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Growth Prospects in China and India Compared

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Abstract

This paper compares the growth prospects of China and India through a growth accounting analysis. Consistent time series for capital stock and employment are constructed using available survey data, and recent revisions to the national accounts for both countries are incorporated. The results allow for a discussion of the sources of growth in both countries, and a consideration of each country's rate of potential growth in light of the outlook for national savings, as demographic shifts occur in each country.

JEL Classification: E20, O11, O47, P52

Keywords: Growth accounting; potential growth; capital measurement; demographics; China; India

1. Introduction

China and India, as the fastest-growing of the 'BRIC' economies, occupy a special place in the imagination of observers in the OECD and elsewhere. Despite their low incomes, their sheer size combined with rapid growth means that they make a substantial and rapidly growing contribution to world output. The success or failure of each country to maintain their rapid growth into the future will have a tremendous impact not only on their own economies but on the world economy as a whole. Moreover, with populations of 1.3 and 1.1 billion, respectively, their rapid growth has the potential to raise living standards significantly for a third of the world's population, bringing hundreds of millions of people out of poverty and creating a middle class that rivals the EU and US in both size and income.

In both countries, growth has accelerated in recent decades as trade liberalisation and market-oriented structural reforms have deepened. A glance at both countries' experience suggests a number of similarities in their reform paths. Despite very different political systems, both countries followed a reform path that markedly reduced the role of the government in economic activity and allowed a greater degree of openness to foreign trade. Reform started earlier in China than in India. Moreover, the opening to trade has proceeded at a much more rapid pace in China. Indeed, by the beginning of this decade, India was still one of the most highly protected economies in the world. On the other hand, India has always had a stronger private sector. Moreover, while the private sector was subject to considerable constraints on its investment planning, these largely ended in the early 1990s. However, in China the private sector has only emerged in past decade, as the result of a more favourable legal framework and the sale of government-owned assets. A careful description of these countries' sequence of reforms is elaborated elsewhere and we will not dwell on the policy details here.[2] Nevertheless, it

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[2] Refer for instance, to OECD (2003), Lardy (2002) and Maddison (1998) on China, and Srinivansan and Tendulkar (2003) or Mukerji (2002) on India, for comprehensive accounts, among others.

is important to note that China's transition started somewhat earlier and involved greater change than in India since it was, on the whole, further from being a market economy. However, both countries' reforms are still ongoing, so it would be premature to judge only past progress.

Looking forward, despite immense reforms and impressive growth, there has been considerable scepticism about the sustainability of China's growth in particular. Especially over the past few years, when growth has broached double-digit rates, questions about the extent to which it can be sustained without creating inflationary pressures or incurring large batches of new non-performing loans are often heard in the press. For India, the situation is nearly reversed: many observers have thought that India can and should grow faster than the 6% average that it attained over the past ten years. Recent marked increases in investment suggest that the economy can indeed grow faster than this on a sustainable basis – at around 8½ per cent annually if the increase in investment is not just a cyclical phenomenon. Indeed, many political leaders have argued that India should be able to grow even faster over the medium-term.

For China, we will argue that that current growth rates are not markedly different from potential growth rates and so that concerns about overheating are not warranted but that the case that growth will need to slow down over the medium term seems strong. On the other hand, in India growth around the 8½ per cent rate can be sustained but faster growth will require substantial reforms designed to increase saving. However, considerable caution is in order, due to tremendous uncertainty about the basic statistical data which must underlie any serious consideration of each country's potential. Most prominently, China has neither an official estimate of capital stock nor a consistent economy-wide employment series. While India produces a capital stock valuation, it suffers from methodological weakness, and has no annual economy-wide employment series. Moreover, there have been ongoing questions about the quality of both countries' statistics. In this paper, we make considerable efforts to address the key methodological concerns regarding input measurement and estimate economy-wide production functions whose results we then decompose using growth accounting techniques.

Some recent studies have addressed some of the issues that we consider; however, many of these studies have given inadequate attention to the measurement difficulties for productive inputs. In addition, on the output side, major revisions to both countries' national accounts have been made in the past year, improving their credibility, and allowing us to update the estimates for China that we presented in the OECD's first economic survey of that country (OECD, 2005), and make preliminary estimates for India, which is now also the subject of a forthcoming OECD economic survey.

2. Related studies

There is no shortage of studies that have carried out growth accounting analyses of China and India's growth, separately. For China, recent aggregate studies include Chow and Li (2002), IMF (2003), Holz (2006a), as well as our own previous estimates in OECD (2005). Dougherty (2004) summarizes a number of earlier such studies on China. For India, recent aggregate studies include Pallikara (2004), Rodrik and Subramanian (2004), Singh and Berry (2004), Sivasubramonian (2004), Virmani (2004), Ghosh and Narayana (2005) and Bosworth and Collins (2007). A large number of

productivity studies have been carried out for India's manufacturing sector in particular, many of which are described in Kaur (2006).

However, few studies have explicitly compared China with India using a directly comparable framework or given adequate attention to the measurement issues. Broader multi-country studies such as Wilson and Purushothaman (2003), Bosworth and Collins (2003), and Jorgenson and Vu (2005) have made useful comparisons but did not address the numerous measurement difficulties in the underlying data series that are present in both countries. In fact, a review of the literature only found one recent in-depth study of this nature, Fan and Felipe (2005) though subsequently Bosworth and Collins (2007) have made a similar growth decomposition to that presented in this paper though their focus was on the productivity impact of sectoral reallocation of labour.

Fan and Felipe examine China and India's growth performance from the income side, looking at the sustainability of investment through an analysis of profit rates using a classical (Marx-inspired) approach. The results question the sustainability of the much higher rate of capital accumulation in China as compared with India, given an apparent ongoing fall in the economy-wide profit rate. Since such income-approach measures are based on an aggregation of provincial national accounts, there is some question about how much weight to attribute to them. For instance, the study finds an ongoing downward trend in profits, which differs significantly from the rise in industrial sector profit rates we document since 1999 in OECD (2005) and Dougherty and Herd (2005).

In this study, we decompose growth from the production side, taking the neoclassical view that investment is primarily a consequence of savings in our supply-oriented growth projections.[3] Nevertheless, we re-affirm the headline finding that differences in the rate of investment and capital accumulation are the most important difference in the two economies' growth rates. However, differences in the rate of productivity growth also play an important role, and these results are sensitive to how inputs are measured. By addressing the construction of labour and capital inputs systematically, and incorporating recent national account revisions for both countries, we provide new estimates for the sources of growth and potential growth rates for both countries (following the framework of Cotis et al., 2005). Moreover, we make some tentative projections about the role of demographics in influencing saving and investment rates, as well as labour supply, over a medium to long-term horizon.

3. Measurement of inputs and outputs

The sheer quantity of studies of China and India's growth mentioned above is attributable in part to the difficulties in measuring each country's productive inputs and outputs given the depth of their national accounts. Moreover, methodological assumptions have varied widely, particularly for China, with approaches to measurement of capital stock of particular controversy (see Holz, 2006b). The OECD's Economic Survey of China (OECD, 2005) presented earlier estimates for this economy, which we revise below, using updated assumptions and national accounts revisions. We also address the relevant measurement issues for India.

[3] Vanston (2006) summarizes various frameworks that are commonly employed in examining convergence scenarios for OECD and non-OECD countries.

3.1 Employment data

3.1.1 India

A decomposition of the proximate factors behind economic growth requires knowledge of the movement of factor inputs. The measurement of such inputs and, indeed, outputs is problematic in many developing countries where much economic activity takes place in the informal sector of the economy. People are often employed on a casual basis or are self-employed. Consequently, few developing counties have employment data based on establishment returns and most rely on household surveys.

India is no exception to this experience but it does have a well developed capability to undertake national sample surveys that can be utilised to generate employment data. These surveys have included questions on employment and unemployment since 1995 and, since 1972, have been repeated every five years. Employment and unemployment has been monitored annually since 1989 with a reduced sample size. The annual sample size is sufficient to generate accurate data at the national level. There have been some questions, notably with regard to poverty, as to whether the sample design of the smaller annual surveys is accurate. However, even a typical four-way split of employment (urban – rural, male – female) coupled with a three-way split of industries (primary, secondary and tertiary) results in adequate sample sizes.

Despite the adequacy of the sample size for measuring employment, the National Sample Survey Organisation (NSSO) has never published level data for employment. Rather it publishes long series of "worker participation rates". These ratios measure the proportion of workers in the total population. They are presented for the typical four-way split described above. To obtain level data, the worker participation rates need to be multiplied by the population in each of the four cells. The NSSO counsels against the population estimates from its sample and suggest using census data. The registrar-general, however, does not provide annual population estimates in the required four-way split. In order to obtain the requisite breakdown, the data from the decennial censuses have been interpolated to an annual and quarterly frequency at the state-level, using the required four-way split.

The time-frame for the surveys has varied over different rounds requiring matching the mid-point of the survey to appropriate estimates of population. Some rounds refer to a calendar year, others to an agricultural year (July to June) while some annual surveys are only for a six monthly period. The surveys, however, ask questions to different samples each quarter and so the participation rate data effectively generates a period average data rather than a point-in-time estimate. This complicates the use of the surveys for measuring short-term changes in employment but does not obviate its use for longer period comparisons. In this study, it has been assumed that the participation rates refer to the mid-point of each round for the purpose of matching to population data.

The output from these calculations is a set of twelve time-series showing employment by three principal industries (agriculture, secondary and tertiary sectors), two locational variables (rural and urban) and two gender variables. Given the problems of timing and the non-availability of annual population data, these series can only be regarded as approximate indicators. However, the only alternative to using the NSS surveys is to use the census data for employment. This data source appears only once

every ten years and appears to measure employment inadequately. In particular, there are large discrepancies between estimates of economically active women between the NSS and census, probably because the NSS surveyors devote more effort to establishing whether the respondents participate in economic activity rather than relying on the self-declaration in the census.

A further problem with using the NSS data is that six measures of employment are given in each survey. Respondents are classified according to their usual activity and then according to their principal activity and their subsidiary activity. Finally, they are asked as to whether work was their principal activity in the past day, week and year. The three measures generated substantially different levels employment due mainly to the intermittent nature of employment in agriculture and of casual employment in urban areas. The daily and annual measures suffer from different biases. A person in casual, intermittent employment is, on the daily measure, likely to be counted as unemployed whereas in reality the person may be better classed as under-employed or employed on a part-time basis. On the other hand, the annual data counts people as employed even if their work is only seasonal. This study uses the weekly data series that lie in between these extremes.

3.1.2 Employment data for China

Chinese employment data has been based on a sample survey since 1990. However, at the same time, the authorities have continued to publish employment data based on establishment returns. As a result it is possible to compare the two sources in overlapping years. The movement from an establishment to a survey basis introduced a break in the officially published time series for employment, with the survey based data being some 14% higher than the establishment-based data. For the purposes of this study, it has been assumed that the understatement of employment by the establishment data has been constant over time (prior to 1990). This is unlikely to be a correct assumption as after 1990 there has been substantial variation in the ratio of the survey data and the establishment data from year to year. An alternative would have been to use the establishment series but the last observation for that series is for 2002. Moreover, that series too has a break in 1998 when people with a labour contract with a company but not actually working were no longer counted as employed.

3.2 A comparison of employment in India and China

The resulting employment series for India shows a resilient labour market from the late 1990s after a period in the mid-1990s when employment had been stagnant. Between 1998 and 2003, employment is estimated to have grown by 17% after having been almost stable in the previous five years. This growth in employment was associated with a marked increase in employment outside of the agricultural sector – more than 70% of the increase in employment came in the secondary and tertiary sectors of the economy. Most notable was the almost 50% increase in employment in the secondary sector of the economy that appears to have been mainly concentrated in small manufacturing plants in rural areas. Service sector employment, though still larger than the industrial sector, increased much less rapidly. The pace of change in the structure of employment has been slower than in China despite the strong restrictions on movement of workers and the absence of landless labourers in the Chinese countryside. Indeed, the

speed of the decline in the share of agriculture in India was only half that observed in China in the period 1978 to 2003.

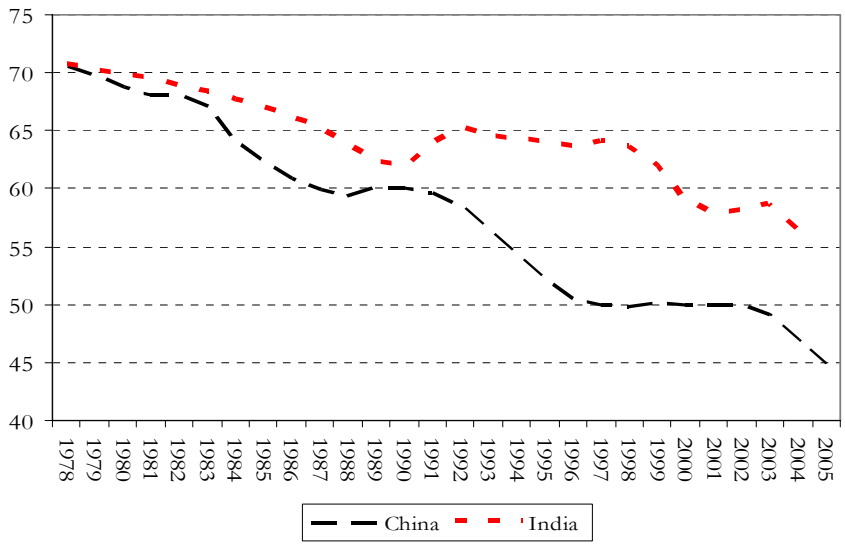
Table 1. Growth of employment by year

	1985	1990	1995	2000	2001	2002	2003	2004	2005
	annual growth in five year period ending in specified year				annual growth				
India	1.8	1.7	2.1	1.5	4.4	0.0	3.5	2.3	n.a.
China	3.3	2.6	1.0	1.2	1.3	1.0	0.9	1.0	0.8

Source: China National Bureau of Statistics and Statistical Yearbook, India Central Statistical Organisation and National Sample Survey.

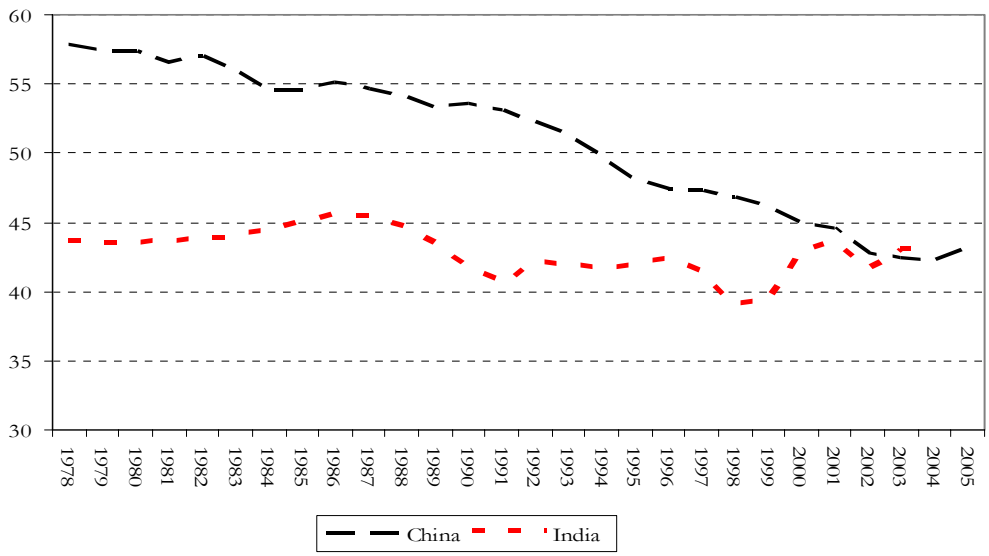
Outside of agriculture, the traditional view that employment in India is less oriented to the secondary (industrial) sector than in China is no longer true. The share of industrial employment in non-agricultural employment in India has followed two markedly different trends. In the period after the gradual opening of the economy to foreign trade and the ending of industrial licensing, the share of employment in industry declined somewhat, but since the late 1990s there has been an increase in the share of employment in that sector. By contrast in China, there has been a steady decline in the share of employment in the secondary sector. This decline reflects the ending of the bias towards industry inherent in the pre-1978 Chinese economy. Nationwide employment data for China is published with a long lag, as it is drawn from annual sample census that covers 0.1% of the population and so the most recent data is for 2004. In the period since 1997, when labour market flexibility was introduced in China, employment in the secondary sector has been stable, growing by only 2% whereas service sector employment has grown by almost one quarter. Moreover, within the secondary sector manufacturing employment fell up to 2002 and employment growth was concentrated in construction. Overall, by 2004, the share of service sector employment in India was similar to that in China.

Chart 1. Share of agricultural in total employment Per cent of total



Source: same source as Table 1.

Chart 2. Share of secondary sector in non-agricultural employment Per cent of total



Source: same source as Table 1

3.3 Capital stock data

3.3.1 India

Indian national accounts provide data series for the capital stock and gross and net fixed capital investment from 1950 onwards. Two series are published for capital investment with a classification by industry and one by institutional sector (which is broken down by type of asset). Until 1999, these two series moved closely but since then the series have diverged markedly, with the institutional series increasing more rapidly than the industry series. The former series is used in the computation of the GDP expenditure-based series. On the other hand, the industry series has been used in the calculation of the capital stock, introducing a discrepancy between the movement of the share of investment in GDP and the capital output ratio. Since 2006, the national accounts constant price data have been revised to 1999/2000 prices, the CSO has assumed that the institutional data is correct and it has ceased to publish independent estimates on an industrial basis but has not yet issued a revised capital stock series.

The series chosen to measure capital is not the series that is generally used to measure investment in Indian official sources. The CSO, in its national accounts publication, presents fixed investment as being the sum of institutional fixed capital formation, investment in valuables (such as gold and jewellery) and the errors and omissions that stem from the difference between the income, expenditure and financial asset data. This is a presentation that differs from that recommended in the UN/OECD System of National Accounts. Household purchases of gold and jewellery are treated as consumption outlays (as with acquisitions of other consumer durables). Excluding such outlays from investments, lowers the share by 0.8% of GDP. Moreover errors and omissions have been growing steadily in the five years to 2005, with the result that the measured increase in investment as a share of GDP has only increased from 28.8% of GDP to 30% against a rise to 33% in the wider definition (Shetty, 2006).

This study has attempted to estimate a series for the fixed capital stock for the period 1998 to 2005 on the basis of the information in the revised national institutional fixed capital investment series. This has required mixing constant price investment data measured in two different price bases. The growth rate of the 1999/2000 constant price investment data has been used to prolong the 1993/4 price base data from 1999 onwards. The series for gross investment on an institutional basis has then been used to estimate the increase in the capital stock using a perpetual inventory model. Finally, the upward revision to the increment in the capital stock has been allocated to the secondary and tertiary industries on the basis of the preceding year's capital stock. The capital stock of the primary sector has not been affected by this change as the historical evolution of this variable has been very stable. The overall result of these calculations is to raise the 2004 estimate of the capital stock by 11% relative to the estimate based on industry-by-industry fixed capital formation. This procedure for calculating capital stock is temporary and will be resolved once the full national account statistics are issued using the new price base.

3.3.2 China

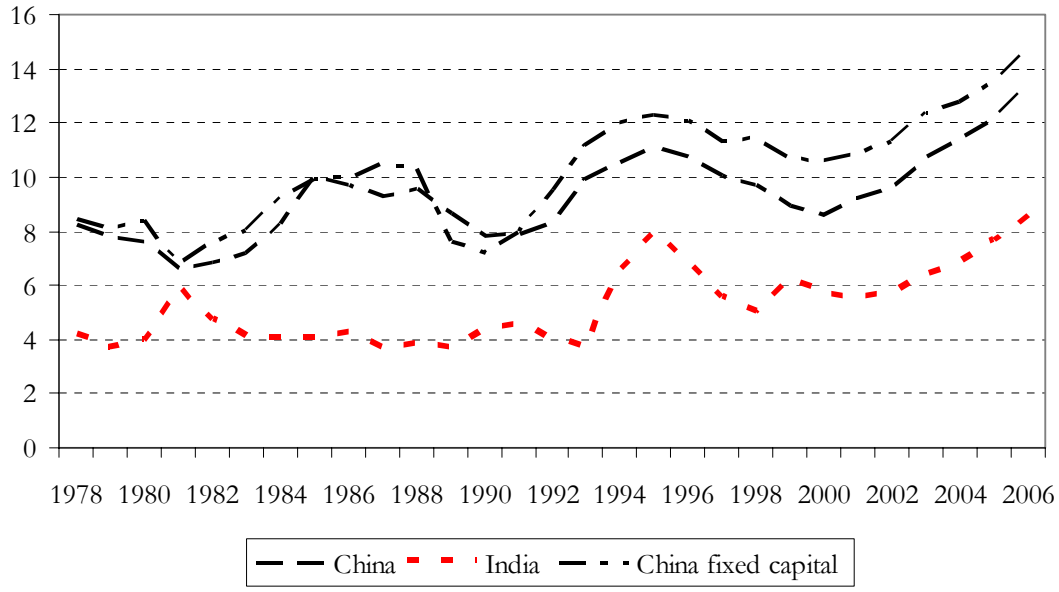
No official data exists for the Chinese capital stock and so this study has estimated the capital using a number of different sources. National accounts data do not exist in constant price form but do exist as nominal series since 1952, as the result of a major effort to restate material product data in the form required by the SNA. However, in 2005, a new figure for the value of investment in 2004 was issued by the statistical authorities. This figure was produced as the result of the 2004 Economic Census. As yet no revision has been issued for the period since the last census covering services was undertaken in 1992. We have revised the investment series in a similar way to that used by the authorities to revise GDP. The change in investment between 1992 and 2004 was split into an average increase and a deviation from the average increase. The revised series was calculated by applying the same deviation from average growth that occurred in the old investment series to the new average growth of investment. In order to obtain constant price data, the new nominal series was deflated by the price index for fixed asset investment. A depreciation rate was taken from a publication by the NBS and Statistics Canada. An initial value for the value of the capital stock in 1952 was taken from Chow (1993) and then the capital stock was computed using a perpetual inventory model.[4]

There are a number of differences in the measurement of the capital stock used in this paper between India and China. *First*, the depreciation rate in China is less well estimated than that in India. However, over the longer term, the choice of the depreciation has little impact on the estimated growth of the capital stock. *Second*, the Chinese data for the capital stock include inventories and these are less well estimated at constant prices than is physical capital whereas the Indian data excludes inventories. Until the mid-1990s this was not an important source of difference between the different measures of the capital stock but since inventories were markedly reduced in the mid-1990s, the growth of fixed capital in China has consistently outpaced total

[4] The Chow estimates of initial capital stock have been recently critiqued by Holz (2006b), and alternative estimates are compared but Chow (2006) argues that the methodology of Holz is mistaken. Moreover, during the post-reform period that we cover, the effect of the different initial estimates does not make a large difference on the growth rate of the capital stock.

capital. *Third*, following the general approach of growth accounting, the capital stock estimate in China includes a fixed element for land based on Chow's estimate of the value of land in 1950 but the figure for India does not include an initial value for land. However, its inclusion in the case of China makes only a slight difference in the period after 1980 that is the focus of the paper. Resolving these differences is the subject of continuing research.

Chart 3. Capital stock growth Per cent per year



Source: refer to text.

3.4 A comparison of capital stock in India and China

The evolution of the capital stocks of China and India shows a markedly different pattern. In China, the acceleration in capital formation started after the introduction of major economic reforms in 1978, accelerated once again at the beginning of the 1990s as the economy was opened to foreign competition and has been boosted again in this decade as the state exited from a large part of economic activity. By contrast, the initial reforms in India, starting in the mid-1980s had little impact on capital formation but the major reforms of the early 1990s appear to have put the pace of capital formation on a steadily accelerating path, after an initial burst associated with the end of industrial investment licensing. Overall, the capital stock has grown some 4 percentage points annually faster in China than in India over past 30 years, with the difference rising to 5 percentage points if the focus is just on fixed capital. In the past three years, the difference has risen to almost 7 percentage points. Over the longer term, these differentials in capital stock growth have been translated into similar differentials in the growth of capital per worker, and as we will see later, output as well.

3.5 Human capital

The commonest method for measuring human capital is by computing the number of years schooling received by an individual. In the case of India, this information is not available from either census or sample survey data. Rather, both sources provide information on the highest level of education of individuals with the result that it is not possible to accurately account for years of education since, at each level of education pupils, start but do not necessarily finish courses. Years of education can thus only be measured with a degree of error by using either the census or a sample survey. The NSS survey provides information on the following categories: illiterate; up to primary education, middle school, secondary, higher secondary and tertiary education. Census data gives a finer split at lower levels of education and makes it possible to distinguish between those that have completed primary education. In China, the census is the only source of information for the number of years of education and has to be completed by perpetual inventory models of the number of years of education built up from the knowledge of the proportion of each age group enrolled as students.

The average level of education in India is low both in relation to all other countries and relative to China, though it has been steadily increasing. In 1972, almost 90% of workers had only received a primary school education and, most had not competed that cycle leaving almost three-quarters of them illiterate. By 2004, the average years of education had more than doubled, one of the fastest growth rates amongst countries for which estimates are available bringing considerable reductions in the proportion of the 12 year old age group that was illiterate, but still 40% of workers were illiterate. In addition, the gender gap for illiteracy amongst young people was markedly reduced. However, the pace of improvement has slackened this decade both at the primary level and at the tertiary level. While the increase in human capital has been relatively rapid, increasing at just under 0.9% annually, it has nonetheless been slower than that in China. The difference has been particularly marked at the tertiary level where China has pulled ahead of India in the proportion of the relevant age group in higher education.

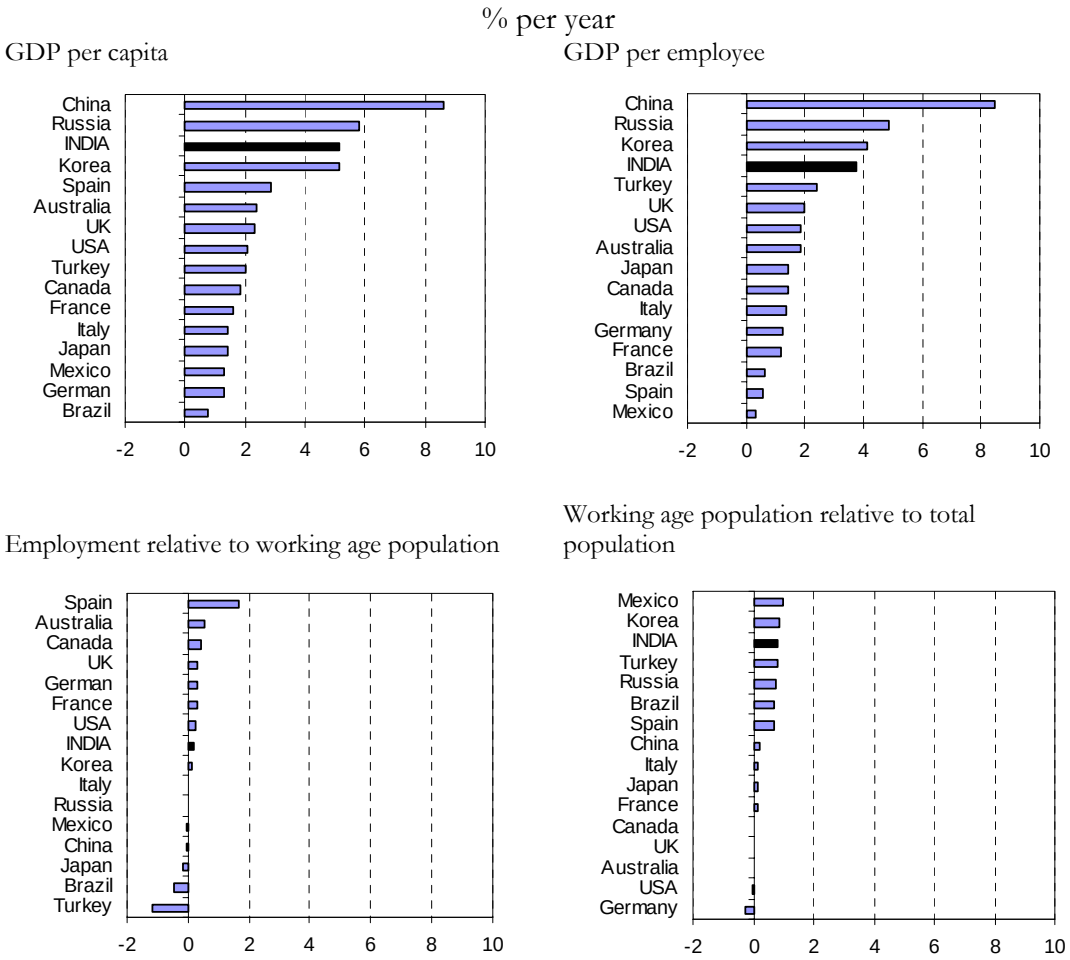
4. Sources of growth (a decomposition)

We utilise a simple growth accounting framework to offer some insight into the factors behind growth in India and the differences with China. A standard identity permits the growth of GDP per capita to be split into three factors: the growth labour productivity; the growth of employment relative to the growth of the working population and, finally the growth of the working age population relative to the total population. For most OECD countries the working age population can be proxied by the population aged 15 to 60 or 64 depending on the country. In case of developing countries such a measure could be misleading as a considerable proportion of elderly people work as do some children under 15. The working age population here is defined as the total population weighted by constant age-specific activity rates.

This framework illustrates that the bulk of growth in GDP per capita is associated with the growth of labour productivity. In the case of India, productivity increased faster than incomes due to a slight fall in employment rates. In the case of China, though, real incomes have grown faster than productivity since 1980 due to the rapid growth in the proportion of the population in the age groups with the highest employment rates. Over the longer term, the gains to be expected from demographic

factors will tend to wane as the proportion of people in the lower activity rate age-groups increases, approximately 60 years after a decrease in the birth rate. In terms of contribution to cross-country differences in income growth over the period 1990 to 2006, participation rates are the least important of these three components. However, cross-country differences in the proportion of total available persons that are actually working have been persistent over time. No data are available for India or China or the other BRIC countries on economy-wide average hours of work. Demographic factors can be significant over periods of decades but changes due to this factor tend to be reversed as participation rates adjust. Overall, the key factors determining income growth is thus the growth of labour productivity not just in India and China but also in most OECD countries.[5]

Chart 4. Factors contributing to the catch-up process in the period 1990 to 2005



1.For OECD countries, the charts show the average growth in variables contributing to growth over the period 1990 to 2005, using a semi-log regression of the relevant variable and a time trend. In the case of OECD countries, this average is measured over the period 1990 to 2005. For non-member countries, if there is statistical evidence of significant change in the growth of a GDP per capita then a more recent period is used. Thus, for India, the data refer to the period 2000 to 2005 and for Russia, from 1996 to 2005. Labour input is measured by persons worked. The working age population is measured by weighting the population age distribution by age-specific activity rates for 2000.
Source: OECD databases and various national sources.

[5] In a recent global comparison, Jorgenson and Vu (2005) find that for the G7 countries, TFP growth contributed only about a quarter of GDP growth over 1989-2003. Capital deepening represented half.

The growth of labour productivity is the key long-term determinant of both differences between economic performance in India and China and the extent to which income levels in these countries are catching up to those in the OECD area. A growth accounting framework provides some insight into the factors behind both the evolution of growth over time and differences between China and India. The broad sweep of differences is well known. Prior to 1980, income growth was held back in both countries by adherence to socialist economic policies that adversely impacted productivity growth. In India, income per head increased at a very slow pace in the thirty years after independence with total factor productivity increasing by less than 17% in the whole period. In the same period, performance in China was even worse with cumulative growth of TFP of less than 10%. Nonetheless, incomes per head in China rose more rapidly than in India thanks to greater capital accumulation.

Table 2. Factors behind Indian growth

Period average compound growth rates[2]

	1950-1979	1980-89	1990-99	2000-05
GDP[1]	3.54	4.94	6.00	6.47
Employment	2.26	2.11	1.56	2.61
Labour productivity	1.25	2.78	4.36	3.76
Capital deepening	0.76	0.94	1.90	1.98
Total factor productivity	0.49	1.83	2.44	1.76
Human capital	0.29	0.38	0.38	0.16
Residual	0.20	1.45	2.06	1.60
Memorandum item				
Capital stock	3.81	4.02	5.42	6.68
GDP per capita	1.30	2.68	3.86	4.80
Labour productivity	1.25	2.78	4.36	3.76
Participation	0.11	-0.65	-0.60	0.17
Demographics	-0.05	0.56	0.12	0.83

1. GDP is measured on a rainfall corrected basis.
2. Period estimates are based on a semi-log regression of a given variable and on a set of time trends covering the periods in question the contribution of capital intensity to growth is based on a Cobb-Douglas production function in which the capital share is 0.5 – in line with the long-run average income share in India.
Source: authors' estimates.

Economic reforms in both countries led to significant improvement in economic performance from the 1980s onwards. In India, both income growth and labour productivity growth have accelerated with more rapid growth in the working age population than in the total population bringing a further boost to real incomes. The growth of total factor productivity accelerated markedly in China and, though slowing in recent years, remains rapid. Moving enterprises from the public sector to the private sector has been one factor behind the rapid growth of TFP, given the much higher level of TFP in private enterprises compared with public companies in China (Dougherty and Herd, 2007). Moreover, capital accumulation accelerated to even greater extent. In India, the improvements in both TFP and especially capital accumulation have been more modest. The relatively low level of capital accumulation has meant that TFP growth in India has accounted for a much larger proportion of total labour productivity growth than in China, even though TFP growth has been slower in India than in China.

It is clear that the improvement in productivity in India started well before the well-known reforms of 1991. Significant if ad-hoc policy changes were introduced during the 1980s, even if they were business – rather than market-oriented. Many observers have suggested that there was no further increase in productivity in the1990s, with some Indian observers calling into question the efficacy of these wide-ranging reforms. The results here suggest that TFP did accelerate once again in the 1990s but has fallen back slightly this decade. Nonetheless, independently, Bosworth et al. (2006) have followed a similar methodology to this paper and found comparable results. At the moment, the finding that TFP growth has slowed this decade can only be considered tentative because while (rainfall corrected) GDP data show rapid growth in the past two years, a reliable analysis of the growth in factor inputs cannot be made due to the considerable lag in the availability of investment and employment data. There are, moreover, a number of areas where reform is continuing. Trade barriers are being reduced, as even at the end of a reforming decade, only two countries in the world had higher tariffs than India. At the same time, the policies that reserve a large number of industries to small scale firms are being ended.

The movement of total factor productivity and capital formation are not, of course, independent. In particular, the combination of a rapid growth in TFP at the start of the reform period in China helped boost the growth of incomes and may have been one of the factors that led to the increase in the savings rate in the 1980s. Reform in India has been much more hesitant than in China leading to less improvement in TFP and a slower increase in saving and domestic investment. Seen from a purely accounting perspective, over the past 25 years, about 40% of the difference in labour productivity growth in China and India has come from lower total factor productivity growth.

The sources of the rapid improvement in Chinese TFP growth are varied. The OECD *Economic Survey of China* focused on several: education; opening to foreign trade; the increasing share of private sector activity in the whole economy; movement of labour from agricultural to non-agricultural activities; and urbanization. It is noticeable that in all of these areas the performance of the Indian economy has not been as good as that of the Chinese economy. The education system in China has been able to deliver primary school education to nearly all parts of the country while at the same time rapidly expanding the university sector, whereas still only half of the youngest age groups are receiving a complete primary education in India.

Table 3. Analysis of factors behind growth in China

Period average compound growth rates

	1950-1979	1980-1989	1990-1999	1999-2005
GDP	5.62	10.62	9.94	8.75
Employment	2.6	2.9	1.17	1.01
Labour productivity	2.95	7.51	8.66	7.67
Capital deepening	2.61	2.96	4.81	5.09
Total factor productivity	0.31	4.39	3.68	2.45
Memorandum item				
Capital stock	7.3	8.24	9.71	10.04
GDP per capita	3.45	9.11	8.74	8.13
Labour productivity	2.95	7.51	8.66	7.67
Participation	0.49	-0.27	0.13	-0.45
Demographics	0	1.78	-0.07	0.89

Source: China National Bureau of Statistics and authors' estimates.

The primary difference between the performance of the India and Chinese economy has been faster growth of the capital stock in China (Table 4). With only a slight difference in the growth of the employment, this faster growth of the capital stock has been translated into a more rapid growth of capital intensity in China. But the growth of total factor productivity has also been faster in China than India. This appears to reflect a greater ease for labour to move out of agriculture into higher productivity sectors in China than in India.

Table 4. Sources of difference between economic performance of China and India

Average annual compound growth rate China less India

	1980-1989	1990-1999	2000-2005	Average
Labour productivity	4.73	4.30	3.91	4.22
Capital intensity	2.02	2.91	3.11	2.57
Total factor productivity	2.56	1.24	0.69	1.59
Share of growth attributable to				
Capital intensity	42.7	67.7	79.5	60.9
Total factor productivity	54.1	28.8	17.6	37.6

Source: authors' estimates

The movement of workers out of the agricultural sector has been a potent source of increased productivity in China. Both average and marginal labour productivity appear high in non-agricultural activities and so the movement of labour has boosted the growth of productivity. According to the *Economic Survey of China*, the movement has boosted incomes by 0.5% each year on average in China in the period 1998 to 2003. Moreover, the strong movement of labour to urban areas, where most non-agricultural activity is concentrated, has not eliminated the gap between urban and rural areas. Earnings equations in China suggest a marked difference between urban and rural incomes, at similar levels of educational qualification. Such gaps are, in part, maintained by the household registration system that limits the movement of labour.

A traditional analysis of the impact of the movement of labour between major sectors also appears to show a beneficial impact of labour mobility on aggregate labour productivity in India as well.[6] Productivity is markedly higher in the secondary sector and even higher in the tertiary sector (Table 5). Unfortunately, the Indian authorities separately identify the contribution of residential housing to the output of the tertiary sector which implies a bias in the comparison of productivity between the two sectors, as residential housing produces output with little labour input. Taking into account the higher level of productivity outside the agricultural sector, sectoral change appears to have boosted labour productivity growth by about 0.8% per year – somewhat less than in the case of China. Bosworth and Collins (2007) found a somewhat higher impact of sectoral reallocation.

6 The benefits from movement across sectors likely could have been much larger, based on the experience of other developing countries. An analysis of two-digit manufacturing sectors in van Ark and Timmer (2003) shows that there had been relatively little shift of employment between sectors in the period through 2001.

Table 5. Impact of sectoral employment change on labour productivity growth in India

	1978	1983	1998	1993	1998	2003	Average growth
	Constant 1993 rupees per worker						% per year
Primary	1,281	1,330	1,513	1,585	1,874	1,907	1.6
Secondary	3,958	3,978	4,373	5,498	8,067	7,163	2.4
Tertiary	4,793	5,143	5,775	6,862	9,456	11,036	3.4
Base weighted productivity	2,206	2,300	2,585	2,960	3,922	4,091	2.5
Actual productivity	2,206	2,378	2,843	3,268	4,455	5,022	3.3

Source: National account statistics of India and authors' estimates.

There are, however, grounds for being cautious about this source of productivity growth in India. There is a dual labour market in India. In the "informal" economy, which consists essentially of enterprises run without the benefit of limited liability and mostly of very small scale, there is little employment protection legislation and barriers to migration are almost non-existent. Moreover, in rural areas there are a large number of landless labourers who do not risk losing property rights when moving in contrast to the situation in China. The absence of these barriers should result in equalization of marginal products between agricultural and informal non-agricultural activities. Consequently, movement between these sectors should have little impact on labour productivity. On the other hand, for companies in the formal sector of the economy, the employment protection legislation is tighter than in nearly all OECD countries. This suggests that the appropriate classification of the economy may be a split between agriculture and the informal and formal parts of the non-agricultural economy.

The differences in productivity between the formal and informal sectors of the Indian are extremely large. In terms of net domestic product per worker, productivity in the formal sector is 19 times higher than in the agricultural sector, with the highest productivity being registered in the formal private company sector (Table 6). In this part of the economy productivity is just under 10 times higher than in the economy as a whole. There has been a movement of labour out of the agricultural sector (see above) but simultaneously there has also been a fall in the share of employment in the formal ("organised" in Indian jargon) sector of the economy. While this proportionate fall was greatest in the public sector, even in the dynamic private sector employment remained stable, despite an increase of nearly one million employees in the IT services sector between 1999 and 2005, and so showed a fall in proportionate terms. Overall, the marginal worker has been employed in the private informal economy where the productivity level is only twice that of the agricultural sector. The gain from the movement of labour from the agricultural sector to the informal sector was only modest and was not sufficient to offset the movement out of the formal sector of the economy. As a result, the overall impact of sectoral change has been to reduce the growth of labour productivity. A more disaggregated approach might show a more positive impact from re-allocation of labour, especially given the strong growth of the software services

sector. Labour productivity in this sector is higher than for the economy as a whole, but is not markedly higher than that in the formal sector of the economy, due to the relatively low level of value-added per worker in IT enabled services (such as call centres and other forms of business process outsourcing) where employment has been growing rapidly.

Table 6. Labour productivity by institutional sector in India

	1993	1998	1999	2000	2001	2002	average growth
	Constant 1993 rupees per worker						% per year
Informal sector							
Agriculture	934	1104	1090	1101	1128	1033	1.1
Non-agriculture	2041	2756	2597	2397	2350	2545	2.5
Formal sector	9441	13822	15212	16288	17679	19520	8.4
Private companies	11707	16783	19480	22616	24340	27253	9.8
Public enterprises	11227	17021	17345	17453	20134	22928	8.3
Public administration	6054	8618	9893	10130	10281	10481	6.3
Base weighted productivity	100	134	136	138	144	151	4.7
Actual productivity	100	135	137	138	140	146	4.3

Source: National account statistics of India and NSS employment data.
Note: *The constant price data assume that the share of each sector in constant price output is the same as the share in current price output. Years refer to fiscal years.*

The labour markets in China and India thus stand in stark contrast. In China, employment protection was markedly reduced at the end of the 1990s as part of the switch from away from state sector employment and the strong growth in employment in private enterprises has been sufficient more several years to offset the severe retrenchment in public sector enterprises. This movement has had a highly beneficial impact on the level of total factor productivity. On the other hand the government has been extremely cautious in allowing migration between rural and urban areas, even though the urban population if growing significantly. Significant legal barriers to population movement remain in place. On the other hand, in India, there are few barriers to migration but employment protection legislation is far more draconian than in the OECD area let alone than when compared to actual practice in China. Employers

in India, especially in the industrial sector have the greatest difficulty in shedding labour and even in changing the job description of a worker. Within India, states with marginally higher degrees of restrictive labour legislation have been found to have higher poverty levels but it would seem that the impact of restrictive labour legislation may be a factor holding back economic growth in India.

5. Estimating the level and growth of potential output

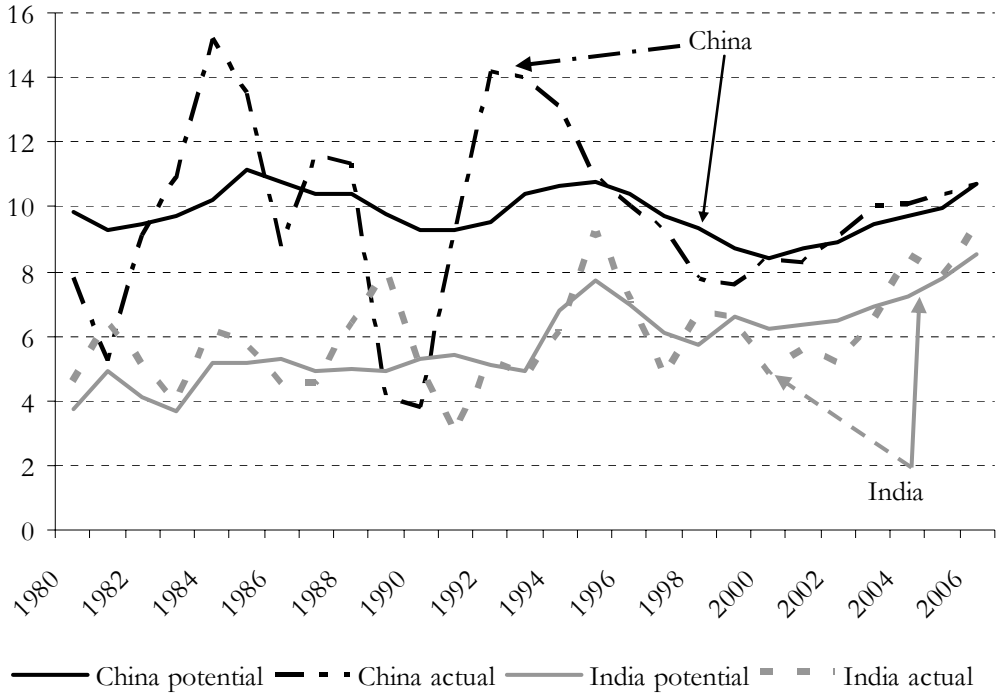
A full analysis decomposition of the factors behind economic growth also requires removal of business cycle fluctuations and, in the case of India, weather related impacts on the agricultural economy. Weather related impacts can be removed by regressing expressing agricultural output on monsoon season rainfall.[7] The methodology follows one similar to that used by the OECD for estimating potential output for the economies of member countries (Cotis et al., 2005). First, a stochastic Cobb Douglas production function is estimated. The impact of economic activity on the unemployment rate, the activity rate and total factor productivity is then removed by using a Hodrick-Prescott filter. The resulting filtered values for the unemployment rate and activity rate are then combined with a measure of the working population to estimate filtered employment. This is then recombined with data for the actual capital stock to estimate potential output.

Over the past decade, this methodology shows the potential growth rate of China outpacing that of India. The strong growth of potential in China, currently 10.7%, is based on annual capital stock growth of 13.4% and only slow growth of labour input (Chart 5). Unlike most OECD countries, potential growth in China exhibits marked fluctuations. These have been driven by pronounced investment cycles of which there have been three since the start of economic reform in 1978. Each of these cycles has lasted around ten years. Both of the previous investment cycles have ended with severe overheating and inflation. As yet, the current cycle has not resulted in this type of overheating. However, actual GDP has now moved above our estimate of potential GDP, pointing to problems if the current growth rate is maintained for several more years.

While the potential growth rate of the Indian economy has been less rapid than that of China, it has been more stable and has been steadily increasing, reaching an estimated 8.4% in 2006. There has been one cycle, following the ending of industrial licensing in 1990. The current upswing in potential growth is more evenly balanced than in China, in that the growth of the working population has been maintained since the mid-1990s whereas in China there has been a pronounced slowdown in the growth of the working age population and a modest slowdown in total factor productivity growth – though TFP growth remains faster in China than in India. As a result, the acceleration in potential has been achieved with less of an increase in the growth of the capital stock and hence in the share of investment in demand.

[7] The removal of seasonal effect of rainfall could be done directly in the production function. Virmani (2005), for instance, takes such an approach.

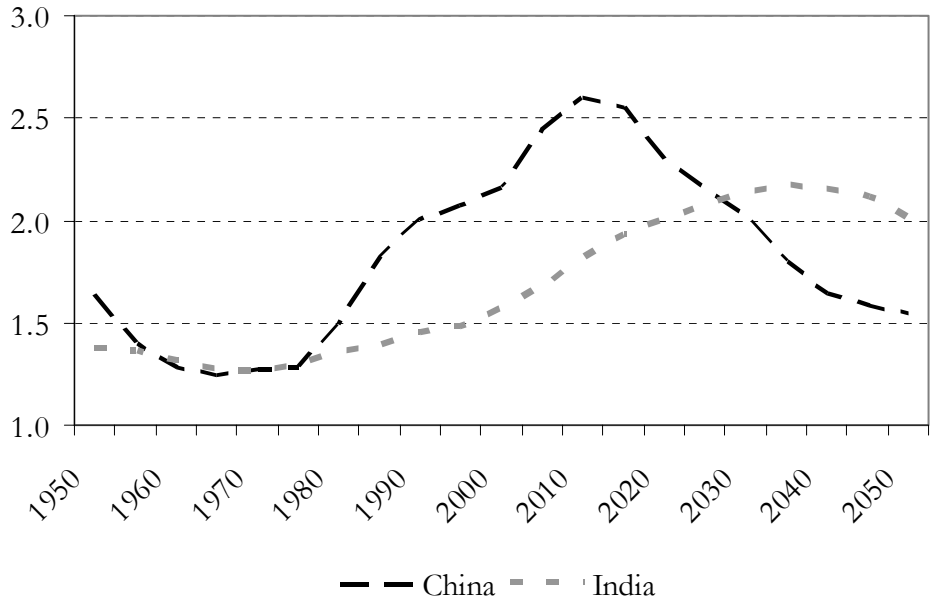
Chart 5. Actual and potential growth rates - Annual growth rate



Source : Authors' estimates for potential growth; National sources for GDP

Making projections of economic developments over a twenty year period is extremely hazardous; nonetheless a supply-side analysis suggests that the current expansion of Chinese potential output is unsustainable over this period while there is room for the Indian performance to improve. In the case of China, demographics are moving strongly against the maintenance of such high growth rates (Chart 6). Currently working age population is growing by around 1% annually, but, based on UN population projections, the number of available workers (as well as their ratio to non-workers, shown in the figure below) will have stabilised in six years time and will then start to fall. In addition, in 2006, the potential growth of the Chinese economy was based on a growth in the capital stock that was outstripping GDP growth by a substantial margin. It is unlikely that such a development can continue for any length of time, as it implies a constantly increasing share of investment in GDP. For example, the ratio of real net investment to GDP has risen from an estimated 30% of GDP in 2002 to a projected level of 45% in 2006. Maintaining growth of capital at its current rate for a decade would require the net investment rate to rise to 60% of GDP and to nearly 80% in a further 10 years.

Chart 6. Ratio of working age to on-working age population



Source: United Nations Population projections

The results of two scenarios are explored here: one in which investment is capped at 45% by successful administrative actions and another in which investment falls to its long run average of 33%. In both cases potential growth slackens markedly. Nonetheless, the gain in real incomes over the next two decades would still be between three and four times the likely growth of real incomes in the United States in that period.

Two scenarios are also presented for India: an increase in the net investment ratio of five and ten percentage points. Such an increase could be feasible with no policy changes given that the dependency ratio (notably that of children) will be falling in the next decade with the result that the saving rate could increase. Overall, this increase in the investment rate (pushing the growth of capital from 7.4% to 8% annually) should be almost sufficient to counter the decline in the growth rate of the working population. As a result, GDP growth would be maintained and indeed increase slightly. Moreover, with the growth rate of the total population also slowing, the growth of real incomes should accelerate significantly, from 6½ per cent in 2006 to nearly 8% by the end of the projection period, a similar result to that found by Poddar and Yi (2007). Such a trajectory would be sufficient to raise real incomes by a factor of 3.5 in the period 2006 to 2024.

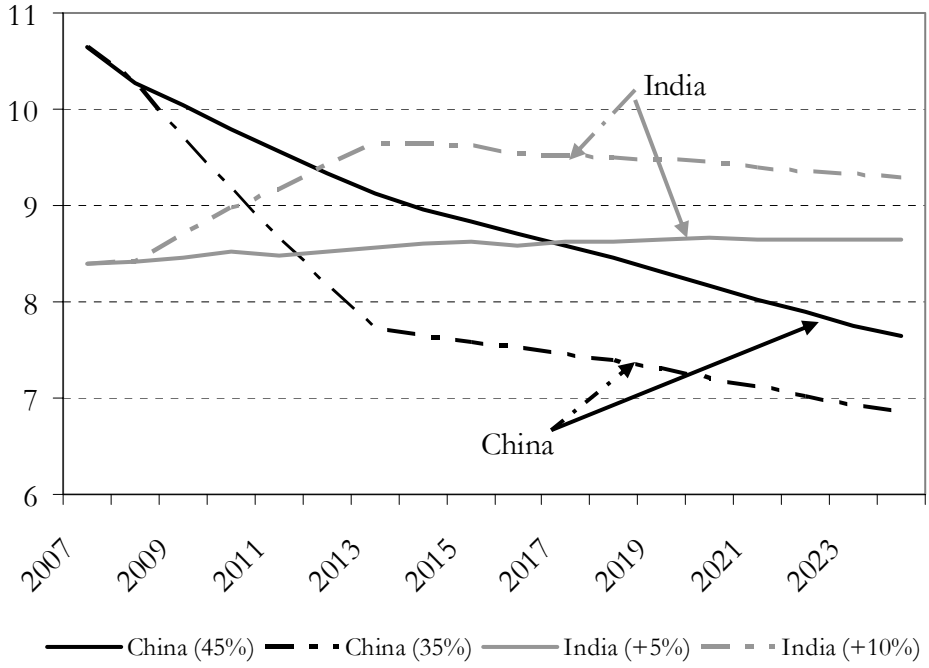
The second scenario for India is more optimistic but perhaps not as realistic as the first. It is based on a more significant increase in the investment ratio by 10 percentage points. Such an increase in investment would need to be accompanied by increase in domestic savings if the economy were not to risk the type of balance of payments crisis seen in some parts of Asia in 1997. The most obvious source of saving would be to raise government saving, but the government is current only planning on an increase in government saving of the order of 2% of GDP between 2006 and 2008 at the moment. However, if the increase were to be taken further and to reach 5% of GDP then potential growth could increase to 9¾ per cent by 2015, broadly in line with

the government's objective of reaching 10% growth by the end of the eleventh plan period in 2011.

Chart 7. Growth scenarios for India and China

China: constant investment share and a reduced investment share

India: a medium and large increase in the investment share



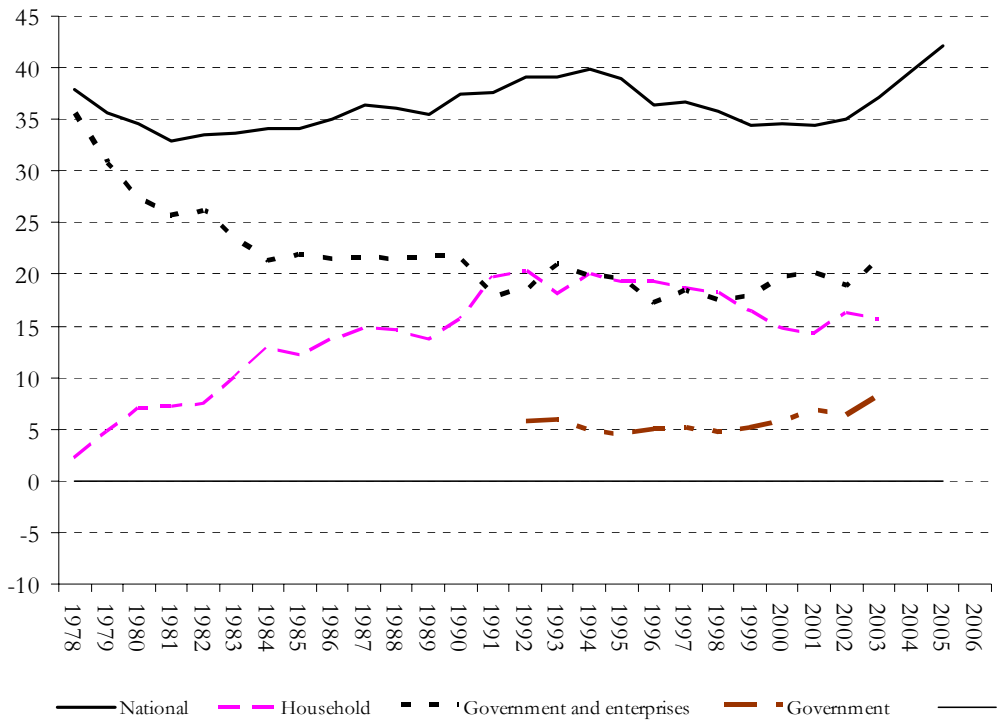
Source: Authors' estimates

One could imagine a more optimistic scenario for India that would allow an increase in labour force growth to filter through to a larger rise in the household savings rate (supported by prudent fiscal policy), but given that India's household savings rate is already higher than China's, the scope for further increases may well be limited. The future role of savings is discussed next.

5.1 Savings rates and demographics

The investment ratios of both China and India are supported by savings ratios that are extraordinarily high and often subject to misleading explanations. Yet a breakdown of each country's savings rates by institutional sector reveals that the main factors are highly structural in nature and change only gradually over time. Moreover, the role of government policy in influencing savings rates is limited (de Mello et al., 2004). Given the capital controls in place in both countries, they have both depended primarily on domestic financing of their investment, although India has allowed and enjoyed significant portfolio in-flows, while China has attracted considerable amounts of net foreign direct investment.

Chart 8. China's national saving rate and its components Per cent of GDP



Source: National Bureau of Statistics, Statistical Yearbook and Modigliani and Cao (2004).

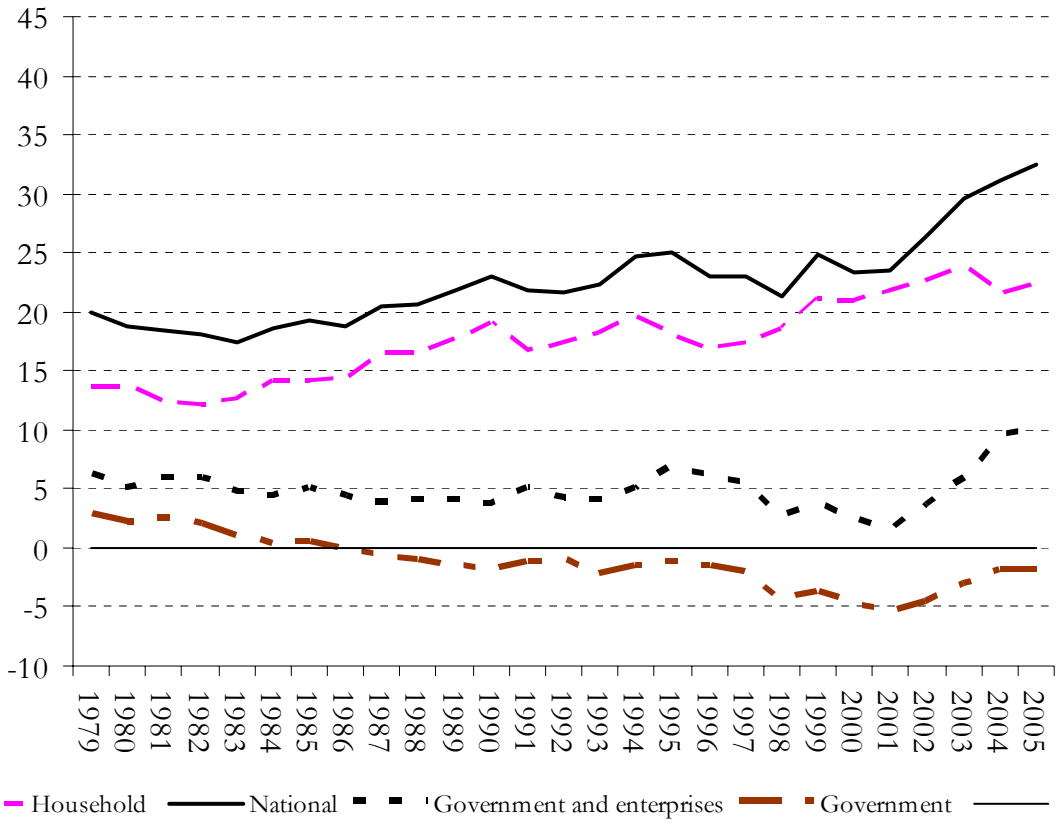
For China, the largest component of savings is not household savings, but business retained earnings (Chart 8). Despite the very rapid shift of China's economy toward private ownership over the past five years, as a result of the underdeveloped financial system with limited capital markets, business finds it attractive to reinvest much of its net profits rather than pay dividends (Dougherty and Herd, 2005). As a share of GDP, retained earnings continue to represent over 20% of GDP, a figure that is much higher than in India, where the financial system and capital markets in particular, are more developed. As a result of the substantial state presence in China, government savings could not be distinguished from business savings until the 1990s, but in any case, it has played a complementary – if minor – role in keeping savings high.

Household savings in China increased from only 5% of GDP in late 1970s to over 20% in the past few years, according to our estimates. A regression analysis suggests that only two factors explain most of this increase: future earning potential (measured as the trend rate of per capita household income growth) and the share of population at working age. More than half of the increase in savings can be attributed to the demographic profile of the population. This profile plays a role as a result of life-cycle savings effects, where individuals save more at the peak of their working life, so the larger the share of working age individuals, the higher the household savings rate (Modigliani and Cao, 2003).

Looking forward, China's savings rates may well decline as the share of its population at working age starts to decline in six years' time. Nevertheless, there is some encouraging evidence that heads of Chinese households continue to save significantly well into retirement (Chamon and Prasad, 2006). If this is indeed the case, and if it is supported by policies that encourage participation, a more gradual slowdown in

potential growth may well be observed. Nevertheless, as the financial system develops, business sector retained earnings are likely to fall, accelerating any effects from demographic shifts.

Chart 9. India's national saving rate and its components Per cent of GDP at market prices



Source: Centre for Monitoring the Indian Economy

The largest component of national savings in India by far is household savings. It has risen from 10-15% to 20-25% of GDP over the past two decades (Chart 9). The risen has been driven by the ongoing gradual rise in per capita income growth and the steadily growing share of the population at working age (Dougherty, 2006). Household saving in India is higher than that in China. Moreover, estimates of the sensitivity of household savings to demographic shifts suggest that India's household savings rate, while already high, may be even more sensitive than China's to the dependency ratio. This could mean that savings rates may rise further than anticipated, yielding a greater demographic dividend as the dependency ratio falls through 2030. This in turn would require that the economy is able to fully utilize the additional resources for investment.

In stark contrast to China, for India, significant public dis-saving has limited national savings, and likely crowded out investment.[8] Indeed, the principal difference in the level of national savings between China and India stems for the nearly 10 percentage point difference in the level of government saving. Fortunately, the deterioration in

[8] While the possibility of Ricardian effects would seem possible, the government fiscal deficit does not appear as significant in a savings equation.

public savings since 1982 reversed course in 2002 and has improved somewhat since then, although it is still negative. Moreover, business sector savings, which represents about 10% of GDP, with private sector and government enterprise retained earnings each holding similar shares, has increased this decade.

6. Conclusion

This comparative analysis of the Chinese and Indian economies reinforces the view that capital formation has been the key factor behind the rapid growth of these two economies rather than growth of total factor productivity. This conclusion is also true for the differences in the growth performance of the two economies. During the past decade higher capital formation in China has been responsible for nearly three-quarters of the excess of growth in China relative to India. Looking forward, while it seems unlikely that China can maintain its current growth rate over the next two decades, as the share of investment in GDP would need to continually increase. At the same time, Indian growth seems likely to increase somewhat. Household saving is likely to increase and more than offset the decline in labour force growth. As a result, Indian growth could overtake that of China in the coming decade.

India also has the possibility of introducing policies that would improve the growth of total factor productivity. With the right combination of changes it could raise its productivity growth sufficiently to increase trend output growth by a percentage point (or more). Such a scenario could even yield output growth significantly faster than that of China in the future, allowing for some catch-up to take place, especially as institutions may prove more resilient in India than China.[9]

An obvious policy change would be to try to enhance factor mobility, notably that of labour through reforms of the labour laws which may be the primary reason behind the falling employment share of the high productivity sector of the economy, thereby enhancing the impact of the move of workers out of the agricultural sector that has been an important factor in enhancing Chinese productivity growth.

[9] Such a scenario is elaborated in Fromlet (2005).

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