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Welfare comparison beyond GDP: An illustration from China and India

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Abstract

The paper provides a welfare comparison between China and India. China outperforms India as a whole, but the gap is evidently being reduced. The preliminary results show that India has more regional variations. After controlling for state effects, however, economic development displays a pronounced effect on the improvement of welfare indicators in India, whereas in China, most variations are correlated with income differences across provinces. Another interesting finding is that over time, the income effect on social indicators is diminishing in China, calling for more alternative approaches. Our analysis strongly suggests that in India, state-level social policies play a key role.

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Key Words: Welfare; social indicators; China; India
JEL Classification Numbers: D63: C43: O18

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1. Introduction

China and India have become the powerhouses of the current global economy. Their remarkable economic performance has led the world to not only look closely at their overall economic development strategy, but also to try to understand how their success could help enhance economic opportunities for the rest of the world. It is therefore of great interest for academicians and policymakers to learn from these countries, even though their institutional structures and organizations differ considerably.

Although China has experienced unprecedented economic growth over the past three decades, many concerns remain that would need careful attention. This also applies to the Indian context. In this paper, we posit the critical importance of other social, health and infrastructural indicators rather than focusing on gross domestic product (GDP) alone. Moreover, when it comes to country development levels, significant differences remain within a given country, as seen in recent literature. Although the reform process has offered unseen benefits from economic engagements and activism, it has had differential levels of impact across regions. The large regional variations in the two countries enable us to quantify the contributions of economic development and social policies to the improvement of major welfare performance indicators.

This paper is organized into the following sections. Section 2 provides some recent work on issues related to the comparative development of both countries. We review the empirical literature on GDP differential and welfare indicators. In section 3, the paper discusses national and regional trends. The regional inequality comparison is discussed for both countries. Section 4 attempts to show a relationship between GDP per capita and welfare indicators, such as education, health and infrastructure. Finally, section 5 concludes the paper.

2. What recent literature tells us about the China–India Comparison?

Various significant studies have been conducted over the years to understand the differences and similarities of economic performance and development strategies in China and India. Essentially, the latest figures have also received amazing international media attention because of the two following statistics on poverty incidence. The China Human Development Report (2005) shows that the poverty rate has declined drastically, falling from 31% in 1978

to 2.8% in 2004. For India, the poverty rate has also declined remarkably, from about 60% in the 1950s to an expected 19.7% in 2007.[1]

As far as China–India comparisons are concerned, the studies mostly compared economic growth and trade performance. The United Nations (2005) provided a comparative discussion of China and India and highlighted their combined importance due to not only the rise in their own economic growth but also their impact on changing patterns of global interdependence and trade outcomes. Dreze and Sen (1997) conducted an insightful study of education and health outcomes for both China and India. Many comparative studies on China and India have also gone into a discussion of regional differences by employing "convergence" analysis to show that there is some sort of indication of income per capita convergence in China, but not in India (for further discussions on comparative study of China and India, see Malenbaum, 1959; Kuitenbrouwer, 1973; Guha, 1993; Bajpai et al., 1997; Desai, 2003; Khanna and Huang, 2003; Srinivasan, 2004; Basu et al., 2005; Bardhan, 2006; Wu and Zhou, 2006; Borooah et al., 2006 and Basu, 2007).

One of the salient features of the China–India comparison, apart from their economic growth stories, rests on their different institutional frameworks. Many commentators on China and India have been arguing that India's development is sustainable due to the democratic nature of the Indian political system. Gajwani, Kanbur and Zhang (2006) discuss the observed patterns in regional inequality in response to major events during the period of economic reforms in China and India. The analysis shows that China's regional inequality has an inland–coastal dimension, while the regional comparative advantage in India has shifted from land quality to the level of human capital.

The present paper attempts to present an overall view of economic development and/or disparity at both the national and regional level for the past two decades. We examine closely the factors that are related to welfare indicators, for example, indicators related to education, health and infrastructure, as well as their evolution over the past two decades at both the national and regional level. The discussion of the Gini inequality index across regions within country indicates that both China and India should refocus on their development strategies with a view to spreading the fruits of economic growth among the different socio-economic groups. The importance of per capita income in explaining development outcome indicators is examined in a panel data framework, and an attempt has been made to determine whether per capita income correlates with welfare indicators over the past two decades or so.

[1] Planning Commission of India expects that during 10th Five-year plan poverty rate to reduce to 19.7% by 2007.

3. National and regional trends

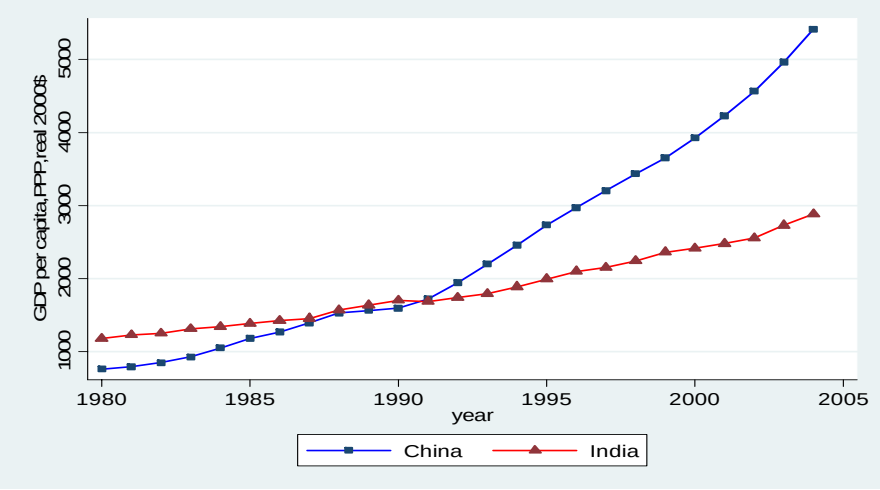
This section explores trends in per capita GDP, education, health and infrastructure at the national and regional level over the last two and half decades in both countries, shedding light on the different development patterns in both countries.

Comparative performance at the national level

Since the Chinese economic reform began in the late 1970s, there has been a tremendous upsurge of economic growth performance. The Government has adopted robust economic policies and implemented associated changes to raise living standards and has started opening the economy up to the outside world. As a result of the changes in economic policies, the Chinese economy grew at an average of 9 to 10 per cent per annum and per capita GDP (constant ppp $ international) rose from $763 to $5,419 over the last 25 years (Table 1). After India's new economic reform policies introduced in 1991, per capita GDP also grew faster, from $1,701$ in 1990 to $2,885 in 2004, at a faster clip than in the 1980s.

The time series plot of per capita GDP from 1980 to 1990 shows that India registered higher value but that China's progress since 1990 has been astonishing (Figure 1). Although there has been an increase in India's per capita GDP, China's progress has been much faster.

Figure.1. Comparing per capita GDP (in constant PPP$ international)

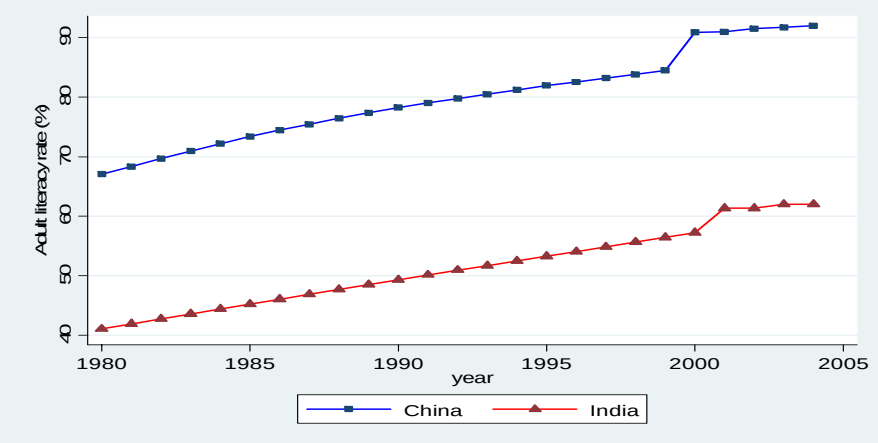


Sources: WDI (World Bank, 2006).

The change in per capita income during the period of economic reform has brought about substantial changes in other indicators of development. The change in educational improvement has been captured by the adult literacy rate (ALR), which rose from 67 per cent

in 1980 to 92 per cent in 2004. Similarly, in India, the adult literacy rate increased from 41 per cent in 1980 to 62 per cent in 2004. The comparison clearly shows that India's recent figure for the adult literacy rate is still below China's literacy rate of 1980.

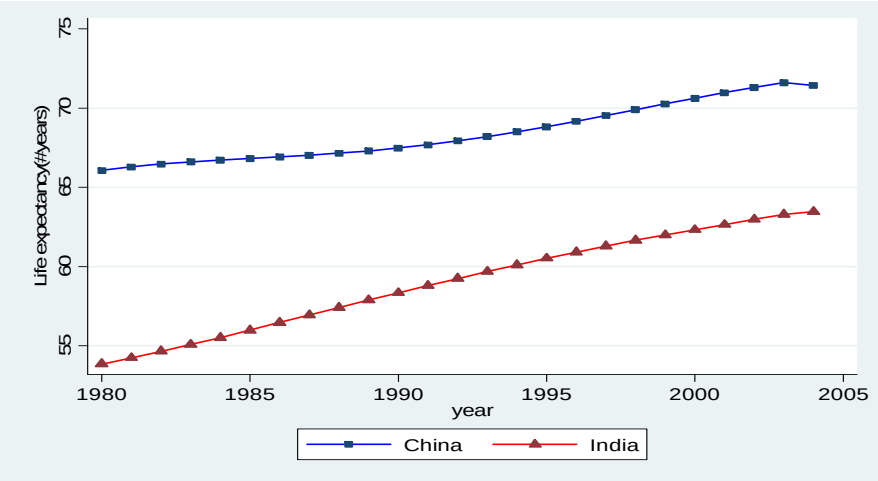
Figure.2. Comparing adult literacy rates (percentage)



Source: WDI (World Bank, 2006).

In the 1980s, the adult literacy rate increased by 11 per cent in China and 8 per cent in India, respectively, and similar rates of progress were registered in the 1990s, indicating some sort of secular improvement in both countries over the period. Since 2000/2001, both China and India have displayeed a similar sharp increase in adult literacy values (Figure 2).[2]

Figure. 3. Comparing life expectancy at birth (years)

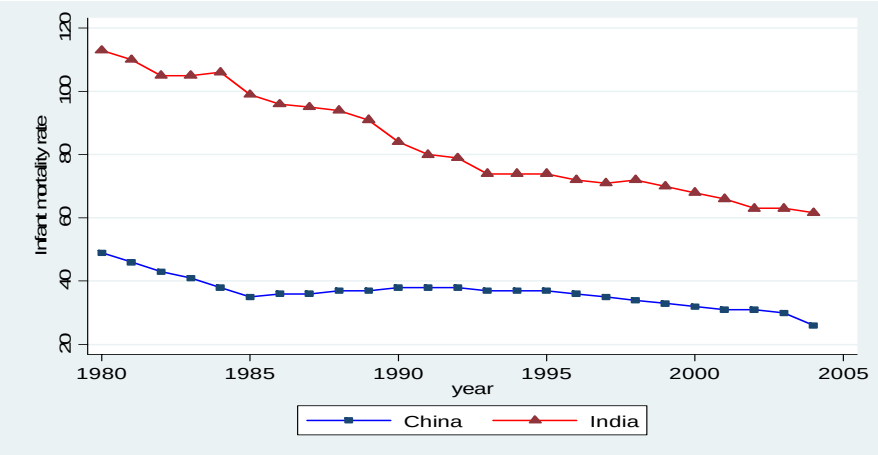


Source: WDI (World Bank, 2006).

[2] The missing values are imputed by simple interpolation of the series.

By looking at health-related indicators in Figure 3, we can see that Chinese life expectancy (LE) grew by five years over the last 25 years, as compared with a 10-year increase in India. In the 1980s, the corresponding improvement was only about one and half years in China and about five years in India, respectively. Moreover, during the later period, life expectancy rose at a faster clip in India. Nevertheless, life expectancy in India is still some 8 years less than in China.

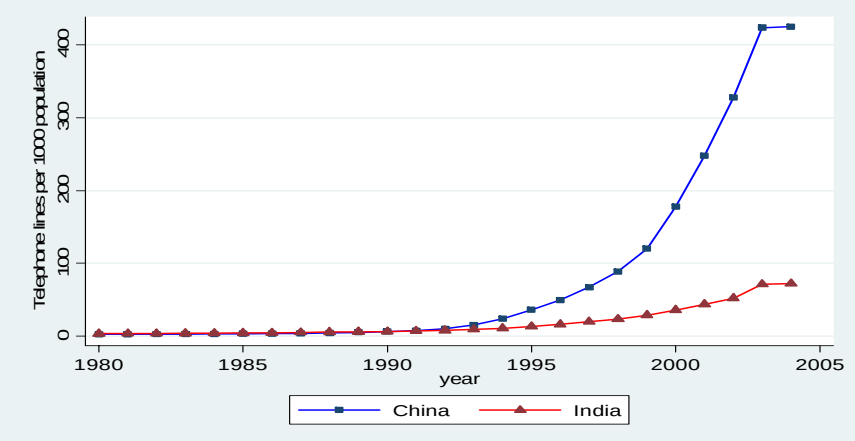
Figure. 4. Comparing infant mortality rates (per 1000 live births)



Source: WDI (World Bank, 2006).

Mortality-based indicators, such as the infant mortality rate (IMR), have been much lower in China than in India (Figure 4). In 1980, China had an IMR of 49, while India had 113. During this period, in both countries, the IMR per 1000 live births fell by half of the 1980 value. However, by comparing China and India's IMR value, it is clear that India's IMR is about three times that of signs of convergence over the period.

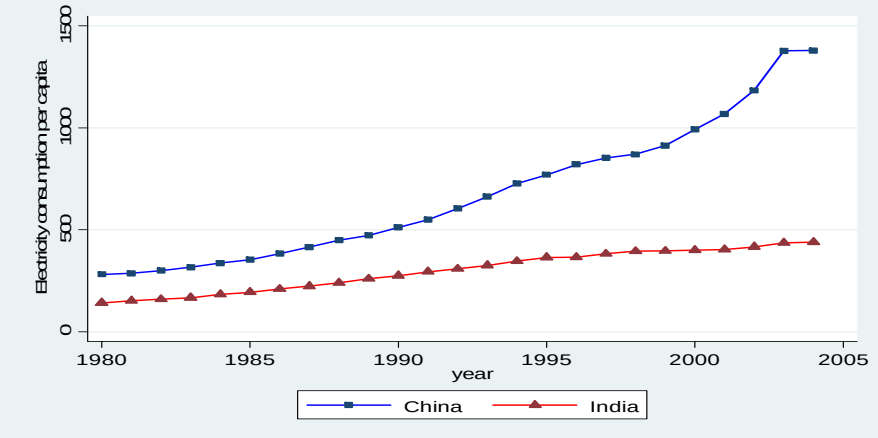
Figure.5. Comparing telephone line, fixed line and mobile (per 1000 population)



Source: WDI (World Bank, 2006).

One can readily observe changes stemming from the telecommunication revolution, which can be captured by telephone mainline subscriber figures. During the first 10 years since 1980, China and India registered similar progress, but the 1990s were marked by a real turnaround in China. Figure 5 shows that telephone subscribers (per 1000 population) grew from 6 to 425, while India registered a modest rise from 6 to 72.

Figure. 6. Comparing per capita electricity consumption (kwh)



Source: WDI (World Bank, 2006).

The electricity consumption per capita indicator provides an indication of economic development and industrialization as well as the improved living standards of residents. This value went up from 282 kwh in 1980 to 1380 in 2004, indicating an overall fivefold rise; while it increased threefold in India. (Figure 6) In absolute values, however, Chinese electricity consumption is three times higher than in India. This figure indicates that manufacturing development has helped the Chinese domestic market to grow rapidly over the period, giving further feedback to industrialization. With the growing demand of industrialization, energy consumption rises.

The above illustrations clearly indicate that in levels, China's performance in social, health and infrastructure-related indicators have been much higher. Although there has been some sort of rapid improvement in many of these indicators in India since economic reform policies were initiated in 1991, China's initial values were higher in all cases. More specifically, significant differences in human capital indicators, such as the adult literacy rate, may be crucial for sustaining economic growth.

Differences in adult literacy rates were much greater in China than India throughout the comparison period. It is expected that per capita GDP will be closely related to social health infrastructure-related indicators. To verify this, we look into pair-wise correlation

between per capita GDP with five indicators that we are comparing here. Per capita GDP is highly correlated with all the indicators of the analysis. We discuss the relationship of each of the five indicators with per capita GDP in three different time periods and for the entire period (Table 2). From column 1 to column 4, we present correlation figures for China; and from column 5 to column 8, results for India are shown. For example, in column 1, the correlation coefficient between per capita GDP and the adult literacy rate is 0.992 in 1980-89, and then in 2000-2004, the value falls to 0.982 (column 3). Similarly, we notice a weaker relationship between per capita GDP and other development outcome indicators in China. In the case of India (column 5 to column 7), all the indicators show a weaker correlation with per capita GDP over the years.

In general, the correlation of the infant mortality rate with per capita GDP is lower than those for the other four indicators. This suggests that in addition to economic growth, some public policies such as immunization and early childcare can play a significant role in reducing infant mortality.

Comparative performance at the regional level

Regional differences in human capital, infrastructure, and social policy-related indicators are critical. It has been well documented in the policy discussions that in both countries, regional differences should be addressed and new development strategies redirected to reduce the differential level of development gains from the economic reform process. The within-country differentials are crucial to the sustained economic growth of both countries. According to a United Nations report:

'*China and India, together containing a third of the world's population, have enjoyed tremendous economic growth over the past decade. Their successes in advancing average well-being imply major improvements for a large portion of humanity. But their experiences also point to the importance of looking beyond national averages to understand differences within countries*' (Box3.4, Human Development Report, UNDP 2003).

Therefore, we highlight some comparisons of key factors in our paper. In Table 3, we describe descriptive statistics of outcome indicators for both China and India to show their overall trend since 1980s. One human capital variable, adult literacy, indicates that the 1980 rate for Yunnan province was still higher than that of Bihar state, even in the latest year. Although the ratio of maximum to minimum value declined in both countries, the value is

much less in China. Similar trends can be found in three other variables, such as life expectancy, infant mortality and telephone subscriptions. Yet although one can see straight away that China may seem to be doing well in most indicators, some provinces are still doing worse than better-performing Indian states. The table shows that some Indian states, such Kerala, perform better than many Chinese provinces, e.g. in terms of adult literacy, life expectancy and infant mortality rates.

In the following table, we discuss the regional differential for both countries, by geographical and economic development areas. In China, by looking at the coastal and inland regions, differential levels of development are evident. All five indicators we have included here for analysis indicate a better performance for coastal regions in comparison to inland region (Table 4). Similarly, in the case of India, BIMARUO states are the ones lagging the farthest behind, and we use this group to determine the difference between two regions. The results clearly show that BIMARUO states are lagging behind in comparison to the other Indian states (11 major states of India are included here for our analysis).

The table also shows figures for two periods: 1980 and 2004. In China, one can easily observe that all the five indicators performed better in coastal areas than in inland areas in China. Similar patterns can be found in India as well. BIMARUO states and the other major Indian states have shown overall progress, but the former group of states is lagging behind the latter group.

Furthermore, we can present a comparison of life expectancy levels for the best-performing provinces of China with those of Indian states. Some argue that China has already reached a high level of life expectancy, as a result of which there is limited scope for marginal improvement. However, Table 5 below indicates that the Indian state of Kerala experienced a similar improvement in life expectancy, from 68 years to 73 years, in the latest year. However, the best-performing Chinese provinces show a considerably higher level of life expectancy than the best-performing Indian states. The top three Chinese provinces still display much higher levels of life expectancy than the best-performing Indian states. Another noticeable point is that, on average, these provinces/states managed to increase the number of years of expected life by a margin of five years over the past two decades. This provides a strong argument against the excuse that because life expectancy in China is already high, marginal improvement is very difficult.

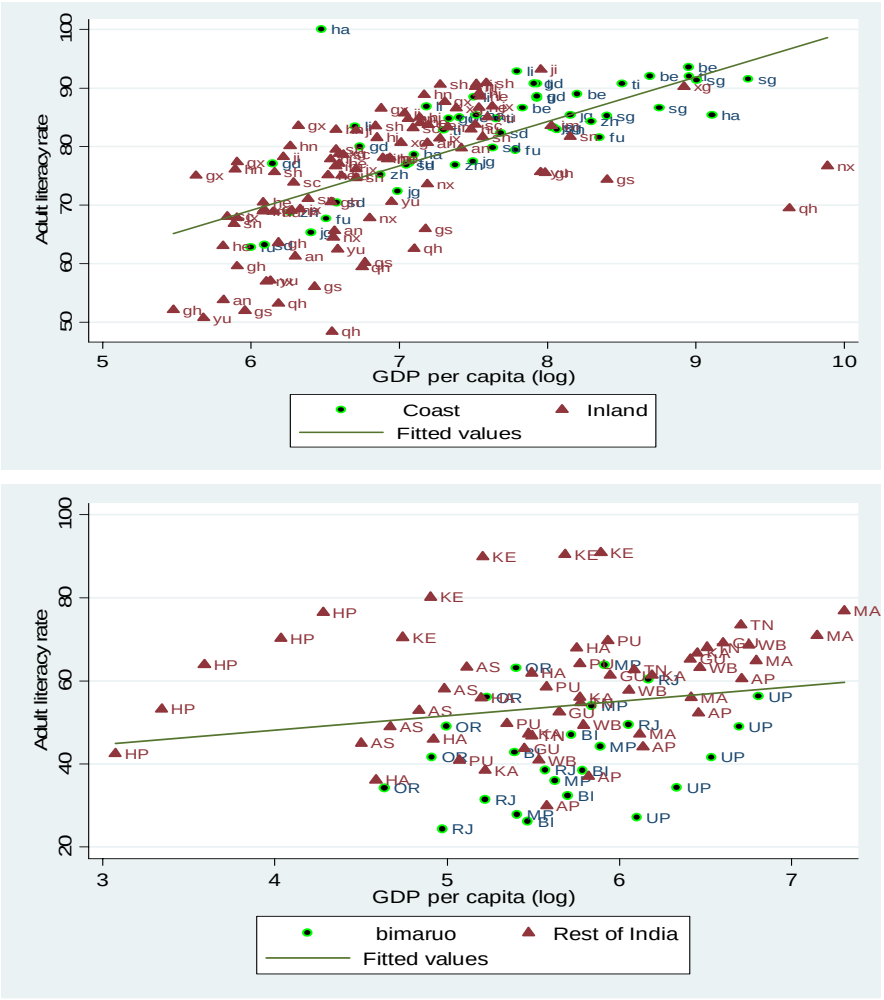
This discussion clearly points out that even if the average numbers may be higher in China (and provinces), deeper and larger interregional differences remain hidden. It is evident that some Indian states, such as Kerala, performed better than many Chinese provinces. This

may lead us to make a general observation here, namely that China's growth-enhanced improvements in social indicators is far from balanced.

Given this background, analyses of the relationship between the per capita GDP of provinces/states in both countries with five development indicators have major policy implications. In China, plotting five time points of per capita income (logarithms of) against the adult literacy rate (per cent) yields a clear positive trend, while in the case of India, the relationship is not very clear.

In the Chinese provinces, the coastal regions have done much better, as can be observed from the plotted diagram. In the Indian states, there is some sort of dichotomy as few states are doing much better than the rest. We show BIMARUO states and the other major states in the analysis (Figure 7).

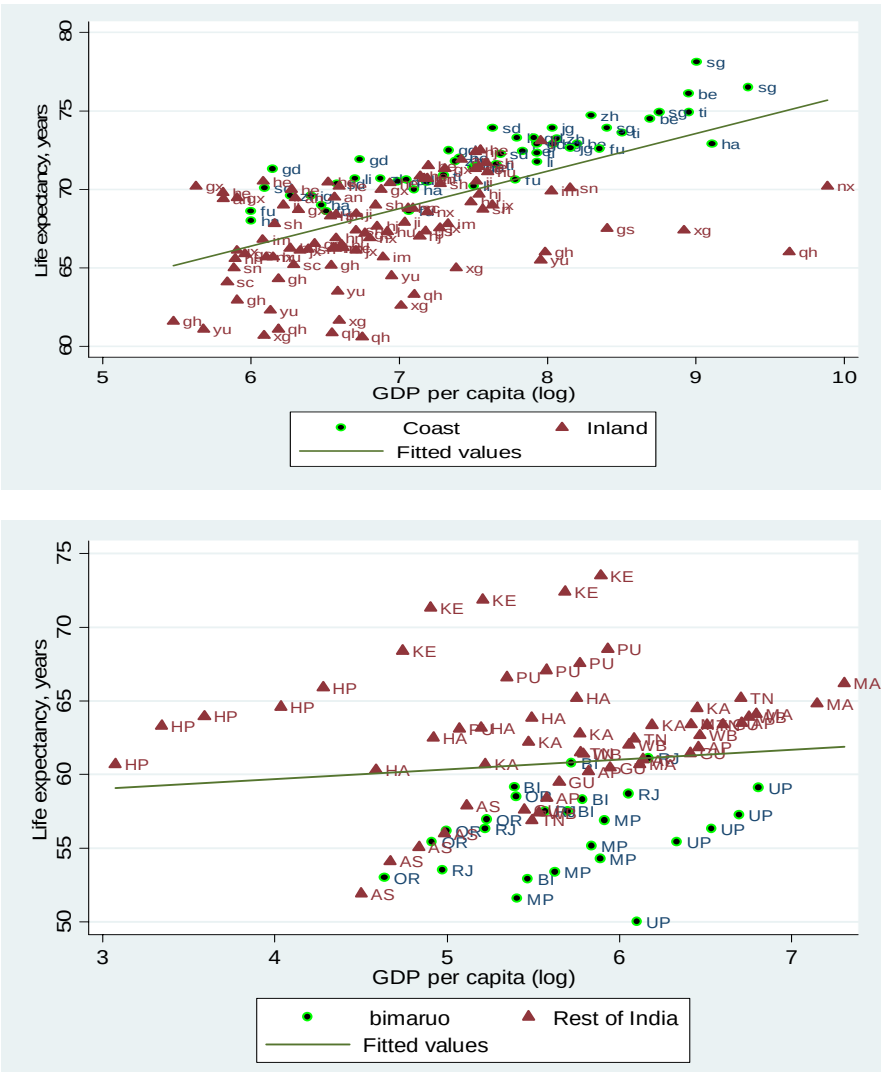
Figure. 7. Per capita income and adult literacy rates



Note: Provincial and state abbreviations are shown in Appendix table

Another crucial relationship can be found between per capita income and life expectancy, as a measure of a country's health status. This shows a trend similar to that of the adult literacy rate. In China, the coastal provinces have performed much better than the inland provinces, as is also the case for the BIMARUO states, which have failed to keep pace with the other major Indian states (Figure 8).

Figure.8. Per capita income and life expectancy



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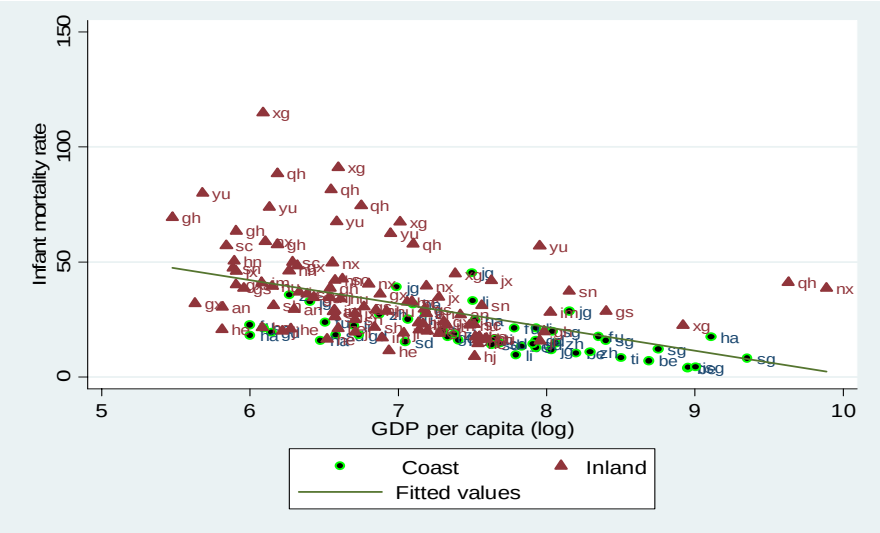
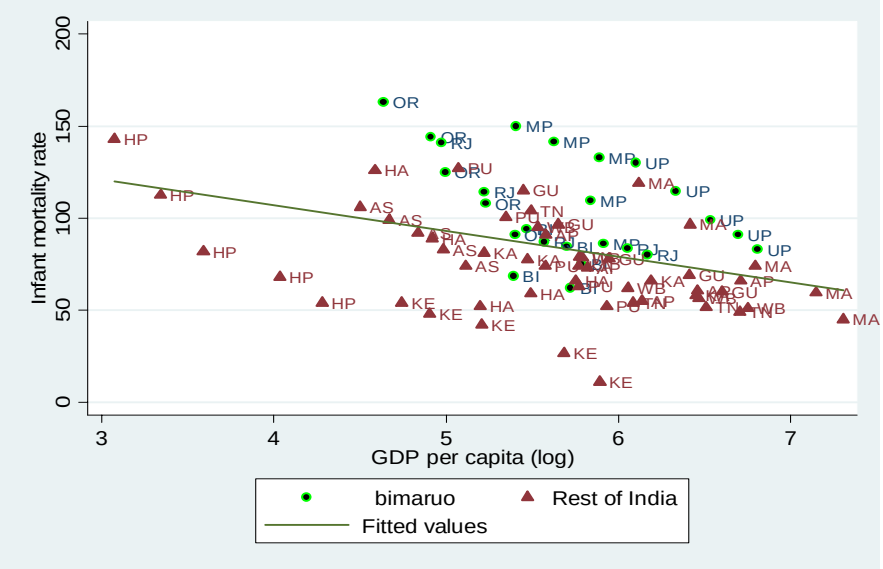
Infant mortality rates reflect a country's progress in providing higher- quality health services. Both China and India have taken several measures to provide health care in both rural and urban areas. Again, plotting per capita income against the mortality rate reveals a negative trend in both countries. Figure 9 shows that in China, the coastal provinces have

performed much better than the inland provinces, as is also the case for the BIMARUO states, which have fallen behind the other major Indian states.

Figure. 9. Per capita income and infant mortality rates

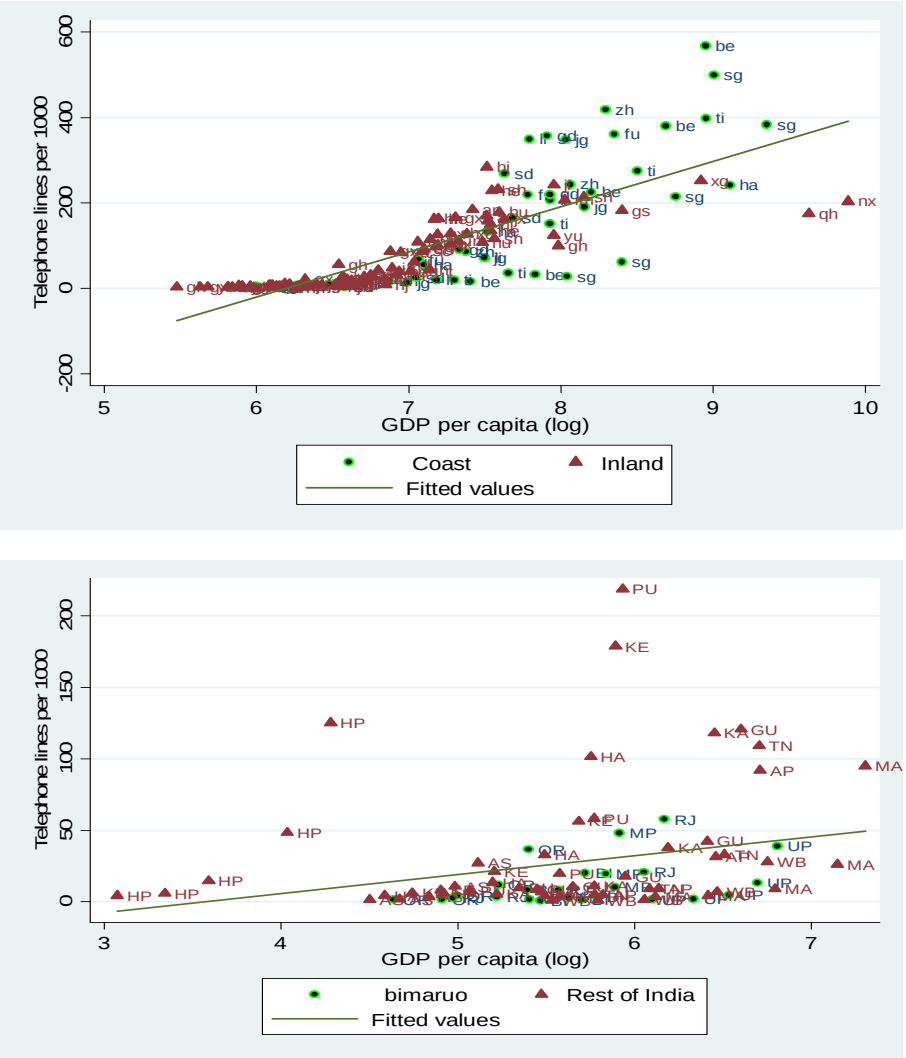




Note: Provincial and state abbreviations are shown in Appendix table

Another indication of improved living standards is the telecommunication revolution. The penetration of telephone mainlines is also related to the increase in per capita income. The rise in per capita income is highly related to telephone mainlines, while this trend is not that strong in India. Likewise, with education and health indicators, once again, the coastal provinces clearly outperformed the inland provinces in China, and the BIMARUO states have a lot to do to keep up with the other major Indian states (Figure 10).

Figure. 10. Per capita income and telephone lines

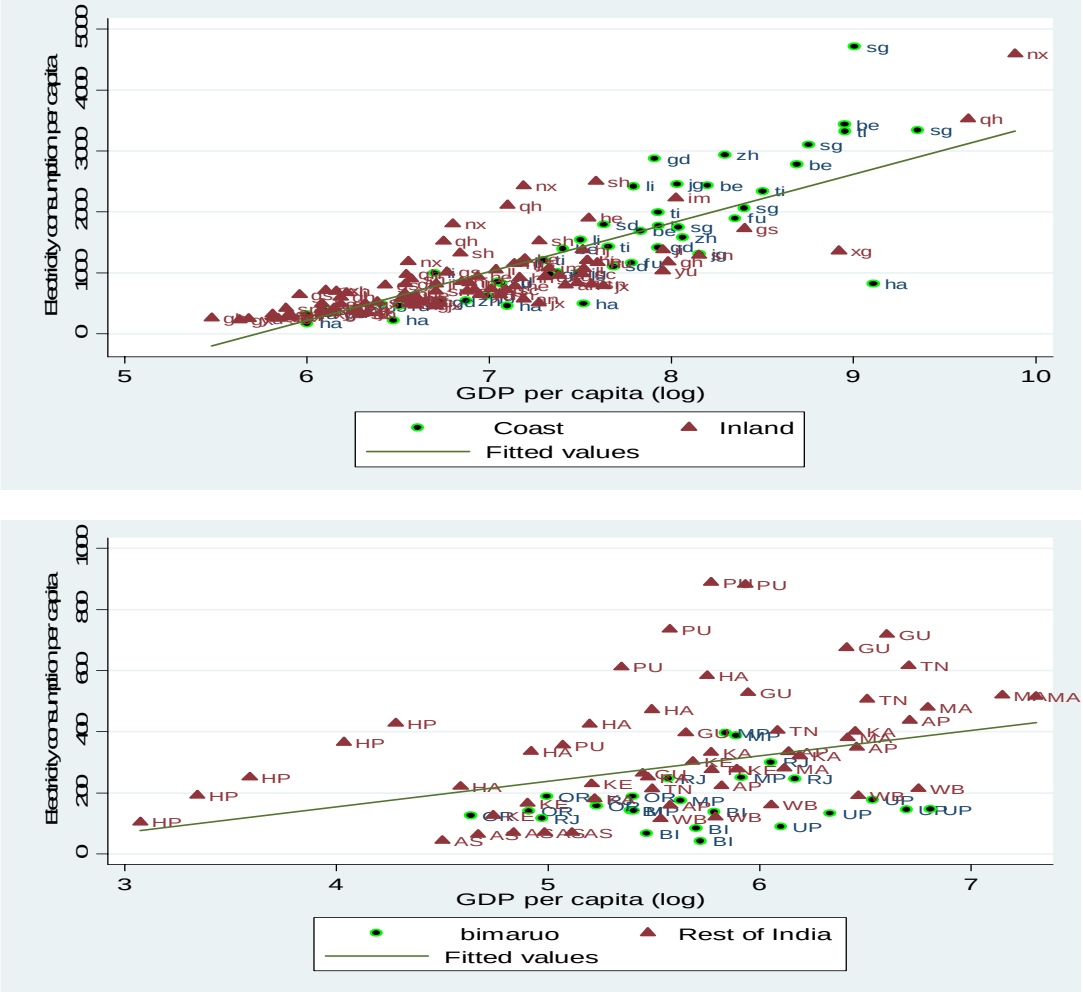


Note: Provincial and state abbreviations are shown in Appendix table

With industrialization, both countries require a sustained flow of energy resources. Per capita electricity consumption is supposed to be highly correlated with per capita income. The coastal regions of China feature a much clearer relationship of income and electricity consumption than the major Indian states (Figure 11).

Environmental factors are now being discussed as key drivers for sustainability of economic growth and development. With growing phenomena of urbanization and industrialization in both countries, air and water pollution are fast becoming a major obstacle to ecological balance, leading to negative impacts on human welfare. Due to a lack of comparable long-time series data on both countries, the recent analysis does go into details of environmental impacts on development outcomes. The current wave of discussions in both countries now focuses on the "green growth" concept that specifically considers the importance of the environment for economic welfare.

Figure. 11. Per capita income and electricity consumption



Note: Provincial and state abbreviations are shown in Appendix table

Regional inequality in China and India

We now present the inequality measures of major welfare indicators in the two countries in different decades. These measures will justify what we observe from the simple scatter graphs. From the graphs, it is apparent that there are larger regional variations in major welfare indicators and/or outcome variables in India than in China, implying that the Indian states have more discretionary power to set their own social policies. We will discuss below in detail how, after controlling for State effects, growth has a clear impact on social outcome indicators in India.

We study the Gini inequality measures for education inequality in China and India. Table 6 shows a rise from 6.9% in 1980-1984 to 3.3% in 2000-2004. Regional inequality in life expectancy in China, as computed for the Gini, shows a steady decline over the last two decades.

There has been a constant drop in education inequality measures over the similar period from 14.8% in 1980-1984 to 7.9% in 2000-2004 in India (Table 7). We observe that regional inequality, as measured by the Gini index for life expectancy, has declined both in China and India. In Table 6 and Table 7, we present results from IMR regional inequality. For China, regional inequality in IMR increased, from 22.8 % to 27. 8% over the period in China, while in India IMR increased from 12.4 % in 1980-1984 to 15.6% in 2000-2004.

This clearly indicates that regional inequality in IMR in China is higher than India and has increased over the years. Actually, among all the social indicators, IMR has the least to do with income and more with social policy. This underscores the problem due to the collapse of the public health system in rural areas.

The above tables also show the regional Gini index for telephone subscribers (per 1000 people), which indicates an overall decline in China as in India since the 1980s. Then, we present regional inequality measures for electricity consumption (per capita kwh) in China and India. The Gini inequality measure remained stable in China, while it increased in India.

Table 8 sums up the results of the regional inequality trends for both countries. Regional inequality in the adult literacy rate fell in both China and India. Life expectancy and telephone lines inequality levels declined in both China and India, while the IMR inequality level increased. The Gini inequality index of infant mortality rate went up in both countries. However, electricity consumption showed an increasing regional inequality trend in India but did not change much in China. In all, we observe that over the past several decades, China's development strategy has been growth driven and relies on income growth to trickle down to social outcome indicators.

4. Some correlates: GDP per capita and welfare indicators

The main purpose of this section is to explore correlates between per capita income and welfare indicators such as education, health and access to infrastructure. The analysis is based on provincial and state data from China and India, respectively. The results are shown on the basis of static panel data sets for China and India.

The panel data is set up where we pooled cross-section units (i, denotes cross-section units with 29 provinces in China and 16 states in India) with five time points (t time points with periods such as 1980-84, 1985-1989, 1990-1994, 1995-1999 and 2000-2004). Some of the cross-sectional problems of estimated coefficients can be reduced in panel data econometrics, as this takes into account estimation issues, such as unobserved regional effects, omitted variable bias due to unobserved heterogeneity, outliers, endogeneity and

many others. The estimates become more reliable as the number of observations increase drastically along with the degree of freedom.[3]

Initially, we estimate pooled ordinary least squares, which takes the following regression form in panel data framework:

$$Y_{it} = \alpha_0 + \beta_1 PCY_{it} + \varepsilon_{it} \text{ ……..(1)}$$

where Y_{it} represents indicators of welfare, i=1,2…29 (China), and 1,2….16(India); t=1980-84, 1985-1989, 1990-1994, 1995-1999 and 2000-2004, and ε_{it} is a random error term with usual properties.

The pooled OLS estimation model does not exploit all the panel structures because all coefficients are constant across time and regions; furthermore, the coefficient estimates will be inefficient and standard errors may be incorrect. However, if we want to estimate the unobserved heterogeneity, and assume that α_i and regressors are correlated, then this is known as the "fixed effects model" (FEM), wheras if they are uncorrelated, the model is known as the "random effects model" (REM). The choices of models are determined by employing the Hausman specification test (1978). Given the structure of relationships in China and India, we employ fixed effects models of within-groups and between-groups estimators.

In the within-group model, the specification for the individual province/state effects is given by:

$$Y_{it} = \alpha_i + \beta_1 PCY_{it} + \varepsilon_{it} \text{ ……..(2)}$$

where it follows the specifications of equation 1.

In the first set of results, we cover the whole sample period – five non-overlapping time periods In Table 9, we report pooled OLS results for China and India. We use double-log functional forms for all estimations in panel data analysis. By estimating equation (1), we find five estimates of beta-coefficients, each one for each of the welfare indicators, that indicate the elasticity, meaning that if there is a 1 per cent increase in per capita income, the dependent variables will grow by "some" percentage points. All the results in Table 9 show that per capita income is a significant determinant of welfare indicators of education, health and infrastructure. In panel A, China's results are described. All coefficients are highly statistically significant at the 1 per cent level. The results indicate that a 1 per cent increase in per capita income leads to a 0.10 per cent increase in adult literacy. For the life expectancy rate, the change in per capita income is only 0.03 per cent. In the case of IMR, the per cent change is

[3] See Baltagi (2002) and Wooldridge (2002) for further details on the panel data models.

0.39 per cent (fall due to a 1 per cent rise in income). Then, with a 1 per cent change in per capita income, telephone mainlines will grow by 1.55 per cent. Similarly, a change in per capita electricity consumption due to a 1 per cent change is 0.69 per cent. Hence, telephone mainlines show the maximum elasticity among five non-GDP indicators, while the life expectancy variable features the least elasticity.

In panel B, results from the Indian data set are shown. PCY does not go very far in explaining adult literacy and life expectancy rates. Moreover, the coefficients are not statistically significant. In addition, a 1 per cent change in per capita income reduces IMR by 0.16 per cent. Likewise in both China and India, telephone subscription has the maximum elasticity, followed by electricity consumption.

One interesting observation from Table 9 is that a Chinese regional analysis indicates that PCY explains a good proportion of the improvements in welfare indicators, and coefficients are highly significant for all the five indicators under the present analysis. On the other hand, in the case of India, PCY explain only a tiny portion of variation in welfare indicators, and coefficients on adult literacy and life expectancy are not statistically significant.

To go deeper into the analysis, we disaggregate the whole time period into two sub-periods as follows: 1980-1984, 1985-1989, and 1990-1994, 1995-1999 and 2000-2004. For China, the first sub-period is the one when the country began to implement policies for economic reform, when India was mostly following closed-door economic policies. Since 1990, China has been making efforts to achieve wide-ranging policy reform, while in India, economic reform policies have been taken up with a clear indication of new planning strategies.

In Table 10, we show results for the first sub-period of the sample. It can be seen clearly that in China, PCY accurately reflects the variation in welfare factors. Moreover, a 1 per cent change in PCY results in a 0.16 per cent increase in adult literacy, a 0.05 per cent rise in life expectancy, a 0.45 per cent drop in infant mortality, a 1.12 per cent rise in telephone subscriptions and a 0.84 per cent increase in electricity consumption, respectively. All coefficients are statistically significant at the 1 per cent level. In the case of India, we find that none of the coefficients are significant. Moreover, coefficients for adult literacy and life expectancy are negative but not significant.

For the second sub-period, we also find qualitatively similar results as for the first period (Table 10) in both countries. The R-squared values in China to explain the variation welfare indicators have gone down for adult literacy, telephone subscriptions and per capita

electricity consumption indicators, while for life expectancy and infant mortality the R-squared values do not increase much. In terms of magnitude of the coefficients, all coefficients have shown lower values but all of them are statistically significant. In the case of India, all coefficients are statistically insignificant and R-squared values are significantly lower than for China.

By analysing the entire period, we may see some sort of indication that PCY explains a very small part of welfare indicators in India, which is not the case in China. Moreover, the significance and magnitude of coefficients are much lower in India. The results from two of the above tables (Table 10 and Table 11) indicate that in China, the economic growth variable explains variations in welfare indicators. In India, the same economic growth does not explain any variations/change in welfare indicators.

However, from the figures in section 3, we clearly observe that in India there are substantial differences in welfare and/or social outcome indicators and not so much in per capita income. In China, we observe that social outcome variables do not vary much across provinces, whereas per capita income varies considerably. With the help of static-pooled OLS, we cannot account for the province/state level differences. In order to capture this, we now present results from a fixed-effects panel data modeling framework. Likewise, in the pooled OLS, we also discuss the results for the entire sample period, and then also divide into two sub-samples.

Now we turn to analysing the contribution of within-province/state and between province/state in our fixed-effect model. From the comparison, our aim will be find out, if at all, the Indian state effect is much bigger than Chinese provincial effects. In Table 12, we present fixed-effects panel data results, which show some qualitatively and quantitatively significantly different results. In panel A of Table 12, China's results are shown for all five welfare indicators which can be explained by per capita income (PCY). In the within-group fixed-effects model, we take into account heterogeneity between provinces/states in the analysis. After we factor in provincial effects, there are two indicators – adult literacy and telephone subscriptions – which displayed higher values as compared to pooled OLS results, because here a 1 per cent change in PCY leads to a 0.11 per cent rise and a 1.80 per cent rise in these indicators, respectively. The coefficients for life expectancy remain the same, and there has been a slight fall in the magnitude of infant mortality and electricity consumption per capita. As in the pooled OLS case, with the fixed-effects model, we also find that coefficients are statistically highly significant.

The results are strikingly different once we control for state effects in India. In panel B of Table 12, we find that all coefficients are statistically significant at the 1 per cent level. Compared to the pooled OLS results of Table 9, all coefficients are statistically significant and have a much higher magnitude. For example, now a 1 per cent change in PCY raises adult literacy by 0.49 per cent and life expectancy by 0.08 per cent, reduces infant mortality by 0.62 per cent, and raises telephone subscriptions by 2.88 per cent and per capita electricity consumption by 0.74 per cent.

Likewise, in the pooled OLS case, we also divide the whole period into two sub-periods. In Table 13, panel fixed-effects results are shown. Both in China and India, the coefficients for welfare indicators are statistically highly significant. In panel A, for Chinese provinces, the coefficient value of adult literacy is higher than the whole sample, and coefficients for other indicators are also very high. In the case of India, we once again find that the coefficient for adult literacy is much higher than for China, as are life expectancy, infant mortality and per capita electricity consumption. For the telephone subscribers' coefficient, the Chinese figure is higher than the Indian one.

In Table 14, we again carry out the analysis for the second sub-period. Here as well, all coefficients are statistically significant. The coefficients for ALR, IMR, TEL and ELC are lower than in the first sub-period, but the LE coefficient has improved and is equivalent to the value from the coefficient for the whole sample. Also, R-squared values are also quite high as compared to India.

However, just by looking at the coefficients for welfare indicators for India in the second sub-period, we note that except for the telephone subscribers' coefficient, all other coefficients have lower values when regressed against per capita GDP across states. In the case of telephone subscriptions, a 1 per cent change in per capita GDP leads to a 3.6 per cent increase in the indicators.

In the fixed-effects within-group estimation, we do not take into account information between provinces/states in the analysis. In between-groups estimates, all cross-section units are assumed to be fixed and common across provinces/states. This calculates the mean of each indicator for each province/state across the time period and estimates the group means-dependent variable on the group means-independent variable.

We then run the estimates based on the between-effects model for the whole period and for both sub-periods. In Table 15, we report results for China in panel A and for India in panel B. Although the variations in welfare indicators are explained by per capita income and coefficients are statistically significant in China, none of them are statistically significant in

the case of India. Furthermore, by comparing within-group and between-group coefficients for both China and India, we find that three indicators have larger value of coefficients (life expectancy, infant mortality and per capita electricity consumption) in between-group estimates in Chinese provincial comparison, whereas in the case of India, none of the coefficients are statistically significant and have the wrong signs for adult literacy, life expectancy and telephone subscribers).

In Table 16 shows the first sub-period and Table 17 reports the second sub-period for both China and India, respectively. Again, by comparing the between-group effect estimates with within-group estimates, Chinese between-province effects show higher value of coefficients for all welfare indicators except for telephone subscribers, and for adult literacy and telephone subscribers in the second period, respectively. Likewise, in the first period, Indian between-state effects still remain limited and none of the coefficients are statistically significant.

To sum up, the above tables clearly indicate that in China, priority was given to increasing economic development by raising income, while in India the key was to make changes in the social and health sectors of the economy. In China, there are much smaller differences among provinces in terms of the effect of growth on social indicators. But indicators themselves vary by province. Therefore, policy implications in China are that to reduce differences in social indicators, one needs to reduce differences in GDP growth. Otherwise, China needs to change the relationship between GDP growth and improvement in social indicators, so laggard regions can also improve social indicators.

On the other hand, in India one can observe that differences in social and health outcomes are much greater. So development policies differ in both countries given their different institutional frameworks. Because of the state-level differences in education, health and infrastructure facilities, five-year Indian planning experiences are increasingly focusing on developing the above sectors in order to uplift poor people. In China, the major issue is to reduce income inequalities among the different regions.

5. Conclusions

In this paper, we attempt to understand the dynamics of national and regional level development by going beyond GDP analysis via a comparison of China and India. Our point is that India is much more heterogeneous than China. Therefore, social polices and institutional arrangements vary sharply. However, after controlling for state effects, we still

find that economic growth is related to welfare indicators. The preliminary analysis indicates that economic development is related to social welfare, although the link is stronger in China than in India. However, India has more regional variations in terms of the performance of key social outcome variables. However, after controlling for state effects, economic development shows a pronounced effect on the improvement of social welfare in India. In India, state-level differences in social welfare experiences reflect an increasingly effective thrust, through planning processes, to uplift the impoverished, whereas in China, most variations can be explained by income differences across provinces.

Another important finding is that over time, the income effect is diminishing in China, calling for more alternative approaches. At least for infant morality, government intervention has proved to be very effective. Our analysis above (both graphical and econometric) strongly suggests that Indian state-level effects are significant, and we can say that although income matters, social policies at the state level can also play a key role. To this extent, China should learn from the experience of some Indian states. The analysis of two countries provides sufficient indication that there is scope for each country to learn further from the other's development strategy.

Appendix 1

Table A1

List of Chinese provinces in sample

Province	Provincial code	Coastal provinces (=1.0 otherwise)
Beijing	be	1
Tianjin	ti	1
Hebei	he	0
Shanxi	sh	0
Inner Mongolia	im	0
Liaoning	li	1
Jilin	ji	0
Heilongjiang	hj	0
Shanghai	sg	1
Jiangsu	jg	1
Zhejiang	zh	1
Anhui	an	0
Fujian	fu	1
Jiangxi	jx	0
Shandong	sd	1
Henan	he	0
Hubei	hu	0
Hunan	hn	0
Guangdong	gd	1
Guangxi	gx	0
Hainan	ha	1
Sichuan and Chongqing	sc	0
Guizhou	gh	0
Yunnan	yu	0
Shaanxi	sn	0
Gansu	gs	0
Qinghai	qh	0
Ningxia	nx	0
Xinjiang	xg	0

Table A2

List of Indian states in sample

State	State code	Coastal states (=1. 0 otherwise)	BIMARUO States (=1. 0 otherwise)
Andhra Pradesh	AP	1	0
Assam	AS	0	0
Bihar	BI	0	1
Gujarat	GU	1	0
Haryana	HA	0	0
Himachal Pradesh	HP	0	0
Karnataka	KA	1	0
Kerala	KE	1	0
Madhya Pradesh	MP	0	1
Maharashtra	MA	1	0
Orissa	OR	1	1
Punjab	PU	0	0
Rajasthan	RJ	0	1
Tamil Nadu	TN	1	0
Uttar Pradesh	UP	0	1
West Bengal	WB	1	0

Appendix 2

For the analysis of this paper, the national-level data on China and India are mostly obtained from the World Development Indicators 2006 of the World Bank. Furthermore, we supplement data with national data sources, such as the *China Statistical Yearbook*, and *Statistical Abstract of India*. Regional-level data on China and India are obtained from different sources.

China

Data on life expectancy, infant mortality and illiteracy are complied from provincial-level national statistical volumes of the population census 1981, 1990 and 2000, and *Comprehensive Statistical Data and materials on 50 years of New China* (China State Statistical Bureau 2000). See also Zhang and Kanbur (2005) for further discussions on their sources and construction. Data on telephone lines and electricity power consumption come from the *China Statistical Yearbook* (various years), and also from *Comprehensive Statistical Data and materials on 50 years of New China*. The population data come from *Comprehensive Statistical Data and materials on 50 years of New China* and the *China Statistical Yearbook.* Furthermore, in most cases, our sample consists of 23 provinces, 2 autonomous regions (Inner Mongolia and Tibet) and 4 centrally administered municipalities.

India

The population data in India come from national population census 1981, 1991 and 2001, which was carried out by the National Sample Survey Organization (NSSO) of the Government of India. Data on literacy and life expectancy come from the Office of the Registrar General of India, and were supplemented by the *Statistical Abstract of India* (various years). Infant mortality data are from the Sample Registration System, Office of the Registrar General of India. Telephone mainlines data come from the Ministry of Telecommunications, Government of India, while electricity consumption data are from the *Statistical Abstract of India* (various years), and the Centre for Monitoring the Indian Economy (CMIE). We also used the National Human Development Report 2001 of the Planning Commission for some of these indicators.

Inequality measures

This paper follows the methodology discussed in Zhang and Kanbur (2001), Kanbur and Zhang (2005) and Gajwani, Kanbur and Zhang (2006). With the available information on indicators, we construct a measure of inequality: the standard Gini coefficient of inequality.

Table 1

Comparative performance of China and India

	1980	**1990**	**2004**
China/India			
	762.6	1596.3	5418.9
GDP per capita (constant PPP$ international)	1178.5	1701.0	2885.3
	67.1	78.3	92.0
Adult literacy rate (percentage)	41.0	49.3	62.0
	66.1	67.5	71.4
Life expectancy rate (years)	53.9	58.4	63.5
	49.0	38.0	26.0
Infant mortality rate (per 1000 live births)	113.0	84.0	61.6
	2.2	6.0	425.0
Telephone line (per 1000 population)	3.1	6.0	72.0
	281.6	511.1	1380.0
Electricity consumption per capita (kwh)	141.8	274.7	439.0

Source. World Development Indicators (World Bank, 2006).

Table 2

Correlation with GDP per capita

	China				India			
	1980-1989	1990-1999	2000-2004	1980-2004	1980-1989	1990-1999	2000-2004	1980-2004
	Col.1	Col.2	Col.3	Col.4	Col.5	Col.6	Col.7	Col.8
Literacy rate, adult total (% of people ages 15 and above)	0.992	0.997	0.982	0.985	0.987	0.986	0.706	0.993
Life expectancy at birth, total (years)	0.979	0.985	0.897	0.978	0.991	0.982	0.961	0.990
Mortality rate, infant (per 1,000 live births)	-0.870	-0.904	-0.881	-0.873	-0.959	-0.881	-0.891	-0.978
Fixed line and mobile phone subscribers (per 1,000 people)	0.967	0.997	0.956	0.975	0.992	0.995	0.954	0.980
Electricity power consumption(per capita kwh)	0.990	0.996	0.970	0.996	0.991	0.951	0.972	0.966

Notes. All variables are in logarithmic form. All coefficients are statistically significant at 1the % level. GDP is in PPP (constant 2000 international $) value. Acronyms are in parentheses.

Table 3

Key descriptive comparative statistics in China and India

	1980s(1980-1984)			2000s(2000-2004)		
China/India	**Min**	**Max**	**Ratio (Max/Min)**	**Min**	**Max**	**Ratio (Max/Min)**
Literacy rate, adult total (% of population)	50.74 (Yunnan)	85.03 (Beijing)	1.68	69.48 (Qinghai)	93.55 (Beijing)	1.35
	24.38 (Rajasthan)	70.42 (Kerala)	2.89	47.00 (Bihar)	90.86 (Kerala)	1.93
Life expectancy at birth, total (years)	60.70 (Xinjiang)	72.90 (Shanghai)	1.20	65.50 (Yunnan)	78.10 (Shanghai)	1.19
	50.00 (Uttar Pradesh)	68.40 (Kerala)	1.37	56.90 (Madhya Pradesh)	73.50 (Kerala)	1.29
Mortality rate, infant (per 1,000 live births)	16.09 (Beijing)	114.96 (Xinjiang)	7.14	3.65 (Beijing)	57.06 (Yunnan)	15.63
	54.00 (Kerala)	163.00 (Orissa)	3.02	11.00 (Kerala)	91.00 (Orissa)	8.27
Fixed line and mobile phone subscribers (per 1,000 people)	1.63 (Hunan)	27.77 (Shanghai)	17.04	99.28 (Guizhou)	567.65 (Beijing)	5.72
	0.80 (West Bengal)	8.41 (Gujarat)	10.51	6.91 (Bihar)	58.14 (Punjab)	8.41
Electricity power consumption (per capita kwh)	170.00 (Hainan)	1749.88 (Shanghai)	10.29	783.25 (Jiangxi)	4715.52 (Shanghai)	6.02
	44.40 (Assam)	355.10 (Punjab)	8.00	69.40 (Bihar)	888.60 (Punjab)	12.80

Source. See Appendix 2 for data details.

Table 4

Regional comparison in China and India

	China				India			
	Coast		Inland		BIMARUO		Rest	
	1980	2004	1980	2004	1980	2004	1980	2004
Literacy rate, adult total (% of people ages 15 and above)	74.65	87.47	65.52	83.45	27.96	58.10	43.80	71.21
Life expectancy at birth, total (years)	70.37	74.37	66.02	69.95	52.20	59.28	59.64	65.24
Mortality rate, infant (per 1,000 live births)	22.77	10.76	48.52	26.72	135.60	80.40	105.54	53.27
Fixed line and mobile phone subscribers (per 1,000 people)	10.63	380.35	4.69	190.89	1.73	40.26	4.51	110.33
Electricity power consumption (per capita kwh)	744.27	2664.44	421.70	1624.22	108.30	174.98	187.48	467.40

Notes. Simple average of regional aggregates by combining data from 1980 to 2004. BIMARUO stands for Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Orissa.

Table 5

Comparing life expectancy in China and India

China		1980s (1980-1984)	2000s(2000-2004)
	China_National	66.07	71.44
	Shanghai	72.90	78.10
	Beijing	72.00	76.10
	Guangdong	71.30	73.30
India			
	India_National	53.86	63.46
	Kerala	68.40	73.50
	Punjab	63.10	68.50
	Himachal Pradesh	60.70	65.90

Source. See Appendix 2 for data details.

Table 6

Regional inequality in China

	Gini inequality index (%)				
	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004
Literacy rate, adult total (% of people ages 15 and above)	6.9	5.8	4.5	3.3	3.3
Life expectancy at birth, total (years)	2.4	2.2	2.1	1.9	1.8
Mortality rate, infant (per 1,000 live births)	22.8	23.4	26.5	22.8	27.8
Fixed line and mobile phone subscribers (per 1,000 people)	31.5	37.6	36.6	21.9	21.1
Electricity power consumption (per capita kwh)	25.5	24.2	22.0	22.1	25.9

Notes. For data sources, see Appendix. National Gini for China is computed using the population-weighted literacy rate at the provincial level. Literacy rate, life expectancy rate and infant mortality rate are normalized by their maximum and minimum values over the provinces in that specific year.

Table 7

Regional inequality in India

	Gini inequality index (%)				
	1980-1984	1985-1989	1990-1994	1995-1999	2000-2004
Literacy rate, adult total (% of population)	14.8	13.0	11.9	9.6	7.9
Life expectancy at birth, total (years)	4.4	3.7	3.6	3.4	3.1
Mortality rate, infant (per 1,000 live births)	12.4	13.4	16.5	15.2	15.6
Fixed line and mobile phone subscribers (per 1,000 people)	34.9	35.3	31.3	31.4	32.9
Electricity power consumption (per capita kwh)	26.3	28.4	26.5	30.1	34.9

Notes. For data sources, see Appendix. National Gini for India is computed using the population-weighted literacy rate at the state level.

Table 8

Summary of inequality measure in China and India

	Gini inequality index (%)	
Indicators	Inter-regional	
	China	India
Literacy rate (%)	↓*	↓*
Life expectancy at birth, total (years)	↓*	↓*
Mortality rate, infant (per 1,000 live births)	↑*	↑*
Telephone subscribers (per 1,000 people) (fixed line and mobile)	↓*	↓*
Electricity power consumption (per capita kwh)	↕	↑*

Notes. As compared to first year for the specific indicator: ↑ increase ↓ decrease, ↕ not much change. * Change from the base year to current year is <10% points.

Table 9

Per capita income in static panel OLS estimates
(Whole period: 1980 to 2004)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.10***	0.03***	-0.39***	1.55***	0.69***
	(0.01)	(0.00)	(0.07)	(0.13)	(0.04)
# of Provinces	29	29	29	29	29
Observations	145	145	145	145	145
Adj. R-squared	0.41	0.36	0.50	0.76	0.74
Panel B: India					
PCY	0.07	0.01	-0.16***	0.55*	0.32*
	(0.06)	(0.02)	(0.06)	(0.31)	(0.17)
# of States	16	16	16	16	16
Observations	80	80	80	80	80
Adj. R-squared	0.04	0.01	0.10	0.10	0.14

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 10

Per capita income in static panel OLS estimates

(Time period: 1980-85, 1985-1989)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.16***	0.05***	-0.45***	1.12***	0.84***
	(0.03)	(0.01)	(0.08)	(0.07)	(0.05)
# of Provinces	29	29	29	29	29
Observations	58	58	58	58	58
Adj. R-squared	0.37	0.30	0.25	0.76	0.72
Panel B: India					
PCY	-0.06	-0.02	-0.06	-0.13	0.19
	(0.06)	(0.02)	(0.06)	(0.15)	(0.15)
# of States	16	16	16	16	16
Observations	32	32	32	32	32
Adj. R-squared	0.03	0.02	0.03	0.02	0.06

Notes. All variables are in logarithmic form**.** Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 11

Per capita income in static panel OLS estimates

(Time period: 1990-1994, 1995-1999, 2000-2004)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.06***	0.04***	-0.42***	0.95***	0.57***
	(0.01)	(0.01)	(0.12)	(0.11)	(0.06)
# of Provinces	29	29	29	29	29
Observations	87	87	87	87	87
Adj. R-squared	0.19	0.31	0.27	0.64	0.56
Panel B: India					
PCY	0.01	0.01	-0.08	0.25	0.25
	(0.05)	(0.02)	(0.06)	(0.26)	(0.21)
# of States	16	16	16	16	16
Observations	48	48	48	48	48
Adj. R-squared	0.00	0.01	0.02	0.03	0.08

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 12
Per capita income in static panel within-group effect estimates
(Whole period: 1980 to 2004)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.11***	0.03***	-0.27***	1.80***	0.62***
	(0.01)	(0.00)	(0.05)	(0.18)	(0.04)
# of Provinces	29	29	29	29	29
Observations	145	145	145	145	145
Adj. R-squared	0.41	0.36	0.50	0.76	0.74
Panel B: India					
PCY	0.49***	0.08***	-0.62***	2.88***	0.74***
	(0.05)	(0.01)	(0.08)	(0.14)	(0.06)
# of States	16	16	16	16	16
Observations	80	80	80	80	80
Adj. R-squared	0.04	0.01	0.10	0.10	0.14

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses. ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 13
Per capita income in static panel within-group effect estimates
(Time period: 1980-85, 1985-1989)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.15***	0.01***	-0.23***	1.31***	0.60***
	(0.02)	(0.00)	(0.06)	(0.08)	(0.05)
# of Provinces	29	29	29	29	29
Observations	58	58	58	58	58
Adj. R-squared	0.37	0.30	0.25	0.76	0.72
Panel B: India					
PCY	0.79***	0.20***	-0.71***	0.92***	1.30***
	(0.04)	(0.02)	(0.07)	(0.07)	(0.16)
# of States	16	16	16	16	16
Observations	32	32	32	32	32
Adj. R-squared	0.03	0.02	0.03	0.02	0.06

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 14
Per capita income per capita in static panel within-group effect estimates
(Time period: 1990-1994, 1995-1999, 2000-2004)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.07***	0.03***	-0.23***	1.01***	0.40***
	(0.01)	(0.00)	(0.07)	(0.18)	(0.04)
# of Provinces	29	29	29	29	29
Observations	87	87	87	87	87
Adj. R-squared	0.19	0.31	0.27	0.64	0.56
Panel B: India					
PCY	0.31***	0.06***	-0.45**	3.58***	0.32***
	(0.06)	(0.01)	(0.18)	(0.27)	(0.10)
# of States	16	16	16	16	16
Observations	48	48	48	48	48
Adj. R-squared	0.00	0.01	0.02	0.03	0.08

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 15
Per capita income in static panel between-group effect estimates
(Whole period: 1980 to 2004)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.10***	0.05***	-0.63***	1.04***	0.83***
	(0.04)	(0.01)	(0.15)	(0.07)	(0.11)
# of Provinces	29	29	29	29	29
Observations	145	145	145	145	145
Adj. R-squared	0.41	0.36	0.33	0.76	0.74
Panel B: India					
PCY	-0.05	-0.01	-0.03	-0.10	0.20
	(0.08)	(0.03)	(0.11)	(0.26)	(0.22)
# of States	16	16	16	16	16
Observations	80	80	80	80	80
Adj. R-squared	0.04	0.01	0.10	0.10	0.14

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses. ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 16
Per capita income in static panel between-group effect estimates
(Time period: 1980-85, 1985-1989)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.16***	0.05***	-0.49***	1.08***	0.88***
	(0.04)	(0.01)	(0.16)	(0.13)	(0.11)
# of Provinces	29	29	29	29	29
Observations	58	58	58	58	58
Adj. R-squared	0.37	0.30	0.25	0.76	0.72
Panel B: India					
PCY	-0.09	-0.02	-0.04	-0.17	0.16
	(0.09)	(0.03)	(0.10)	(0.26)	(0.20)
# of States	16	16	16	16	16
Observations	32	32	32	32	32
Adj. R-squared	0.03	0.02	0.03	0.02	0.06

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

Table 17
Per capita income in static panel between-group effect estimates
(Time period: 1990-1994, 1995-1999, 2000-2004)

	ALR	LE	IMR	TEL	ELC
Panel A: China					
PCY	0.05	0.05***	-0.65***	0.89***	0.78***
	(0.03)	(0.01)	(0.16)	(0.09)	(0.12)
# of Provinces	29	29	29	29	29
Observations	87	87	87	87	87
Adj. R-squared	0.19	0.31	0.27	0.64	0.56
Panel B: India					
PCY	-0.02	0.00	-0.04	-0.06	0.24
	(0.06)	(0.03)	(0.13)	(0.25)	(0.23)
# of States	16	16	16	16	16
Observations	48	48	48	48	48
Adj. R-squared	0.00	0.01	0.02	0.03	0.08

Notes. All variables are in logarithmic form. Constants are not reported. Robust standard errors have been adjusted for clustering by provinces/states in parentheses ***Significant at 1 percent, **Significant at 5 percent, * Significant at 10 percent

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