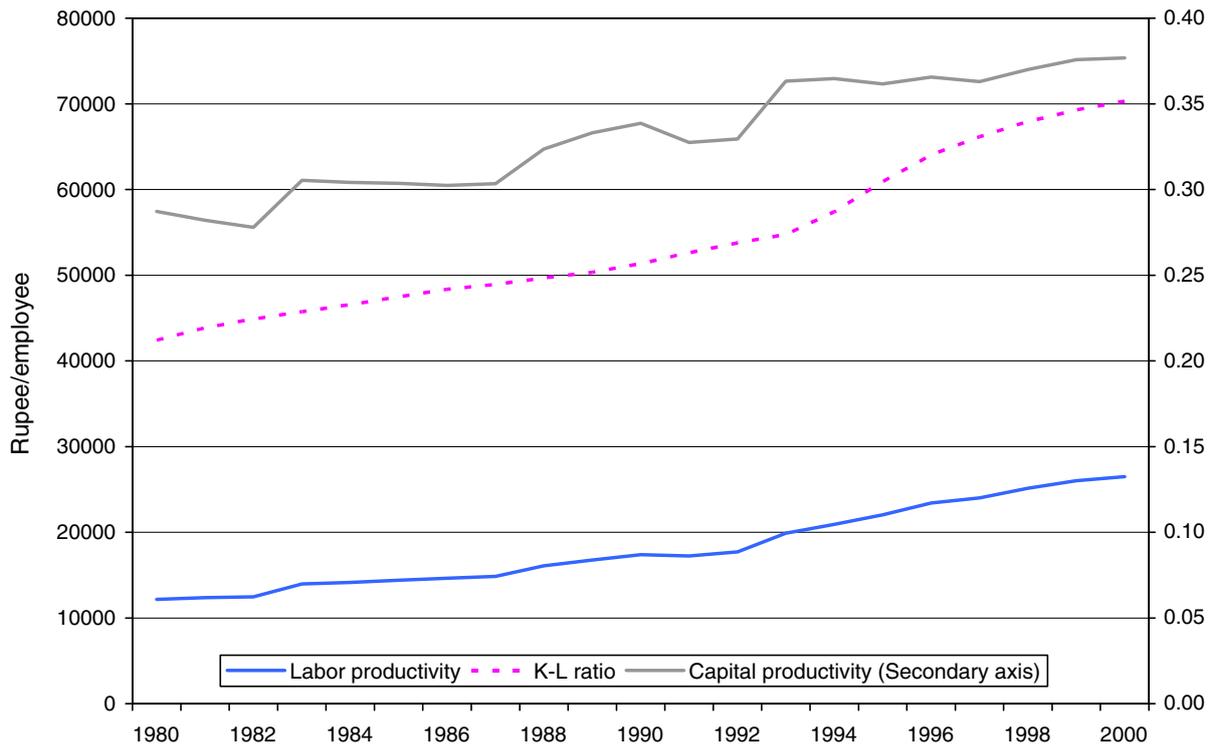
Figure 15. *Labor productivity, capital productivity, capital–labor (K/L) ratio, India. Labor and capital productivity are measured in Rupee/employee in the left scale. Capital productivity: right scale. Source: Authors' estimates. See Appendix.*
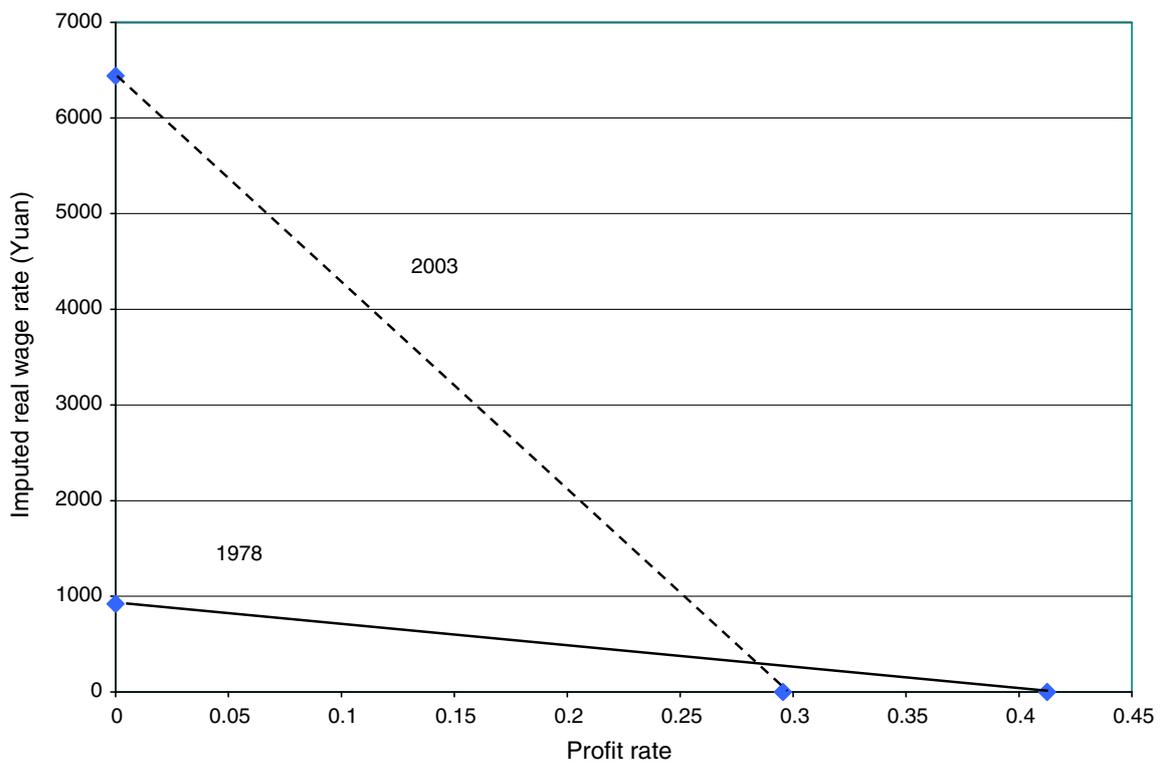
Figure 16. *Growth-distribution schedule. Labor and capital productivity are measured in Rupee/employee in the left scale. Capital productivity is measured in the right scale. China. Source: Authors' estimates.*
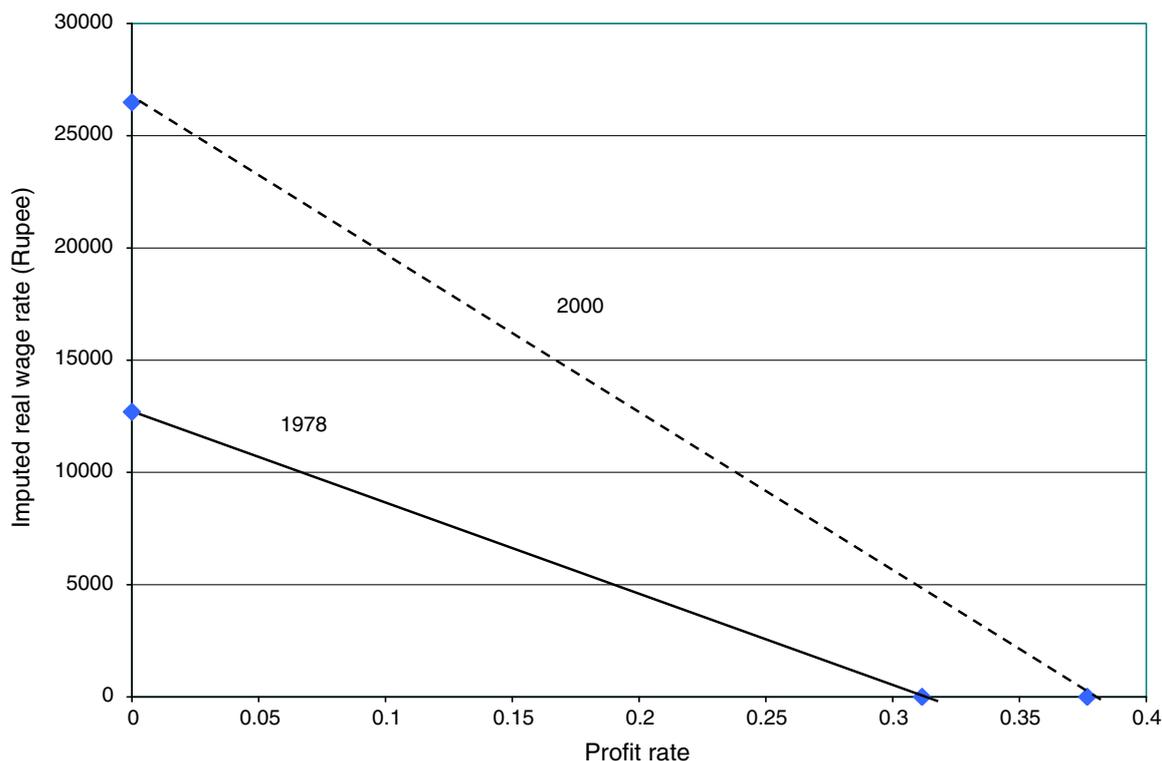
Figure 17. *Growth-distribution schedule. India. Source: Authors' estimates.*

since the early 1980s. On the other hand, capital productivity and the profit rate declined. This is exactly as predicted by Marx. In India, however, labor productivity, wage rates, capital–labor ratio, capital productivity, and profit rate have all increased moderately over the past two decades. In China, the rapid rise in labor productivity was achieved through a high rate of capital accumulation, leading to an increasing capital–labor ratio. This offsets the effect of declining capital productivity. The growth of the capital–labor ratio in China was spurred by high investment growth. In India, moderate growth rates in capital productivity and capital labor ratio are associated with moderate growth of labor productivity.

The conclusion of this analysis is that declining capital productivity is not a puzzling finding, but a normal state of the growth and development process. Higher labor productivity can be considered an *objective* in itself since it is the most important determinant of living standards. In this sense, increasing the capital–labor ratio and declining capital productivity can be seen more as *instruments* toward achieving increases in labor productivity growth. To achieve high labor productivity, capital accumulation has to be rapid. As Lewis (2004, p. 250) indicates, becoming a rich country without any additional capital is virtually impossible.

The Marxian bias is thus associated with the desirable outcomes of higher labor productivity and per capita income. However, there is another side to the story, as the notion of Marx-biased technical change is also related to the decline in the profit rate. Marx argued that the tendency for the profit rate to fall had to be explained in conjunction with rising labor productivity due to induced technical change. The key question to understand this line of argument is as follows: why would entrepreneurs introduce technologies that lower the profit rate? The answer to this question lies in the difference between how the individual entrepreneur behaves and what happens at the aggregate level (Foley & Michl, 1999, pp. 120–123). The individual firm's pursuit of higher profit rates leads to the introduction of labor-saving techniques that eventually lower the profit rate at the aggregate level. [35] For this reason, however, Marx-biased technical change is not sustainable. A falling profit rate can eventually slow down the accumulation of capital and the growth of output. At some point, the lower profit rate will translate into very low or even negative capital accumulation through depreciation and obsolescence, and

the capital stock of the economy would decrease. Most real economies tend not to reach this point because periods of declining capital productivity are followed by periods of increasing capital productivity. [36]

Therefore, Marx-biased technical change embodies an intrinsic dilemma and contradiction. On the one hand, an increasing capital–labor ratio leads to higher labor productivity, which itself leads to higher per capita income as well as to a higher wage rate. On the other hand, an increasing capital–labor ratio is associated with lower capital productivity, and a declining profit rate. The latter can constrain capital accumulation and limit economic growth. Economic development may lie in a balance of these two countervailing forces.

6. THE CHALLENGES FACING INDIA AND CHINA: FUTURE GROWTH

"Can India surpass China?" Is no longer a silly question, and, if it turns out that India has indeed made the wiser bet, the implications—for China's future growth and for how policy experts think about economic development generally—could be enormous. Huang and Khanna (2003, p. 76)

This section discusses the challenges that both economies face, in the case of India how to accelerate growth, and in the case of China the dilemma of whether to maintain the high growth rate, or to reduce it. The section also provides estimates of medium-term growth.

(a) *India: the need for additional investment*

Figure 18 graphs India's actual growth rate and the trend growth rate, estimated using the Hodrick–Prescott filter. [37] The figure indicates that the trend rate picked up significantly after 1980. Until this year it remained consistently below 4%. It then started picking up and since then it shows a clear upward trend. It is approaching 7%. How much can India grow in the next few years?

India's investment–output ratio is only about 55% that of China, and grows much more slowly. While India's capital productivity has been increasing, it has only been higher than that of China since 1996 and by 2002, India's capital productivity was above that of China by about 10 percentage points. On the other hand, the gap between the investment–output ratios of the two countries has widened more. Between 1981 and 1999, China's investment share was above India's by 12.9 percentage points on average. In 1999, the gap was 17.9 percentage points. Thus, the rising investment share has played a major role in explaining China's rapid capital accumulation and, therefore, the difference in capital accumulation between
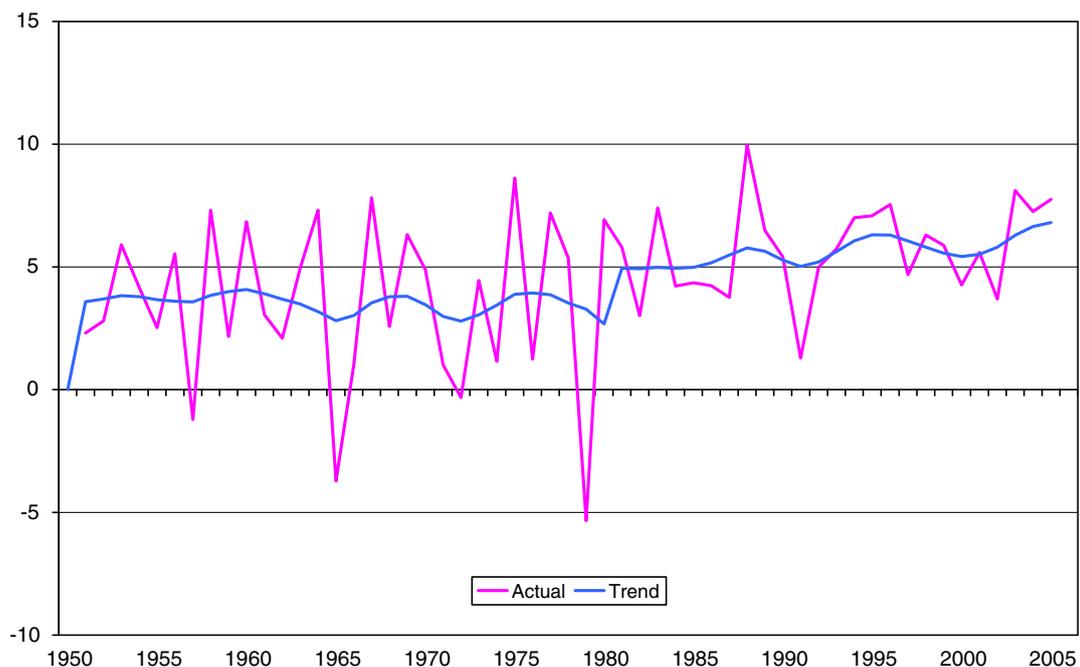

Figure 18. *Actual and trend output growth rates, India (%). Source: Authors' estimates. See* Appendix.

the two economies. This indicates that although capital productivity matters, a high investment share is needed to increase the speed of capital accumulation.

Rodrik and Subramanian (2004a) have recently projected India's future potential output growth rate through to 2025. In a growth accounting exercise assuming a Cobb–Douglas production function with constant returns to scale, they assigned a (constant) capital share of $\pi = 0.35$. The capital stock was assumed to grow by 8.3% annually, compared to the actual growth rate of 4.7%, during 1980–2003. This substantial increase was justified by the authors on the grounds that India's dependency ratio will decline. This, in turn, will lead to a higher savings rate and greater investment growth. The labor force was assumed to grow by 1.9% based on the current rate of increase in the working age population. Finally, they assumed that total factor productivity (TFP) would grow by 2.5% a year, the same rate of the previous two decades (according to their calculations). Under these assumptions, Rodrik and Subramanian (2004a) came up with a growth forecast of 7% per year for output, and 5.6% for per capita output for the next 20 years for India. They referred to it as the "potential output growth" of the economy and argued that India can grow *at least* by this much.

We have used expression (8) to obtain an estimate of medium-term growth. According to Table 1, $\varphi_t \equiv \pi_t \hat{r}_t + (1 - \pi_t)\hat{w}_t \cong 3\%$ for 1980–1999. We follow Rodrik and Subramanian's (2004a) optimistic assumptions and hypothesize that the growth rate of the capital stock $(\widehat{K})$ almost doubles and reaches 8% [38]; that employment continues growing $(\widehat{L})$ by about 2% per annum. Finally, factor shares remain at their past values (i.e., $\pi = 0.43$). This leads to the conclusion that India's annual average growth rate in medium term is about 7.6%. Our interpretation, however, is that India's average growth rate in the medium term is unlikely to exceed this figure. This is because a growth rate of the capital stock of 8% and a growth rate of output of 7% will most likely lead to a nil or even negative growth rate of the profit rate as $\hat{r}_t = \hat{\pi}_t + \widehat{Y}_t - \widehat{K}_t$. Therefore, assuming that $\varphi_t \equiv \pi_t \hat{r}_t + (1 - \pi_t)\hat{w}_t \cong 3\%$ is rather optimistic for it implies, implicitly, a positive contribution of the growth rate of the profit rate to output growth (i.e., still an increasing profit rate).

The key to reaching and sustaining growth rates of 9–10% rests, as argued above, in a sub-stantially higher investment share. The conventional growth accounting framework (Solow, 1957) is a useful starting point to analyze the impact of investment on growth. In this framework, technological progress is regarded as exogenous, that is, it is independent of variables such as investment. As is well-known, the growth accounting equation is derived by differentiating the production function, expressing it in growth rates and assuming that the factors of production are paid their marginal products. Algebraically:

$$\widehat{Y} = \varphi_t + \pi_t \widehat{K} + (1 - \pi_t)\widehat{L}, \tag{12}$$

where $\widehat{Y}$ is the growth rate of output, φ_t is the growth rate of TFP, $\widehat{K}$ is the growth rate of the capital stock, is the growth rate of employment and $(1 - \pi_t)$ are the capital and labor shares in output, respectively. With capital productivity in India at about 0.40 (Figure 8), a 5% point rise in the investment-to-output share (τ) (consistent with the target of the Tenth Plan) would raise the growth rate of the capital stock $(\widehat{K})$ by 2.0% points, that is, $\tau \times \theta = 5\% \times 0.40$. The growth rate of output $(\widehat{Y})$ would then be raised by $\pi \times 2.0\% = 0.45 \times 2.0\% = 0.90\%$. This is a short-term effect. The decrease in capital productivity $(\hat{\theta} = (\widehat{Y} - \widehat{K}) < 0)$ of 1.1% would subsequently reduce the impact of the higher investment share on the growth rate of the capital stock, so that the increments to the growth rate would also fall off. Output would converge to a new higher level. Certainly the desired increase in τ is a very significant one. Much of this new investment needs to be directed into infrastructure, the government's number one priority (even ahead of fiscal consolidation). However, the public sector is in no position to embark on an expansionary fiscal policy to stimulate public investment. The conclusion is that it appears that India will not be able to emulate China and achieve (and in particular sustain) growth rates of 9–10% within the next few years without addressing the need for fiscal consolidation.

The low ratio of the rate of capital accumulation and the profit rate in India documented in Section 4 suggests that India possesses a large untapped investment potential that can lift growth to the rates that China has achieved. As such, it is imperative to understand and address the impediments to its full utilization. Existing studies suggest that, despite economic reforms, hurdles to investment are still high as the investment climate is far less favorable than that of China (Dollar

et al., 2004). India is also less open to foreign investment than China. Desai (2005, pp. 17–19) argues that India's hopes of growing faster depend on less government and on harnessing the private sector. He concludes: "My own view is that India will remain a soft state, a consensual polity, and it will not be capable of sustained growth at the sort of rates which China has attained" (Desai, 2005, p. 19). Lewis (2004) has noted that: "India has by far the most restrictions and barriers on the development of the manufacturing and service industries of all the countries we have studied. Restricting the manufacturing of 836 products to small scale industries and prohibiting investment in India by the world's most productive retailers from France, the United Kingdom, and the United States are just two examples" (Lewis, 2004, p. xxix). [39] This poses a big hindrance to competitiveness in business that might benefit from economies of scale. And: "[1991] Licenses to do business were abolished in most industries. However, abolishing licenses merely removed the outer peel of the onion. Underneath this lay a morass of barriers to India's economic progress" (Lewis, 2004, p. 216). Meanwhile, a large government deficit and public debt impair much needed public investment. Although it is clear that India needs reforms, more research is needed to disentangle obstacles to investment. To unleash its growth potential, India needs to implement policies to ease barriers to investment (ADB, 2006, pp. 158–167). In the final analysis this should lead to a restructuring of the economy such that industry acquires a much higher share. As Panagariya (2005, pp. 193–195): "Why does this matter? Because typically, under liberal trade policies, developing countries are much more likely to be able to expand exports and imports if a large portion of their output originates in industry."

(b) *China: The limits to growth*

As shown above, capital accumulation depends on the investment share as well as on capital productivity. While China's investment share has increased, its capital productivity has declined. The rising investment share, however, has been the dominant factor, leading to rapid capital accumulation. During 1980–2003, China's capital stock grew by 11.3% per annum on average, far outpacing the annual average of 1.6% growth in labor. The increased capital intensity (i.e., increase in the capital–labor ratio) further contributed to labor productivity and per capita income growth.

The Chinese experience since 1978 has largely been a success story. Rising capital intensity (Figure 15) has offset the effect of falling capital productivity, leading to higher labor productivity and rapid growth of per capita income. The growth rates of labor, capital, wage rates, and profit rates imply a growth rate of about 10.0% (Table 1). The question confronting China is how long can the high investment growth continue? Figure 19 shows the actual and trend growth rates for the Chinese economy, the latter also calculated using the Hodrick–Prescott filter. China's trend growth rate has always been substantially higher than that of India. In the mid 1980s it reached 10%. After slowing in the late 1980s, it picked up again and reached 10% again in the early and mid 1990s. After a mild slow down, it seems to be picking up again and in 2004–05 it was over 9%. However, three factors discussed above deserve careful consideration in evaluating the capacity of the Chinese economy to maintain this growth rate: (i) falling capital productivity, which indicates inefficiencies and wastage of capital; (ii) falling profit rate, which will affect investment; and (iii) the fact that the rate of capital accumulation outstrips the profit rate, which indicates creation of excess capacity.

Chinese policy makers are aware of the problems of a growth strategy based on further capital accumulation driven by a higher investment share, and thus the 11th Five-Year Program, approved in March 2006, calls for a rebalancing of the economy with a view to relying more on private consumption. The Program intends to address a number of serious problems affecting the Chinese economy, such as overcapacity, income inequalities, unemployment and damage to the environment, and calls for an indicative growth rate target of 7.5% per annum during 2006–10 (see ADB, 2006, pp. 117–124 for an analysis. See also Blanchard & Giavazzi, 2005). [40] Chinese authorities have increased several times interest rates to dissuade investment, but the measure does not work. [41] Moreover, given the need of the Chinese economy to grow fast to create employment very rapidly, the flip side of such "low" growth rate is that the economy may not generate enough employment and lead to social tensions (Felipe & Hasan, 2006). Using also expression (8), if we assume a capital share of 0.3, that the growth rate of the capital stock slows to about 10% per annum, that employment grows by about
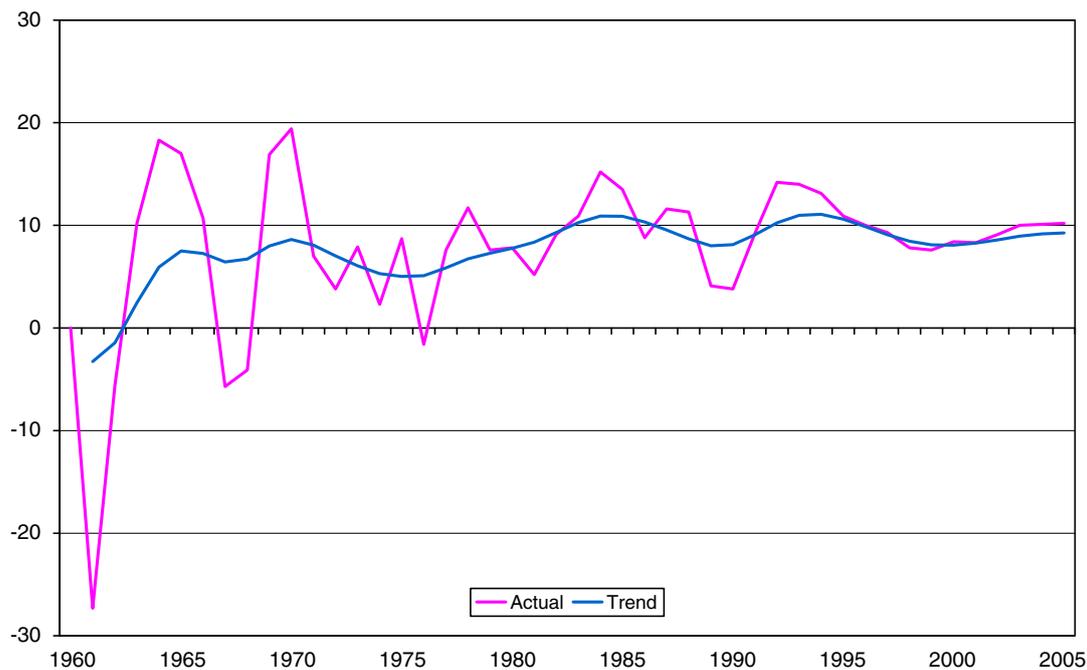
Figure 19. *Actual and trend output growth rates, China (%). Source: Authors' estimates. See Appendix.*

1.5% per annum, that the growth rate of the wage rate declines to about 8%, and that the growth rate of the profit rate stays at about −1.5%, one reaches the conclusion that during the 11th Five-Year Program China will continue growing at an average growth rate of about 9% per annum. [42] Thus China seems to be in a very peculiar dilemma, a knife edge between the need to reduce growth to address some problems and the need to keep up with a high growth rate to address other problems.

Is China's high growth rate sustainable? A falling profit rate is closely related to declining capital productivity. The declining profit rate and capital productivity that characterize the Chinese economy cannot go on forever, as noted above. While profit rates tend to decline as economic development proceeds, the speed of this decline may be a cause for concern in China. [43] It must be recalled that the sharp fluctuations in profitability in advanced countries since the mid-1960s were considered a major reason for the end of the golden age of the 1950s and 1960s, due to their dampening effect on investment (Bhaskar & Glyn, 1995). The fact that the rate of capital accumulation exceeds the profit rate in China further points to possible overinvestment and the need for correction. This overshadows the performance of China and raises questions about the sustainability of its economic growth. Eventually, a

low profit rate will curb investment, constrain capital accumulation, and impede economic growth. Investment expenditure could be stimulated by means such as government subsidies, lower interest rates, etc., but after a while, such stimulus would run into difficulties. There is a level of net investment which would lead to the stock of capital growing at the same rate as output, leading to a constant capital–output ratio. Attempts to promote a higher rate of investment would lead to further excess capacity and further declines in capital productivity. Since in China both capital share and capital productivity are declining, the only way to maintain investment levels in these circumstances (i.e., with a declining profit rate) would be through an even higher investment rate supported by more subsidies. [44]

Therefore, and as discussed in Section 5, increasing capital intensity in China seems to be a double-edged sword. On the one hand, it contributes to rising labor productivity and per capita income. On the other hand, it is associated with a declining profit rate and capital productivity, which can constrain investment and growth. The challenge facing China is how to maintain the high growth momentum. The experience of the advanced economies shows that the economic growth rate slows down as economies become more developed. However, at this point, a significant slowdown

in the growth rate of the Chinese economy could have very serious consequences.

The relatively fast decline in capital productivity prompted Wolf (2005) to argue that: "Given the opportunities it enjoyed and its investment effort, China should have grown even faster." The inefficiency of investment in China is confirmed by its large number of non-performing loans (NPLs). Despite large scale recapitalization of the stated owned banks, NPLs were as high as 13.2% of total loans or 12.6% of GDP at the end of 2004 (China Banking Regulatory Commission). [45] The high NPL ratio is indicative of the huge waste in China's investment. [46] While this may overshadow the performance of China and raises questions about the sustainability of its economic growth, it may also imply that there may be substantial efficiency gains to explore so that there still lies ahead a great growth potential for China. To improve investment efficiency, China needs to deal with the existing stock of NPLs. More importantly, it needs to tackle the fundamental factors that led to the formation of NPLs in the first place. Deepening financial and industrial reforms (i.e., SOE sector) is especially important. [47]

7. CONCLUSIONS

The robust growth of the Chinese economy and the rising growth rate of the Indian economy have generated much interest in comparing the economic performance and prospects of the two economies. This paper has used an exploratory framework, based on a series of simple decompositions derived from accounting identities, to document a number of stylized facts about the Chinese and Indian economies. Two commonly asked questions are: (i) what factors underlie the differences in growth between China and India; and (ii) whether India can match China's growth performance. This paper has tried to shed light on these questions by documenting the evolution of a number of macroeconomic variables and trace the possible causes behind the differences in investment growth in China and India.

A summary of the key findings is as follows:

(i) The most important factor underlying differences in growth between China and India is capital accumulation. This is mostly the result of a much higher investment-to-output ratio in China.

(ii) The two indicators of profitability calculated, the profit rate and the incremental profit rate, are higher in India than in China. This was a particularly puzzling finding given that investment growth and accumulation are substantially higher in China.

(iii) The rate of capital accumulation has been close to, and even exceeded, the profit rate in China. This ratio is taken to be an indicator of the capacity for investment and of the growth potential of the economy. The ratio in India has been much lower. Thus, India differs from China also in how much profit has been plowed back into investment.

(iv) Over the past two decades, the profit rate has declined in China and increased in India. Profit rates can be decomposed into the product of the capital share multiplied by capital productivity. In the case of China, both the capital share and capital productivity have fallen. In India, on the other hand, the capital share has been constant while capital productivity has increased. The latter variable explains the increase in India's profit rate.

(v) China's pattern of technical progress and development fits the so-called Marx-biased technical change. This is characterized by increasing labor productivity and decreasing capital productivity, together with a decreasing profit rate. Such technical change appears to be the norm across the world. Technical change in India seems to be Hicks-neutral.

(vi) If the current structures of the two economies are maintained, India will not be able to catch up or surpass China. To do so, India would need to increase substantially both its investment rate and the rate of capital accumulation.

(vii) China's success story to date owes much to the rapid growth in investment and capital accumulation. Rising capital intensity, however, may be a double-edged sword. On the one hand, it has paved the way for increased labor productivity and per capita income. On the other hand, it is associated with falling capital productivity and profit rates. The latter, together with the fact that the rate of capital accumulation is higher than the rate of profit, overshadows the performance of China and raises questions about the sustainability of its economic growth. Moreover, China faces immense

social pressures to create employment as unemployment and underemployment are growing. A necessary condition to create employment is to continue growing fast. This suggests that the two economies are confronted by two different challenges. For China, the dilemma is whether or not to sustain a high economic growth rate; while for India the question is how to accelerate economic growth. These are not easy tasks.

NOTES

1. See Desai (2005) for a recent comparative introduction to both economies.

2. Throughout this paper, the measure of output we use is Net Domestic Product (NDP) at factor cost, that is, Gross Domestic Product (GDP) at market prices minus net indirect taxes (to go from market prices to fact cost) and depreciation (to go from gross to net). Hence, the figures used are slightly different from those usually reported (i.e., GDP at market prices). The reason is that later in the paper we compute the stock of capital in net terms (i.e., without depreciation). To compare both variables, we prefer to compute both in the same terms. This is a relatively small issue and does not affect our qualitative statements. Nevertheless, in a few instances (mostly when we use published material) we use GDP.

3. Regarding the reliability of the Chinese growth figures, it is worth reading Studwell (2002), especially part II of the book, entitled *Miracle Deconstructed*. Studwell is very skeptical of many figures that tend to overstate the Chinese miracle. This is not an issue we pursue here. We accept the published figures, especially those in the National Accounts.

4. The recently edited volume by Tseng and Cowen (2005) contains a series of excellent papers on the two economies. Huang (2006) offers a comparative analysis of financial constraints. Wilson and Purushothaman (2003) provide comparisons for a group of countries that includes China and India. Papers discussing and comparing both economies certainly abound, but they tend to be reviews of the two economies without much empirical content, for example, The Economist (2005), Lal (1995), La Croix, Mark, and Woo (1999), Weede (2001), Huang and Jha (2004), Klein (2004). Ahluwalia (2002) and Sachs *et al.* (1999) are papers on India that provide some comparisons with China.

5. The other side of this high investment rates is China's high savings rate. See ADB (2006).

6. The Chinese high investment rate is, in principle, a boon for a developing economy, since these economies tend to be labor-abundant but capital-scarce. Indeed, one could point to China's relatively well-developed infrastructure—of higher quality than that in many other economies at a similar stage of development—as a positive effect of such investment. But the disturbing fact is that, in recent years, investment growth has been mostly concentrated in a few sectors such as aluminum, autos, cement, real state and steel. We elaborate upon this issue below.

7. Hong Kong is a different case in that the investment–GDP ratio has fluctuated at around 20% since 1960.

8. This is substantially different from the neoclassical model, where profitability is not considered, at least directly. In this theory, aggregate savings are independent of the distribution of income between wages and profits. Savings are transformed into investment through the interest rate. Even if profitability affected the investment share, this would have no effect on the long term growth rate. Higher investment leads temporarily to a higher growth rate of the capital stock, and thus a higher capital–labor ratio and, consequently, higher productivity. But the initial impact of investment on output growth is small and in the long-run diminishing returns to capital accumulation mean that additional savings are used up in maintaining the higher level of capital per worker. The result is that the growth rate of the capital stock and output go back to their original rates. From this point of view, the profit rate simply reflects the scarcity of capital in relation to labor, without any significant impact on the growth rate of output. In the endogenous growth models such as the "AK," government policies that increase the investment rate of the economy permanently will also increase the growth rate of the economy permanently, and the model generates growth that depends on the savings rate. But the profit rate continues being a variable not considered by these models. In the neoclassical theory of investment the profit rate does not affect investment. In this theory, investment is a function of the cost of capital and output.

9. As explained in the Appendix, the capital stock that we use to compute the profit rate excludes changes in inventories.

10. Since we use NDP at factor cost, our residually computed profit (as the difference between output and total labor compensation) is not identical to the operating surplus provided by the NIPA.

11. The reader will recall that earlier we indicated that the profit rate *causes* investment and capital accumulation; while now we seem to be reversing this causality. Note, however, that the variables considered in both statements are not the same. Moreover, as expression (2) is an identity, the issue of causality is clearly a red herring, and we admit that causality among the variables considered runs in all directions. Although most likely profit rates also *cause* in some way the capital share and the productivity of capital (e.g., through lags), we believe it is correct to argue that capital share and capital productivity *determine* the profit rate, and that the latter *causes* investment and capital accumulation. See also Note 21.

12. China's Statistical Yearbook shows that the share of extra-budgetary funds plus internal finance has increased from 55.4% in 1981 to 70.5% in 2003. We are thankful to Carsten Holz for providing us with this information.

13. Lardy's (2002) capital stock includes inventories (see our Appendix for a justification for why we chose not to include them). Despite this difference in computation, we find that his results and ours are very consistent. We are thankful to a referee for bringing Lardy's results to our attention. The same referee indicated that profitability in China has increased in recent years. Perhaps this temporary recovery in profitability is not inconsistent with a long-run (trend) decline.

14. In a speech in 2004, Shan Weijan (2004), Newbridge Capital's co-managing partner, gave a grim picture of the Chinese growth model in recent years, emphasizing the lack of profitability. Studwell (2002, chap. 7) details the cases of a number of foreign companies' investments in China gone sour. For example, referring to the beer industry he notes: "By the second half of the 1990s, there were many industries where it was a challenge to find more than one or two profitable foreign companies, despite billions of dollars of investment. Not one of the ninety foreign breweries was believed by peers to have turned a profit. In 1998, a survey of 229 foreign-invested businesses by management consultants A.T. Kearney showed that only 38 per cent of all manufacturers were covering their operating costs" (Studwell, 2002, p. 157). On the other hand, recent estimates by the OECD (2005) using data for 160,000 firms show that China's rate of return on capital (calculated as the ratio of the operating surplus to fixed assets plus inventories) increased during 1998–2003 across all types of companies. The average (i.e., all enterprises) increased from 6.1% to 12.2%; the rate of return of state-controlled companies increased from 4.8% to 10.2%. Nevertheless, when one considers the distribution of the rates of return of these companies, two-thirds of them make less than 5% and 35% make a loss; for collectively controlled companies the rate of return increased from 11.2% to 16.5%; and for private companies it went from 7.8% to 15.0% (OECD, 2005, Table 2.7 & Figure 2.7).

15. Beverages and tobacco from 62.44% to 63.97%; textile products from 46.00% to 61.74%; paper and paper products from 5.37% to 8.70%; leather and leather products from 14.10% to 35.23%; chemicals and chemical products from 12.39% to 18.22%; basic metals and alloys from 4.57% to 5.25%; transport equipment and parts from 11.41% to 17.62%; other manufacturing industries from 35.06% to 36.10%.

16. In the neoclassical model, for example, the marginal productivity of capital is constant in the steady state. Hence, the profit rate is constant too. On the other hand, the profit rate is decreasing in transitional dynamics. For Adam Smith, David Ricardo, and Karl Marx, the profit rate had an inherent tendency to decline. Smith argued that as competition for markets among capitalists increases, at some point capital accumulation reaches a maximum, and then the opportunities for profitable investment decrease. For Ricardo, the decrease in the profit rate was a consequence of the decreasing returns to land. For Marx, it was the result of the permanent increase in capitalization.

17. As indicated in Section 3, expression (2) above is not a behavioral relationship. It is, by construction, an identity. However, like in many relationships in macroeconomics there is a gray area between causality (behavioral relationships) and tautology (identities). Think, for example, of the relationships among the variables in the demand-side national income accounting identity. In the case at hand, although the decomposition is an identity, there is no doubt that causality among the three variables runs in all directions. It is worth noting that it could be argued that from a neoclassical point of view, the profit rate equals the marginal productivity of capital (i.e., $r = \partial Y/\partial K$) which, in the case of the Cobb–Douglas production function, equals the product of the output elasticity of capital (which equals the capital share under profit maximization and competitive markets) times capital productivity (i.e., $r = \pi \times \theta$). Hence, it might be inferred that the decomposition we use is simply a way of re-stating what every textbook shows. This argument is, however, incorrect. First, the equality between the profit rate

and the marginal productivity of capital in the neoclassical model is an equilibrium relationship derived from an optimization problem. Our decomposition, for being an accounting identity, is not theory-dependent. Second, the Cobb–Douglas production function, together with the assumption of competitive markets, implies constant factor shares. As we show in Figure 4, this is not the case here. And finally, the notion of marginal productivity of capital (at the aggregate level) requires the existence of an aggregate production function. As has been known for decades, aggregate production functions do not exist (Felipe & Fisher, 2003).

18. Young (1995, Table XXIII) provides the Chinese labor share for the total economy. His figures imply that the capital share has been fairly constant for a long time, at around 40%. The decline shown in Figure 5 is most likely due to the variables used in computing the capital share (i.e., NDP at factor cost).

19. It must be added that China receives much more FDI than India, $60 bn. dollars versus $5 bn. One important reason for the difference is that India imposes caps on FDI on sectors such as insurance, aviation, coal mining, or retailing, among others. The government has succeeded in raising the cap on FDI for telecoms, which recently increased from 49% to 74%. Huang and Khanna (2003) indicate that "China's success in attracting FDI is partly a historical accident—it is a wealthy diaspora. During the 1990s, more than half of China's FDI came from overseas Chinese sources" (Huang & Khanna, 2003, p. 80). Morgan Stanley (2006, p. 52) argues that FDI in India is deterred by the general business environment rather than specific FDI regulations.

20. Von Newman (1945–46) and Kaldor (1937) showed, under some restrictive conditions, that the rate of growth of an economy is maximum when it equals the profit rate. See also Kurz and Salvadori (1995).

21. This is a fundamental equation for the post-Keynesian school of thought, for it is the essence of their model of growth and distribution (Pasinetti, 1962). The equation says that the rate of profit does not depend on microeconomic technical conditions, or on relative physical endowments, like in the neoclassical model, but solely on macroeconomic variables, namely the rate of accumulation and the propensity to save on profits. We are expressing the Cambridge equation with the profit rate determining the rate of growth of accumulation. Some authors argue that causality runs the other way around, that is, from accumulation to the profit rate. This is a standing controversy. See Lavoie (1992, pp. 285–286).

22. This result derives from a closed-economy model. To our knowledge, the condition for an open economy has not been worked out and thus the implications of expression (10) should not be overstated. Nevertheless, we believe that it provides a rough guidance.

23. In practice, firms also borrow to finance their operations and investment plans, not only retained earnings. Hence, the ratio can go above unity. Lin (2001, Table 7.2, p. 185) documents the increase in the number of manufacturers across a number of products before the industrial reform, in 1985 and in 1995. For example, in 1978 there were 38 makers of bicycles. The number had increased to 672 in 1985 and to 1,081 in 1995. And the number of manufacturers of motorcycles increased from 194 in 1985 to 1,535 in 1995. The result is that capacity utilization in many sectors in 1995 was relatively low. Chinese authorities have acknowledged the relatively precarious state of the iron and steel industry, which probably will register losses in 2006. China's steel output capacity reached 470 million metric tons in 2005. However, and despite the problems of the sector, another 70 million tons of capacity is in the pipeline, most of them started by local governments. China is the world's biggest steel producer and consumer. Its annual steel output is equivalent to those of the United States, Russia, and Japan together. The country has 1,499 steel companies. Only 55 of them have an annual production capacity of more than 1 million tons. The government has acknowledged the overcapacity problem and has called for mergers, a restructuring of the sector and the introduction of technical innovations.

24. It is worth noting that despite high growth and the very high values of ζ in recent years, inflation in China remains tame since the late 1990s, when it has been below 5% and even negative. Apart from the fact that China has had good grain harvests, which has kept consumer prices in check, in 2005, the amount of retained profits of state-owned enterprises (SOEs) reached $70 billion. Huang and Khanna (2003) report that according to a 2002 World Bank study "only 52 percent of the Indian firms surveyed reported problems obtaining capital, versus 80 percent of the Chinese companies polled. As a result, the Indian firms relied much less on internally generated finances: only 27 percent of their funding came through operating profits, versus 57 percent for the Chinese firms" (Huang & Khanna, 2003, p. 78).

25. Latest data indicate that China's gross domestic savings rate is close to 45%, while that of India is about 25%. Certainly this provides an explanation for India's lower investment rate. However, what our analysis indicates is that India could do better in terms of investment despite its lower savings rate.

26. It is worth noting the complaints in the cellphone industry. India has the world's fastest-growing cellphone industry, expanding more than 50% a year and adding 5 million subscribers a month. However, regulatory roadblocks and foot-dragging by state-owned competitors is threatening to cool expansion in India's cellphone sector and is a source of frustration among telecommunication investors. While companies are spending billions of dollars upgrading infrastructure, they face bureaucratic bottlenecks beyond their control.

27. The concept of capital productivity is not a straightforward one. While labor productivity is the ratio of output to a measure of labor (usually employment or number of hours), capital productivity is a much more complicated notion due to the problems of measurement and interpretation of the concept of capital, in particular at the aggregate level (Cohen & Harcourt, 2003; Felipe & Fisher, 2003). Given that both numerator (output) and denominator (constant-price value of the capital stock) are measured in value terms, capital productivity is a unitless magnitude.

28. It may be speculated that the productivity of capital should have increased during the period under consideration due to technical progress. If indeed this were the case, then the observed decline in capital productivity would most likely be the result of a decline in utilization. This would tend to explain the decline in both the capital share and in the profit rate.

29. In 2005 and 2006, India achieved impressive growth rates of 8.1% and 9.2%, respectively. In a recent article in the Financial Times, Huang (2006) indicated that "India is achieving this result with just half of China's level of domestic investment in new factories and equipment, and only 10 percent of China's foreign direct investment... The evidence is as clear as ever: China's growth stems from massive accumulation of resources, while India's growth comes from increasing efficiency."

30. This expression operates as a dynamic constraint on the economy for being an identity. It shows very neatly the basic way in which economies develop due to the interaction between the accumulation process (and the resulting growth of productive capacity) and the conflict over income distribution. The important message of the relationship is that there is an inescapable link between changes in the distribution of income, accumulation and growth. Expression (11) can also be written as $\hat{y}_t \equiv \hat{w}_t + (\pi/(1 - \pi_t)) [\hat{r}_t + (\hat{K}_t - \hat{Y}_t)]$, which indicates that positive productivity growth generates an income "surplus" that vents into real wage growth, profit rate growth and/or capital–output ratio growth.

31. See Klein and Palanivel's (2000, pp. 42–44) analysis of India, who emphasize the country's need to raise the efficiency of its capital.

32. These figures are from the Extended Penn World Table. They are in PPP terms, and hence are different from our estimated values for China and India which are in local currency constant prices, shown in Figure 8. The important point remains, however, that capital productivity in China has declined, while the opposite has happened in India.

33. The Classical interpretation of increasing labor productivity and decreasing capital productivity is that this is a reflection of the bias in the adoption of technical change. The Neoclassical interpretation, on the other hand, is that these movements occur along the isoquant of a stable production function.

34. It is important to note that Steedman (1985) showed that Hicks-neutrality is an internally inconsistent and impossible (not just empirically implausible) concept at the level of the aggregate economy in the presence of produced inputs. Steedman derived the sufficient conditions to make Hicks-neutral technical progress impossible (e.g., the *ex-ante* payment of wages; or that sectors have differential profit rates). We are thankful to Heinz D. Kurz and Manseop Park for bringing this to our attention.

35. Individual entrepreneurs' behavior is guided by their race to adopt more profitable technologies. However, they are oblivious with respect to the implications at the aggregate level of their individual behavior, namely, that sooner or later productivity in the economy will increase and so will wages, thus leading to the decline in profitability. It is their individual myopia and lack of coordination that leads to this situation.

36. In his discussion of "what causes periodical crises?" Kalecki (1939, pp. 148–149) argued that investment plays two roles: (i) as an expenditure it is a source of prosperity. Investment improves business and induces more investment; (ii) every investment is an addition to capital accumulation. However, the tragedy of investment is that it causes crises because it is useful. The basic contradiction underlying investment lies in the different time horizon of the effects of investments on demand and on capacity, that is, the fact that while the impact of the former is exhausted in a short time, the one on capacity lasts a longer period.

37. The Hodrick–Prescott filter approach suffers from the so-called or "end-point" problem. This is that future output growth may be overestimated if actual output growth was comparatively high (or underestimated if it was comparatively low) at the end of the sample period.

38. It will be appreciated that an increase in the growth rate of the capital stock from less than 5% to 8% represents a very large increase in the investment share and/or in capital productivity.

39. The number of items in the reservation list peaked in 1984 at 873. The number has been progressively reduced and in January 2007 it affected 239 items.

40. It is worth noting that the share of private consumption in output has been declining in China for decades, while that of investment has been increasing (ADB, 2006). What is interesting is that this was happening while the labor share was increasing, as documented above. Real wages have also increased, at an average rate of 8.4% per annum during 1980–2002. This increase in wages was not spent on consumption but saved (and invested).

41. The problem is that banking lending rates increase, but so do deposit rates. The latter attract more inflows of capital as speculators pile large amounts of yuan hoping that China's currency will strengthen. These speculative inflows add fuel to the investment binge. The Chinese government will have to implement very tough administrative measures to curb investment growth.

42. Figures released in July 2006 indicate that China's growth rate between the first half of 2005 and that of 2006 was 10.9%.

43. Glyn (1997) provides estimates of the manufacturing net profit rate for a number of developed countries. During 1960–72, Japan's profit rate was above 30% and the United States and Germany had profit rates above 20% during the 1960s. Glyn's (1997) survey indicates large variations in cross country profit rates.

44. Kalecki was skeptical of the efficacy of raising investment expenditure to ensure full employment. Moreover, he thought that it was rather wasteful, in that the capital equipment created was not directly useful in adding to social welfare, whereas alternatives such as promoting consumer expenditure would be. In his words: "The proper role of private investment is to provide tools for the production of consumption goods and not to provide enough work to employ all available labour... Both public and private investment should be carried out to the extent to which they are considered useful. If the effective demand thus generated fails to provide full employment, the gap should be filled by increasing consumption and not by piling up unwanted public or private equipment." (Kalecki, 1944, pp. 52–53).

45. In the Spring of 2006, the private company Ernst and Young reported that non-performing loans in China amounted to more than $900 billion, far exceeding official estimates (almost six times higher than disclosed). The report was followed by a complaint from the Chinese authorities, which referred to the estimate as "ridiculous." This led Ernst and Young to issue a statement claiming that its initial estimate was factually erroneous.

46. Recently The Economist ("A Great Big Banking Gamble," October 29, 2005, pp. 69–71) reported that China's banks generated a very low return on assets in 2004, less than 0.5%, by far the lowest in East Asia.

47. See Prasad (2005) on the need for financial sector reform. He argues that it seems that China's high degree of thrift, which fuels its rapid investment growth, "has a low payoff because of the fragile threads holding the economic picture together. Providing cheap capital to enterprises, especially state-owned firms, requires low interest rates. Sustaining bank profits then requires correspondingly lower rates of return on deposits. Thus, maintaining economically unviable state enterprises and supporting them through the banking system results in large implicit costs" (Prasad, 2005, p. 46).

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APPENDIX. MAIN DATA SOURCES AND ESTIMATION ISSUES

The main data sources are the National Income and Product Accounts (NIPA) of both countries. These were supplemented with data

from the Word Development Indicators (WDI), CEIC, Penn World Tables, Extended Penn World Table, and Datastream.

We are aware that in the Spring of 2006 there was a benchmark revision of GDP for 1993–2004. Revised income approach values have not yet been published and revised expenditure approach values have only been published for 2004 (implying a statistical break during 2003–04).

The NIPA information for China used in this paper derives from the publications *GDP 1995–2003—Historical Data on China's Gross Domestic Product 1995–2003*, and *GDP 1952–95—Historical Data on China's Gross Domestic Product 1952–95*. These contain information on GDP from the income side for all Chinese provinces. They were aggregated to form the national totals. The income side of the National Accounts is not available in the *Statistical Yearbook of China*. The sum of provincial value added (production or income approach) since the mid-1990s is several percentage points higher than the national GDP figure. The largest discrepancy is typically located in the tertiary sector and it is uncertain which value is more accurate. Since the NBS expects that the economic census of 2004 will result in large upward revisions to the national tertiary sector's value added figures, it could well be that the provincial date are more accurate than the national data (Holz, 2006).

For India, the national income information is from the United Nations Systems of National Accounts. GDP figures from the expenditure side for both countries are from the World Bank's *World Development Indicators*.

Young (2000) meticulously discussed the construction and shortcomings of the Chinese national accounts data. For investment, we have chosen the series that do not include the "changes in stocks." As Young (2000) points out, the changes in stocks figures for developing countries are frequently a residual and fabricated item used to conceal large discrepancies between the production and expenditure sides of the accounts. In addition, the proper measurement of inventory changes, including the adjustment for differences between current valuations and accounting conventions, is technically more challenging than the measurement of the flow value of investment in fixed capital. In the context of China, considering the unsold inventories of state enterprises as a productive element of the capital stock would seem to be erroneous. For these reasons, we exclude the changes in stocks from the measure of investment and capital stock, and focus on gross fixed capital formation alone.

Compensation of employees, as defined in the System of National Accounts, includes all wages, salaries, and supplements earned by employees, the value of any income in kind they receive from their employers, and employer payments for their social or private pensions. The implicit labor income of proprietors, unpaid family members and the self-employed is supposed to be captured, along with elements of the return to capital, under items such as "income from unincorporated enterprises" (Young, 2000). Self-employment used to be fairly rare in China, although it is now increasing. In 2003, self-employed individuals accounted for about 6% of total employment. Moreover, the Chinese national accounts impute labor income to the self-employed, assuming that where self-employment is found, all income is labor income, and going so far as to conclude that the entire output of some sectors, for example, personal and social services, contains no capital income component whatsoever, allocating all of the output of the sector between compensation of employees and depreciation.

In India, the implicit labor income of proprietors, unpaid family members and the self-employed were included in the operating surplus figures prior to 1993. There is explicit information on such income, labeled as "mixed income," from 1993 onwards. To obtain consistent data, some adjustment needed to be made. While information on the amount of mixed income was not readily available before 1993, the average for 1993–99 shows that mixed income accounts for a relatively stable share of gross profit. Based on information from 1993 to 1999, we, therefore, subtracted a fixed proportion (18%) from operating surplus before 1993. Implicitly, we included mixed income within the compensation of employees' category.

Data on the capital stock for India was drawn from the CEIC, which was originally compiled by the Central Statistics Office (CSO) of India. Economy wide data on capital stock is not readily available for China. A number of researchers have made attempts to construct a capital stock series for China. Among them, Chow's (1993) work is well known. A major problem relating to Chow's data is that initial-year capital stock is limited to five material production sectors and that accumulation

by individuals was excluded (Holz, 2006). Chow and Li (2002) constructed new capital stock figures for China. They used Chow's initial total capital stock figures and derived capital stock data until 1978 by adding the total accumulation for every year. For later years, the perpetual inventory method was used. We have not used this series for two reasons. First, their initial capital stock still includes data for five sectors. And second, inventories were included in the capital stock calculation. Inventories have large and volatile undesired components of inventories. Leaving them out is tantamount to assuming a constant fixed capital–inventory ratio. See also the arguments in Holz (2005b). Holz (2006) has constructed a number of capital stock series for China. He used the scrape rate rather than the rate of depreciation to construct capital stock. However, we cannot directly use this information for our comparative study as the Indian capital stock data were not constructed in this manner.

We constructed capital stock information for China using the following method. For the initial year (i.e., 1978), the economy wide depreciation data, taken from the NIPA, was divided by the depreciation rate to obtain fixed asset values. After obtaining this initial year capital stock, we then used the perpetual inventory method:

$$K_t = (1 - \delta)K_{t-1} + I_t, \tag{A.1}$$

where K is capital stock, I is investment (gross fixed capital formation) at a constant price, δ is the depreciation rate, and t denotes time. A constant depreciation rate of 5% was used, as is frequently done in the literature. Holz (2006) calculated the depreciation rate for China. For the years since 1980, the numbers are very close to 5%. For consistency with other series, the capital stock was measured in 1990 prices. The initial year (1978) capital stock was converted into constant 1990 prices using the GDP deflator from the WDI. As pointed out by Chow and Li (2002, p. 248), during 1952–78, prices of investment goods in China remained almost constant. Thus, accumulation in current prices can be treated as accumulation in constant prices. After 1978, when economic reforms started, prices of investment goods began to change. Information on investment in 1990 prices is from the WDI. Information on investment at constant prices is from the *World Development Indicators*. The capital stock we constructed is broadly in line with information

from other studies. The fact that we have been able to derive reasonable information such as profit rates also reaffirms that our capital stock figures lie within a reasonable range.

While much effort was made to select and construct comparable information for India and China, we must stress that caution needs to be exercised when interpreting results due to differences in the definition and quality of data between the two countries.

Data for Figure 1: United Nations National Accounts Statistics; The Gross Domestic Product of China, 1952–1999. NBS; Data of Gross Domestic Product of China 1996–2002, NBS; China Statistical Yearbook 2004, NBS. Net Domestic Product at factor cost equals Gross Domestic Product at market prices minus depreciation and minus net indirect taxes.

Data for Figure 2: The Gross Domestic Product of China, 1952–1999. NBS; Data of Gross Domestic Product of China 1996–2002, NBS; China Statistical Yearbook 2004, NBS; CEIC.

Data for Figure 4: United Nations National Accounts Statistics; The Gross Domestic Product of China, 1952–1999. NBS; Data of Gross Domestic Product of China 1996–2002, NBS; China Statistical Yearbook 2004, NBS. The profit rate is calculated as the difference between Net Domestic Product at factor cost and the total wage will (referred to as total profits), and then divided by the stock of capital.

Data for Figure 5: United Nations National Accounts Statistics; The Gross Domestic Product of China, 1952–1999. NBS; Data of Gross Domestic Product of China 1996–2002, NBS; China Statistical Yearbook 2004, NBS. The capital share is calculated as the ratio of total profits to the Net Domestic Product at factor cost.

Figure 6: The incremental profit rate is calculated as the difference between total profits in this period and the previous one, divided by investment in the previous period.

Figure 7: Ratio of the growth rate of the capital stock to the profit rate.

Figure 8: Net Domestic Product at factor cost divided by the capital stock.

Data for Figure 9: The Gross Domestic Product of China, 1952–1999. NBS; Data of Gross Domestic Product of China 1996–2002, NBS; China Statistical Yearbook 2004, NBS; Datastream. The average wage rate is calculated as the ratio of the total wage bill to total employment. Labor productivity is the ratio of

Net Domestic Product at factor cost to total employment.

Data for Figure 10: Source: United Nations National Accounts Statistics; Extended Penn World Table.

Data for Figure 14: The Gross Domestic Product of China, 1952–1999. NBS; Data of Gross Domestic Product of China 1996–2002, NBS; China Statistical Yearbook 2004, NBS.

The capital–labor ratio is calculated as the ratio of the capital stock to total employment.

Data for Figure 15: United Nations National Accounts Statistics.

Data for Figure 18: Reserve Bank of India. Handbook of Statistics on India Economy. http://rbidocs.rbi.org.in/rdocs/Publications/DOCs/65874.xls.

Data for Figure 19: CEIC data Company.

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