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Economic Growth and
Population Transition in
India, 2001-2011

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Abstract

This paper analyses how population transition in India during 2001-2011 has influenced economic growth. The analysis reveals that population growth had a substantial impact on the economic growth but the demographic dividend resulting from the transition in population age composition had contributed marginally towards accelerating economic growth during the period under reference. Moreover, there is significant inter-state/Union Territory diversity in the contribution of population transition to economic growth. The argues that the productivity of the economic system in the country will have to be increased to maintain the tempo of economic growth in the coming years as population growth will slow down with the transition in the population.

Introduction

India has recorded an impressive economic growth during the decade 2001-2011. The real gross domestic product at factor cost of the country (at 2004-05 prices) increased from around Rs 23484 billion in 2000-01 to more than Rs 491853 billion in 2010-11 which means that the economy of the country grew at an average annual rate of almost 7.4 per cent during this period which is second highest in the world, next only to China. The growth of the economy has been particularly rapid during 2003-04 through 2007-08 when the real gross domestic product of the country increased at an average annual rate of close to 9 per cent (Nagaraj, 2013). At the same time, the population of the country increased from about 1029 million in 2001 to around 1211 million in 2011. A notable feature of India's population growth during this period is that, for the first time since 1931, the decadal net addition to the population of the country decreased, albeit marginally, which is an indication that population transition is gaining momentum in the country.

This paper aims to analyse the influence of population transition on the economic growth in the country during 2001-2011. By population transition, we mean the change in the population stock - the size and the age composition of the population. It is well-known that population transition leads to the increase in the size and ageing of the population. The implications of the increase in population size for economic growth have been debated for decades (Birdsall, Kelly, Sinding, 2001; Bloom, Canning, Sevilla, 2001, Heady and Hodge, 2009). This debate can be synthesised in terms of three alternative positions - population growth restricts, promotes, or is independent of economic growth. Proponents of each position have empirical evidence to support their case. The issue is, however, complicated as the relationship between population growth and economic growth is found to be different in the developing as compared to the developed countries (Kelly, 2001).

The ageing of the population associated with population transition also influences economic growth because the economic behaviour of the people varies by age. Population with high proportion of children requires high investment on children which tends to depress economic growth. On the other hand, if a large proportion of the population is concentrated in the working ages, then the added productivity of the working population can produce a demographic dividend that can accelerate economic growth (Bloom, Canning, Sevilla, 2001). Bloom and Williamson (1998) were the first to demonstrate the key role played by age composition transition in the economic miracle in selected East Asian countries. Subsequently, many studies have been carried out globally to highlight the contribution of the transition in the age composition of the population to economic growth (Bloom, Canning and Sevilla, 2008; 2011; Golley, 2017; Joe, 2011; Mason, 2008; Prskawetz, 2007; Ranganathan, 2017; Wang, 2013).

The demographic dividend resulting from age composition transition has been further classified as first and second demographic dividends. (Lee, Mason, Miller, 2000; Mason, 2005; Lee and Mason, 2006). The first demographic dividend occurs when the working age population raises relatively fewer number of children leading to the increased availability of resources for investment in the economy. This dividend is transitory in nature. It turns negative at later stages of population transition because of the decrease in the working age population and rapid increase in the old population. The second demographic dividend, on the other hand, is due to the tendency of the people to create assets and accumulate wealth as they get older which leads to increased investment in the economy. The second dividend depends upon the first and begins somewhat later than the first. It is not transitory in nature and can continue indefinitely.

Concerns about the impact of population growth on economic growth in India is not new. Way back in 1958, Coale and Hoover argued that curtailing population growth by reducing fertility could contribute to accelerated increase in per capita output of the Indian economy (Coale and Hoover, 1958), although Kuznets (1956) did not find any correlation between per capita income growth and population growth across nations. There are many studies that have analysed the impact of population growth on economic growth in India (Dawson and Tiffin, 1998; Halder, 2009; Bloom, Canning, Sevilla, 2011; Eberstad, 2010; DaVanzo et al, 2010). These studies have found that population growth has both positive and negative impact on economic growth. Recently, Sethy and Sahoo (2015) have found the evidence of strong positive relationship between per capita output and population growth during 1970-2010. Similar observations have also been made by Peterson (2017) on the basis of historical data.

At same time, a number of studies have pointed out the demographic dividend as the basis of optimism for India's economic future (Bloom, 2011; Kelkar, 2004; Kumar, 2010; Aiyar and Mody, 2011). This optimism has been shared at the official level also (Government of India, 2013). However, Kumar and Subramanian (2012) have observed that the demographic dividend in India was strong and positive during the 1990s but, during the 2000s, there has either been no dividend or the effect of the change in population age composition on India's economic growth has been negative. Thakur (2012) has also observed the negative influence of the growth in working age ratios on the economic growth in the country whereas Chandrashekar et al. (2006) have concluded that India has not been able to exploit the benefit of the change in population age composition because of the unsatisfactory employment, education and health situation. Recently, Singh (2016) has observed that under the conditions prevailing in India, the high optimism about India's ability to reap the demographic dividend seems to be misplaced.

However, to the best of our knowledge, there is no study that has studied the simultaneous effect of the change in population stock - change in population size and the change in population age composition - on economic growth in India. In this paper, we develop an analytical framework that decomposes the growth in the output of the economy into the growth attributed to the change in population size, growth attributed to the change in the population age composition or the demographic dividend and the growth attributed to the change in the productivity of the economic system. Piketty has argued that the output of the economy can be decomposed into two components: purely demographic component and a purely economic component and only the latter allows for an improvement in the standard of living (Piketty, 2014, pp 72). The demographic component of the economy is determined by the population stock - the size and the age composition of the population. The economic component, on the other hand, is determined by the productivity of the economy system which, in turn, is determined by the productivity of those who are engaged in productive activities and the opportunity of participation in productive processes. The growth in the output of the economy, therefore, can be decomposed into the growth attributed to the change in the population stock or the change in population size and the change in the population age composition and the growth attributed to the change in the productivity of the economic system or the change in the per capita output of those who are engaged in productive activities and the change in the opportunity of participation in the productive activities.

In this paper, we follow the arguments put forward by Piketty to analyse the contribution of the change in the demographic component and the change in the economic component to the growth of the output of the economy of India and its constituent states/Union Territories for the period 2000-01 through 2010-11. The decomposition analysis presented in this paper suggests that the change in the demographic component during the period under reference has contributed substantially to the growth of the output of the economy of the country but there is great diversity across states/Union Territories.

The paper is organised as follows. The next section of the paper outlines the decomposition methodology. The paper follows the factor decomposition approach for the purpose. Section three describes the data that constitute the basis for the analysis. Section four describes, briefly, the growth of the output of the economy in India and in its states/Union territories whereas section five explores the change in the population stock that have taken place during the period 2001 through 2011. Section six presents and discusses results of the decomposition exercise. The last section of the paper discusses the demographic imperatives for India and states/Union Territories in the context of economic growth.

Methodology

Let Y denotes the gross domestic product (GDP) at constant prices and P denotes the population. Then, Y is the product of the population (P) and the per capita real GDP or the output.

$$Y = P * \frac{Y}{P} \quad (1)$$

The per capita output may further be written as

$$\frac{Y}{P} = \frac{Y}{L} * \frac{L}{W} * \frac{W}{P} \quad (2)$$

Here, L is the number of workers or the number of people engaged in productive activities and W is the population in the working ages. Combining equations (1) and (2), we get

$$Y = P * \frac{Y}{L} * \frac{L}{W} * \frac{W}{P} \quad (3)$$

$$Y = \left(P * \frac{W}{P} \right) * \left(\frac{Y}{L} * \frac{L}{W} \right)$$

The first term on the right of equation (3) reflects the demographic component of the output of the economy while the second term reflects the economic component. The economic component comprises of two factors - productivity per worker (Y/L) and level of participation of the working age population in productive activities (L/W). Similarly, the demographic component also comprises of two factors - population size (P) and ratio of the working age population to the total population (W/P) which reflects the population age composition.

Equation (3) suggests that the growth of the output of the economy is the result of the change in population size (P), change in the population age composition, change in the worker productivity and change in the proportion of workers to the working age population or the participation opportunity. The growth of the output of the economy can therefore be decomposed into the growth attributed to the change in population size, change in the proportion of population in working ages, change in worker productivity and change in the participation opportunity.

In absolute terms, the growth in the output of the economy may be decomposed as, following Ang (2016)

$$\nabla Y = Y_2 - Y_1 = \frac{(Y_2 - Y_1)}{(\ln(Y_2) - \ln(Y_1))} * (\ln(Y_2) - \ln(Y_1)) \quad (4)$$

Let $D=(W/P)$, $I=(Y/L)$ and $E=(L/W)$, then the equation (4) may be written as

$$\begin{aligned}\ln(Y_2) - \ln(Y_1) &= \ln(P_2 * D_2 * I_2 * E_2) - \ln(P_1 * D_1 * I_1 * E_1), \\ &= \ln(P_2 - P_1) + \ln(D_2 - D_1) + \ln(I_2 - I_1) + \ln(E_2 - E_1)\end{aligned}\quad (5)$$

substituting, we get

$$\begin{aligned}\nabla Y = Y_2 - Y_1 &= \frac{(Y_2 - Y_1)}{(\ln(Y_2) - \ln(Y_1))} * (\ln(P_2) - \ln(P_1)) + \\ &+ \frac{(Y_2 - Y_1)}{(\ln(Y_2) - \ln(Y_1))} * (\ln(D_2) - \ln(D_1)) + \\ &+ \frac{(Y_2 - Y_1)}{(\ln(Y_2) - \ln(Y_1))} * (\ln(I_2) - \ln(I_1)) + \\ &+ \frac{(Y_2 - Y_1)}{(\ln(Y_2) - \ln(Y_1))} * (\ln(E_2) - \ln(E_1))\end{aligned}\quad (6)$$

or

$$\nabla Y = \mathcal{P} + \mathcal{D} + \mathcal{I} + \mathcal{E}\quad (7)$$

The growth attributed to D in equation (7) is popularly known as the demographic divided. The demographic component (DC) of the growth in the total output of the economy is now given by

$$DC = \mathcal{P} + \mathcal{D}\quad (8)$$

whereas the economic component (EC) is given by

$$EC = \mathcal{I} + \mathcal{E}\quad (9)$$

Data Source

Data from two sources have been used in the present analysis. The output of the economy has been measured in terms of the gross domestic product at factor cost (GDP) at 2004-05 prices. Estimates of real GDP at factor cost have been prepared by the Government of India, Ministry of Statistics and Programme Implementation. These estimates are available for all states and Union Territories except the three Union Territories - Dadra and Nagar Haveli, Daman and Diu and Lakshadweep - for the year 2000-01 and 2010-11. The present analysis, therefore, excludes these three Union Territories. On the other hand, estimates of the total population, child population (population aged 0-14 years), working age population (population aged 15-59 years), old population (population aged 60 years and above) and total workers aged 15-19 years have been taken from 2001 and 2011 population census. In India's population census, a person is classified as worker if the person concerned has worked even for a day during the year prior to the census irrespective of the age of the person. A comprehensive definition of work was adopted at the population census to classify a person as a worker. Workers are further classified into main and marginal workers (Government of India, 2011).

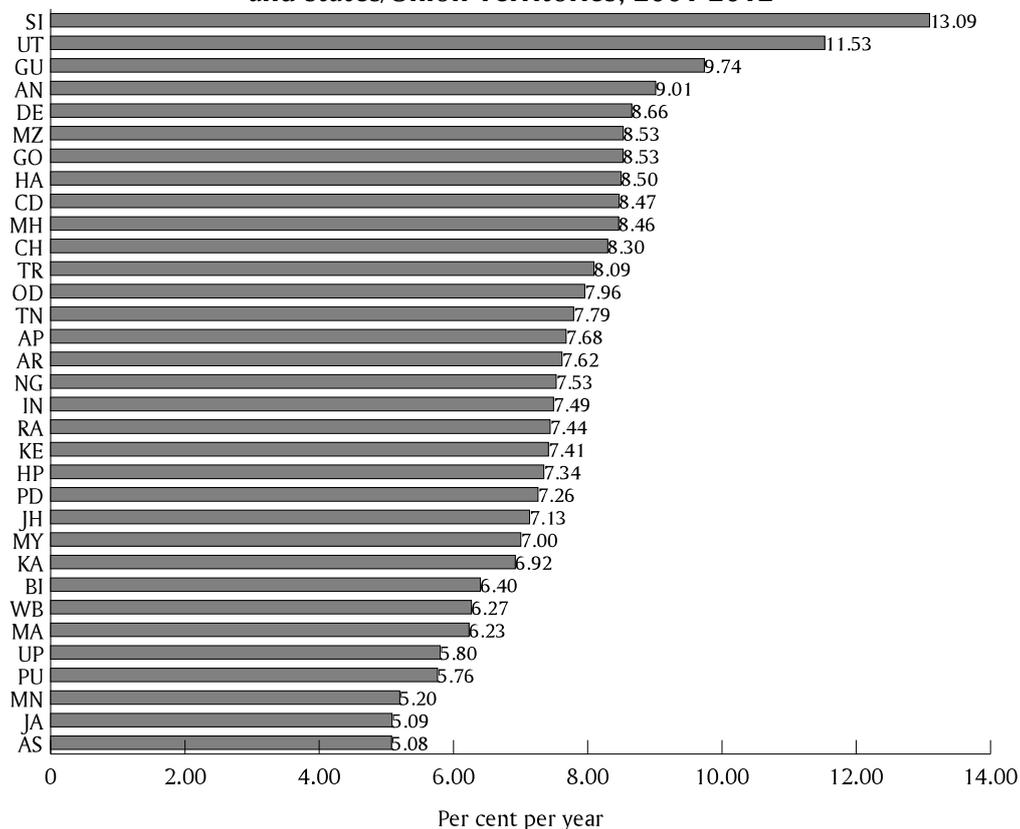
Economic Growth, 2000-2011

The data used in the present analysis are given in the appendix table 1. The real GDP (at 2004-05 prices) at factor cost or the real output of the Indian economy more than doubled from around 23484 billion Rupees in 2000-01 to around 491853 billion Rupees in 2010-11 (Table 1). This means that the economy of the country grew at an average annual rate of around 7.4 per cent per year during the ten years between 2000-01 and 2010-11 (Figure 1). At the same time, the population of the country increased by almost 1.18 times - from about 1025 million in 2001 to 1206 million in 2011 - or at an average annual growth rate of almost 1.62 per cent per year. As the result, the per capita output of the economy of the country increased by more than 1.78 times - from Rs 22902 in 2000-01 to Rs 40794 in 2010-11 - at an average annual growth rate of around 5.77 per cent per year.

Among the states/Union Territories of the country, the growth of the output of the economy varied widely during the period under reference. The growth of the economy was the most rapid in Sikkim where the real GDP at factor cost increased by more than 3.7 times at an average annual growth rate of more than 13 per cent per year during this period. Besides Sikkim, Uttarakhand is the only other state/Union Territory in the country where the economy more than tripled during the 10 years between 2000-01 and 2010-11. By comparison, the real GDP at factor cost increased by less than 1.7 times in Assam at an average annual growth rate of around 5 per cent per year. In addition, there are eight states/Union Territories where the output of the economy less than doubled during the period under reference. At the same time, there are six states/Union Territories where the economy grew at an average annual growth rate of less than 6 per cent per year.

The per capita output of the economy was the highest in Goa and the lowest in Bihar in 2000-01 as well as in 2010-11. However, the increase in the per capita output of the economy, during this period, was relatively the most rapid in Sikkim - almost 11.9 per cent per year - but the slowest in Manipur - 2.4 per cent per year. Sikkim is the only state in the country which recorded double-digit growth in the per capita output of the economy during the period under reference. On the other hand, Jammu and Kashmir is the only other state/Union Territory in the country where the average annual growth rate of the per capita output of the economy was less than 2.5 per cent per year. At the same time, there are eight states/Union Territories where the per capita output of the economy increased at an average annual rate of less than 5 per cent per year. On the other hand, there are only six states/Union Territories where the average annual increase in the per capita output of the economy was more than 7 per cent per year during the period under reference. The wide variation in the performance of the economy across states/Union Territories is very much evident from table 1.

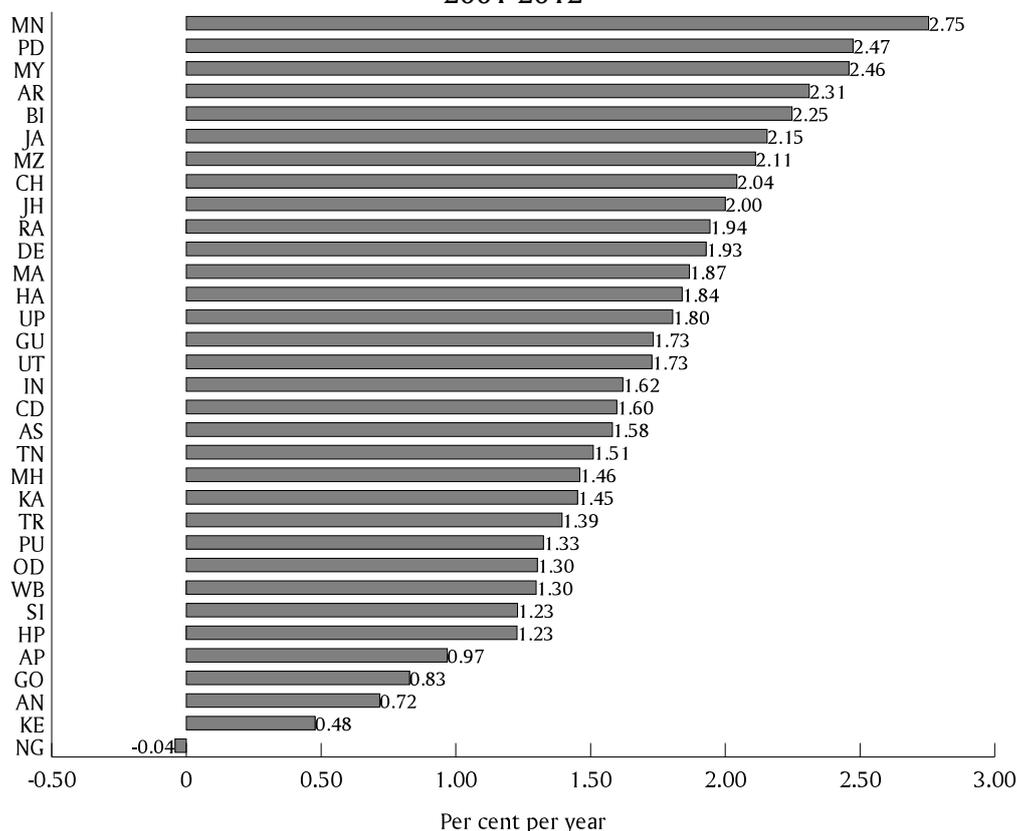
Figure 1
Average annual growth of real GDP (Per cent) in India
and states/Union Territories, 2001-2012



Population Growth

Between 2001 and 2011, more than 180 million people were added to the population of the country. Population growth was the most rapid in Manipur whereas Nagaland is the only state/Union Territory in the country where the population decreased, instead increased, during the period under reference according to India's 2001 and 2011 population census. In addition, there are only three states and Union Territories - Andaman and Nicobar Islands, Andhra Pradesh and Kerala - where the population increased at an average annual rate of less than 1 per cent per year with Kerala recording the slowest growth of population. On the other hand, there are eight states/Union Territories, in addition to Manipur, where the population increased at an average annual rate of more than 2 per cent per year between 2001 and 2011. If population growth rate is any indication, then, it is obvious from figure 2 that population transition varies widely across states/union territories of the country.

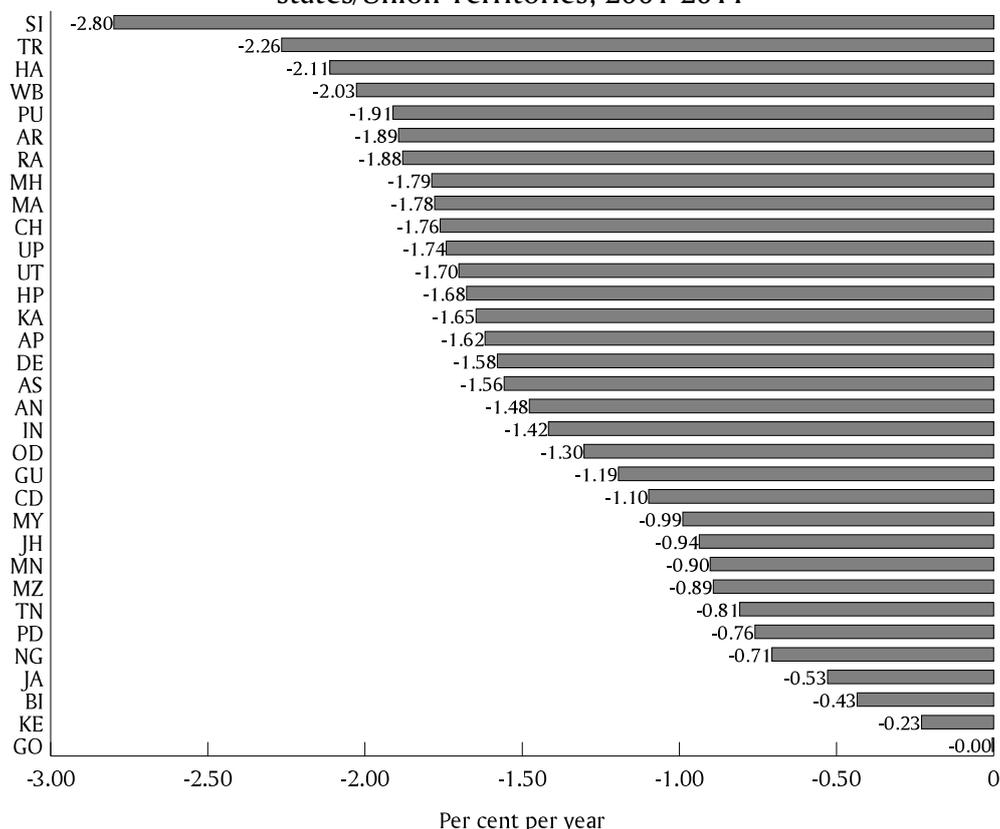
Figure 2
Population growth rate in India and states/Union Territories
2001-2012



Transition in the Age Composition

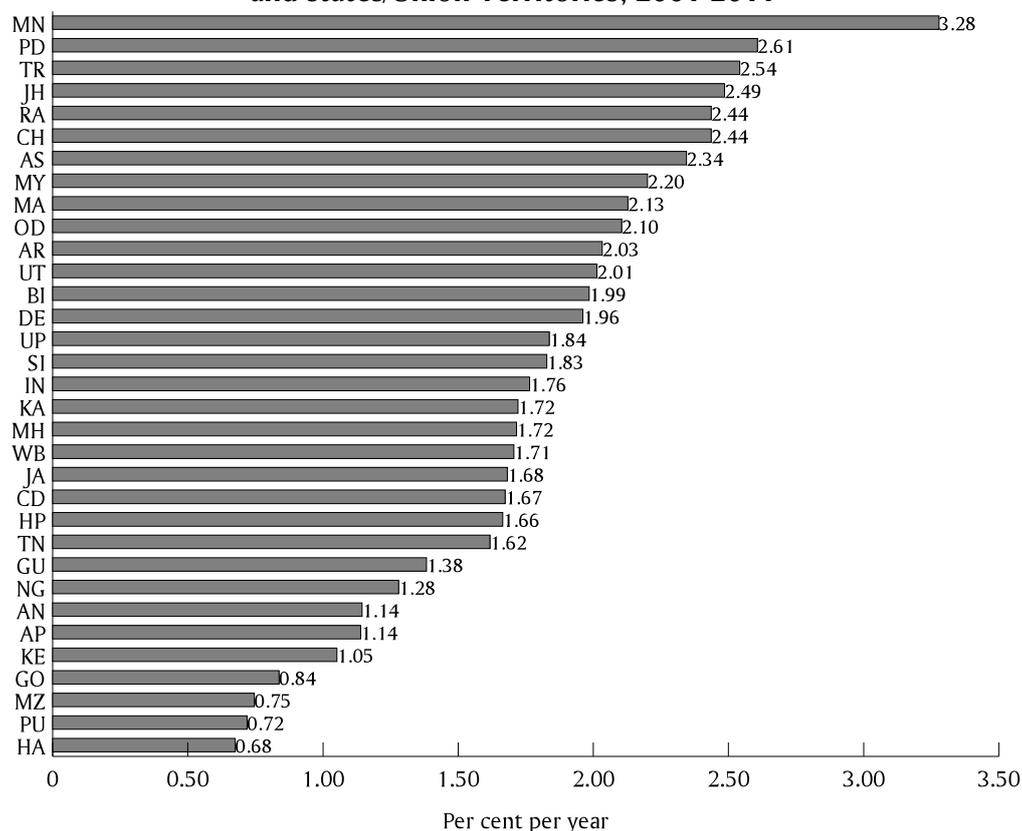
During the period under reference, population of all the three sub-groups - child population (0-14 years), working age population (15-59 years) and old population (60 years and above) - recorded an increase in the country, although the increase was the most rapid in the old population but the least rapid in the child population. The old population in the country increased by almost 36 per cent during the period under reference whereas the child population increased by only about 2 per cent. The working age population, on the other hand, increased by almost 25 per cent between 2001 and 2011. As the result, the dependency ratio - the ratio of the child and the old population to the working age population - decreased from around 752 children and old people for every 1000 working age people in 2001 to 652 in 2011. The decrease in the dependency ratio is attributed to the decrease in the child dependency ratio as the old dependency ratio increased during this period (Figure 3).

Figure 3
Average annual decrease in the dependency ratio (per cent) in India and states/Union Territories, 2001-2011



The dependency ratio decreased in all states/Union Territories of the country during the period under reference, although the pace of the decrease in the dependency ratio varied widely across states/Union Territories which indicates wide variation in the transition in the age composition of the population within the country (Figure 3). The most rapid decrease in the dependency ratio during 2001-2011 was recorded in Sikkim followed by Tripura, Haryana and West Bengal. The decrease in the dependency ratio has also been quite rapid in Punjab, Arunachal Pradesh and Rajasthan. By contrast, there has been hardly any decrease in the dependency ratio in Goa, Kerala and Bihar (Figure 3). In 14 states/Union Territories of the country, the average annual decrease in the dependency ratio was slower than the national average during the period under reference. The decrease in the dependency ratio has been the result of the decrease in the young dependency ratio. The old dependency ratio increased in all but three states of the country - Arunachal Pradesh, Meghalaya and Tripura.

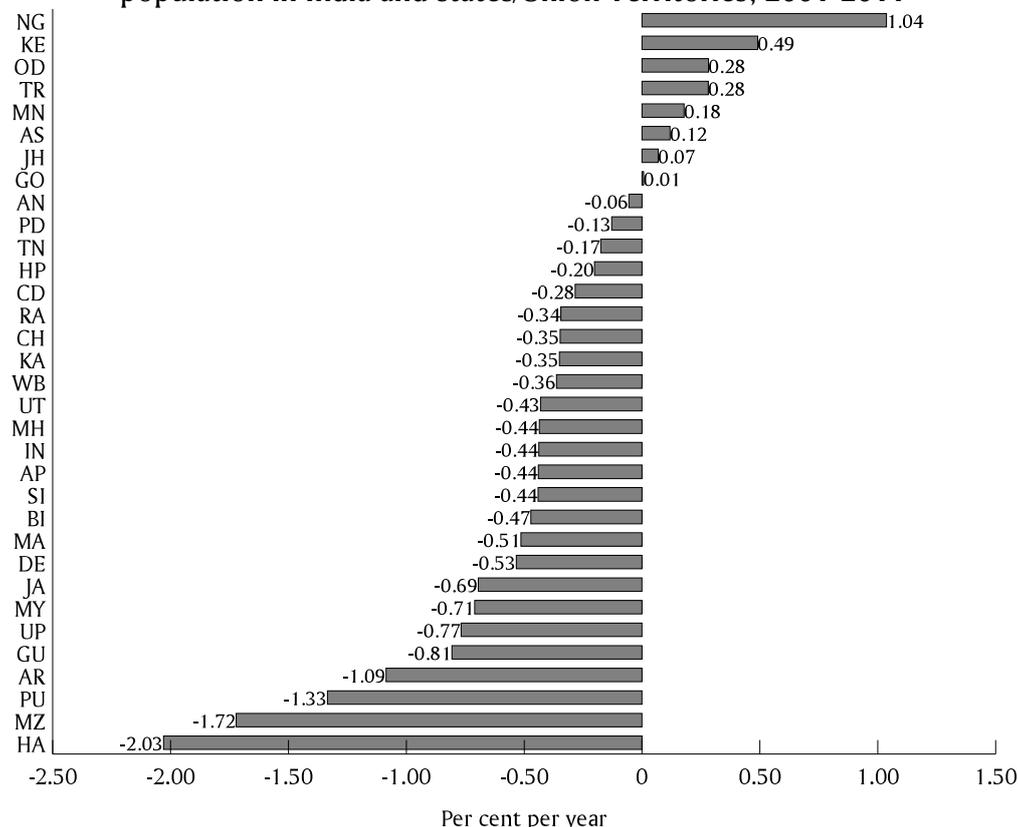
Figure 4
Average annual growth rate of workers (per cent) in India
and states/Union Territories, 2001-2011



Growth of Workers

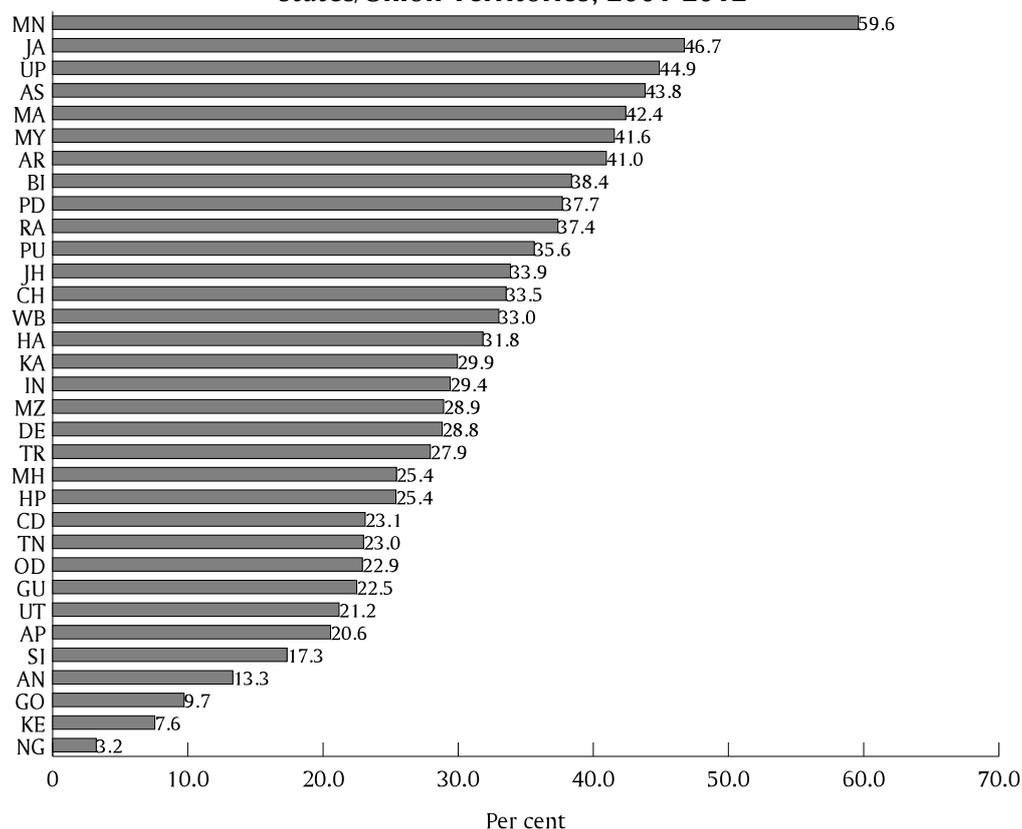
Workers aged 15-59 years in the country increased at an average annual rate of 1.76 per cent during the ten years between 2001-2011 according to the definition of work adopted at 2001 and 2011 population census. In 16 states/Union Territories of the country, the growth of workers aged 15-59 years was faster than the national average with the most rapid growth in workers aged 15-59 years recorded in Manipur which is the only state in the country where workers aged 15-59 years increased at an average annual rate of more than 3 per cent during 2001-11 (Figure 4). On the other hand, there are four states - Haryana, Punjab, Mizoram and Goa - where workers aged 15-59 years increased at an average annual rate of less than 1 per cent per year during this period with Haryana recording the lowest growth of workers aged 15-59 years in the country. In Kerala, Andhra Pradesh, Andaman and Nicobar Islands, Nagaland and Gujarat also, the growth of workers aged 15-59 years has been quite slow during the period under reference - less than 1.5 per cent per year.

Figure 5
Difference between average annual growth rate of workers and working age population in India and states/Union Territories, 2001-2011



The growth of workers aged 15-59 years has, however, been slower than the growth of the working age population during the period under reference. The working age population in the country increased at an average annual rate of more than 2.2 per cent whereas the workers aged 15-59 years increased at an average annual rate of 1.76 per cent. In most of the states/Union Territories of the country also, the increase in the workers aged 15-59 years has been slower than the increase in the working age population during this period. There are, however, eight states where the growth of workers was faster than the growth of the working age population during the period under reference (Figure 5). The growth of workers aged 15-59 years relative to the working age population has been the fastest in Nagaland whereas the growth of workers aged 15-59 years relative to the working age population has been the slowest in haryana during the period under reference. In Mizoram, Punjab and Arunachal Pradesh also, the growth of workers aged 15-59 years has been substantially slower than that of working age population.

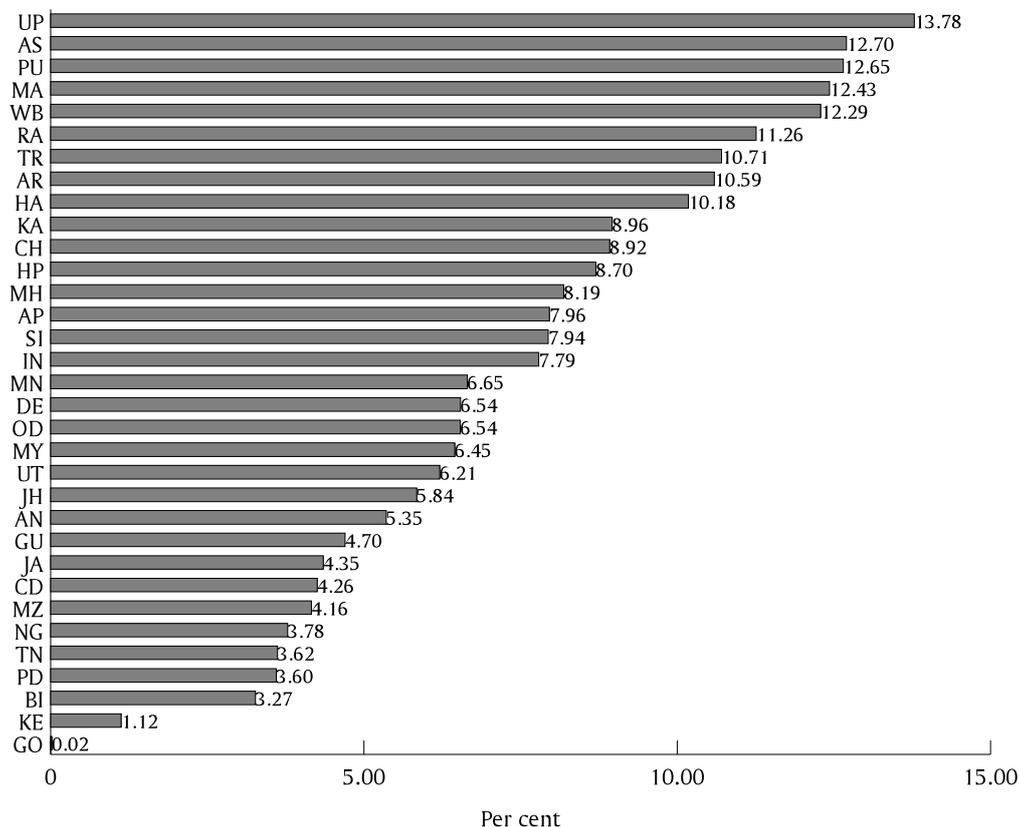
Figure 6
Demographic component of the growth of the economy in India and states/Union Territories, 2001-2012



Decomposition Results

Results of the decomposition of the increase in the total output of the economy of the country and its states/Union Territories are presented in table 3. The demographic component resulted in almost 1.25 times increase in the output of the economy between 2000-01 and 2010-11 whereas the economic component resulted in around 1.68 times increase in the output so that the output of the economy more than doubled during this period. The increase in the population size resulted in around 1.18 times increase in the output of the economy whereas the change in the age composition resulted in around 1.06 times increase in the output. On the other hand, the increase in the productivity per worker resulted in about 1.76 times increase in the output but the decrease in the proportion of workers to the working age population resulted in an increase of 0.96 times only. Alternatively, the increase in the population size accounted for almost 22 per cent of the increase in the output of the Indian economy during 2000-11 whereas the change in the age

Figure 7
Demographic dividend in India and states/Union Territories,
2001-2012



composition accounted for less than 8 per cent of the increase. On the other hand, increase in the worker productivity accounted for 76 per cent of the increase in the output of the economy but the decrease in the proportion of workers to the working age population accounted for around 6 per cent decrease in the output of the economy.

The contribution of the demographic component to the output of the economy varied widely across states/Union Territories. In Manipur, the demographic component accounted for almost 60 per cent of the growth of the output of the economy which is the highest in the country (Figure 6). In Jammu and Kashmir, Uttar Pradesh, Assam, Madhya Pradesh, Meghalaya and Arunachal Pradesh also, the demographic component accounted for more than 40 per cent of the growth of the output of the economy. In other words, a large proportion of the growth in the output of the economy in these states, has contributed little to improving the standard of living of the people. By contrast, in Nagaland, Kerala and Goa, demographic component accounted for less than

10 per cent of the growth in the output of the economy. In these states, nearly all the growth of the output of the economy during the period under reference was attributed to the economic component which has direct relevance to improving the standard of living of the people.

In all states/Union Territories, most of the demographic component of the growth of the output of the economy was the result of the increase in population. In Manipur, population growth resulted in almost 1.32 times increase in the output of the economy which is the highest in the country. In addition, population growth resulted in more than 1.2 times increase in the output of the economy in 12 states/Union Territories of the country. On the other hand, there are only three states/Union Territories where population growth resulted in less than 1.1 times increase in the output of the economy whereas in Nagaland, population decreased, instead increased, during the period under reference so that the decrease in population resulted in a marginal decrease in the output of the economy.

The demographic dividend, on the other hand, contributed only marginally to the growth of the output of the economy in all states/Union Territories during the period under reference. Sikkim is the only state/Union Territory in the country where the demographic dividend resulting from the transition in population age composition induced more than 1.1 times increase in the output of the economy. By contrast, in Goa and Kerala, there was little change in the age composition of the population so that the demographic dividend contributed little to accelerate the growth of the output of the economy. There are, in fact, only six states/Union Territories in the country where the demographic dividend resulting from the transition in the population age structure resulted in more than 1.08 times the growth in the output of the economy.

Alternatively, there are only nine states/Union Territories in the country where the demographic dividend accounted for at least 10 per cent of the increase in the output of the economy during 2000-2011. The contribution of the demographic dividend to the increase in the output of the economy was the largest in Uttar Pradesh where the transition in the population age composition resulted in almost 14 per cent increase in the output of the economy of the state. On the other hand, the demographic dividend contributed less than 5 per cent of the increase in the output of the economy in ten states/Union Territories with the lowest contribution in Goa where the demographic dividend accounted for just around 0.02 per cent increase in the output of the economy of the state. In Kerala also, there was little transition in the population age composition during the period under reference so that the demographic dividend accounted for just around one per cent of the increase in the output of the economy of the state during the period under reference.

Discussions and Conclusions

The present analysis suggests that the demographic component contributed, quite substantially, in fueling the growth of the economy during the 10 years between 2000-01 and 2010-11 in the country as well as in its many states/Union Territories. The analysis also reveals that the contribution of the demographic dividend in accelerating the growth of the economy has not been significant so that most of the contribution of the demographic component to the growth of the output of the economy has been the result of the increase in population size. If the growth of the output of the economy attributed to the demographic component is excluded, then it is obvious that the growth of the economy of the country and of many states/Union Territories of the country during the period under reference has been less spectacular in the context of improving the standard of living of the Indian people.

The analysis also suggests that the prospects of the demographic dividend accelerating the economic growth in future are at best remote. There is little possibility of rapid decline in fertility in the country simply because fertility is already quite low in most of the states/Union Territories. According to the sample registration system, the total fertility rate in India was 2.4 live birth per woman of reproductive age in 2011 (Government of India,). In ten of the twenty states for which estimates of total fertility rate are available through the sample registration system, the replacement fertility was achieved by the 2011. As such, there is little scope of a significant contribution of demographic transition in accelerating economic growth in India in the coming years.

The above observations also suggest that India will have to increase the productivity of its economic system in order to maintain the tempo of economic growth that was witnessed during 2000-01 through 2011-12. This will require both increasing the opportunity for an increasing working age population to effectively participate in the productive activities and improving the average productivity of the worker. If the productivity of the economic system is not increased, then the slowing down the population growth in the coming years will have a decelerating effect on the economic growth in the country. This will particularly be the case in those states/Union territories where the demographic components contributes substantially to the growth of the output of the economy and where the productivity of the economic system is low.

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Table 1
Workers, worker productivity and participation opportunity, 2001 and 2011
India and states/Union Territories

India/State/ Union Territory	Worker productivity Rupees		Participation opportunity		Proportion of workers to working age population	
	2001	2011	2001	2011	2001	2011
India	61909	109748	0.611	0.585	0.657	0.689
AN Islands	109749	241042	0.551	0.548	0.603	0.641
Andhra Pradesh	56997	109593	0.679	0.649	0.551	0.597
Arunachal Pradesh	56201	98204	0.718	0.644	0.567	0.605
Assam	51849	68153	0.565	0.571	0.513	0.523
Bihar	28281	43989	0.572	0.545	0.660	0.684
Chandigarh	175199	345522	0.550	0.535	0.558	0.601
Chhattisgarh	40086	72042	0.740	0.714	0.623	0.659
Delhi	175223	342266	0.504	0.478	0.669	0.669
Goa	196501	423931	0.544	0.544	0.602	0.631
Gujarat	70815	163284	0.643	0.593	0.565	0.616
Haryana	92415	202014	0.637	0.520	0.599	0.638
Himachal Pradesh	71920	126929	0.717	0.703	0.575	0.588
Jammu & Kashmir	70293	98788	0.564	0.526	0.543	0.567
Jharkhand	48508	77218	0.618	0.622	0.604	0.643
Karnataka	64668	108760	0.662	0.639	0.634	0.640
Kerala	95317	180107	0.470	0.494	0.543	0.586
Madhya Pradesh	42052	63393	0.696	0.661	0.591	0.634
Maharashtra	86188	169167	0.646	0.618	0.606	0.627
Manipur	47680	57786	0.636	0.647	0.531	0.555
Meghalaya	60784	98260	0.692	0.645	0.591	0.613
Mizoram	51579	112316	0.784	0.660	0.588	0.605
Nagaland	59164	110525	0.631	0.700	0.585	0.616
Odisha	44550	79976	0.590	0.607	0.647	0.664
Puducherry	162925	259404	0.510	0.503	0.596	0.641
Punjab	101746	168506	0.564	0.494	0.531	0.578
Rajasthan	48455	79913	0.700	0.676	0.596	0.661
Sikkim	56270	173550	0.715	0.685	0.642	0.660
Tamil Nadu	74269	137694	0.627	0.616	0.591	0.644
Tripura	61391	106928	0.553	0.569	0.519	0.562
Uttar Pradesh	47780	71033	0.541	0.501	0.558	0.600
Uttarakhand	63348	164094	0.586	0.562	0.596	0.644
West Bengal	61658	97291	0.561	0.541	0.571	0.605

Source: Computed by the author from Appendix Table 1.

Table 2
Growth of real GDP (r_Y), population (r_p) worker productivity (r_l), change in the ratio of workers to working age population (r_E) and demographic dividend (r_D) in India, States and Union Territories

Country/State/ Union Territory	r_Y	r_p	r_D	r_l	r_E
India	0.739	0.162	0.058	0.563	-0.044
AN Islands	0.901	0.072	0.048	0.787	-0.006
Andhra Pradesh	0.768	0.097	0.061	0.654	-0.044
Arunachal Pradesh	0.761	0.231	0.081	0.558	-0.109
Assam	0.508	0.158	0.065	0.273	0.012
Bihar	0.640	0.225	0.021	0.442	-0.047
Chandigarh	0.847	0.160	0.036	0.679	-0.028
Chhattisgarh	0.830	0.204	0.074	0.586	-0.035
Delhi	0.866	0.193	0.057	0.670	-0.053
Goa	0.853	0.083	0.000	0.769	0.001
Gujarat	0.974	0.173	0.046	0.835	-0.081
Haryana	0.850	0.184	0.086	0.782	-0.203
Himachal Pradesh	0.735	0.123	0.064	0.568	-0.020
Jammu & Kashmir	0.508	0.215	0.022	0.340	-0.069
Jharkhand	0.713	0.200	0.042	0.465	0.007
Karnataka	0.692	0.145	0.062	0.520	-0.035
Kerala	0.741	0.048	0.008	0.636	0.049
Madhya Pradesh	0.623	0.187	0.077	0.410	-0.051
Maharashtra	0.846	0.146	0.069	0.674	-0.044
Manipur	0.520	0.275	0.035	0.192	0.018
Meghalaya	0.700	0.246	0.045	0.480	-0.071
Mizoram	0.853	0.211	0.036	0.778	-0.172
Nagaland	0.753	-0.004	0.028	0.625	0.104
Odisha	0.796	0.130	0.052	0.585	0.028
Puducherry	0.726	0.247	0.026	0.465	-0.013
Punjab	0.576	0.132	0.073	0.504	-0.133
Rajasthan	0.744	0.194	0.084	0.500	-0.034
Sikkim	1.309	0.123	0.104	1.126	-0.044
Tamil Nadu	0.779	0.151	0.028	0.617	-0.017
Tripura	0.809	0.139	0.087	0.555	0.028
Uttar Pradesh	0.580	0.180	0.080	0.397	-0.077
Uttarakhand	1.153	0.173	0.072	0.952	-0.043
West Bengal	0.627	0.130	0.077	0.456	-0.036

Source: Computed by the author from Appendix table 1.

Table 3
Decomposition of the growth of real GDP (Billion Rupees) during 2001-2011
India and states/Union Territories

India/State/ Union Territory	∇Y	Decomposition of the increase in ∇Y			
		∂P	∂D	∂I	∂E
India	25701	5631	2029	19565	-1524
AN Islands	21	2	1	18	0
Andhra Pradesh	2050	258	163	1745	-117
Arunachal Pradesh	28	8	3	20	-4
Assam	292	91	37	157	7
Bihar	616	216	20	425	-45
Chandigarh	76	14	3	61	-3
Chhattisgarh	445	110	40	314	-19
Delhi	1047	233	68	810	-65
Goa	129	13	0	116	0
Gujarat	2288	407	107	1963	-190
Haryana	937	203	95	863	-224
Himachal Pradesh	203	34	18	157	-6
Jammu & Kashmir	153	65	7	102	-21
Jharkhand	456	128	27	297	4
Karnataka	1362	286	122	1023	-69
Kerala	994	64	11	853	66
Madhya Pradesh	826	248	103	544	-68
Maharashtra	4236	731	347	3377	-218
Manipur	27	14	2	10	1
Meghalaya	52	18	3	36	-5
Mizoram	29	7	1	26	-6
Nagaland	49	0	2	41	7
Odisha	687	112	45	505	24
Puducherry	56	19	2	36	-1
Punjab	647	149	82	566	-150
Rajasthan	1118	292	126	752	-52
Sikkim	35	3	3	30	-1
Tamil Nadu	2183	423	79	1730	-49
Tripura	80	14	9	55	3
Uttar Pradesh	1745	543	240	1192	-231
Uttarakhand	381	57	24	314	-14
West Bengal	1438	298	177	1047	-83

Source: Computed by the author.

Appendix Table 1
Real GDP and population 2001 and 2011
India and states/Union Territories

India/State/ Union Territory	Real GDP Billion Rupees		Population Million								Workers Million	
			Total		< 15 years		15-59 years		≥ 60 years			
	2000-01	2010-11	2001	2011	2001	2011	2001	2011	2001	2011	2001	2011
India	23484.81	49185.33	1025.43	1205.72	363.47	372.26	585.36	729.63	0.02	0.03	0.13	0.14
AN Islands	14.05	34.60	0.35	0.38	0.10	0.09	0.23	0.26	5.79	8.28	31.14	34.90
Andhra Pradesh	1774.89	3824.59	76.08	83.81	24.40	21.79	45.89	53.74	0.05	0.06	0.43	0.53
Arunachal Pradesh	24.38	52.20	1.10	1.38	0.44	0.49	0.60	0.83	1.56	2.08	8.52	10.78
Assam	441.97	734.44	26.63	31.19	9.97	10.25	15.10	18.859	5.50	7.71	24.26	29.59
Bihar	686.20	1301.71	82.82	103.70	34.87	41.72	42.45	54.268	0.04	0.07	0.33	0.39
Chandigarh	57.20	133.38	0.90	1.06	0.26	0.27	0.59	0.72	1.50	2.00	8.58	10.95
Chhattisgarh	344.12	789.03	20.81	25.52	7.69	8.18	11.61	15.33	0.72	1.15	4.34	5.28
Delhi	760.60	1807.65	13.83	16.77	4.49	4.57	8.62	11.058	0.11	0.16	0.49	0.53
Goa	95.91	224.99	1.34	1.46	0.33	0.32	0.90	0.98	3.50	4.79	19.60	22.51
Gujarat	1388.25	3675.81	50.62	60.20	16.62	17.45	30.50	37.97	1.58	2.19	7.58	8.11
Haryana	700.27	1637.70	21.06	25.32	7.58	7.53	11.90	15.596	0.55	0.70	2.61	3.08
Himachal Pradesh	187.36	390.54	6.06	6.85	1.88	1.78	3.63	4.38	0.68	0.92	3.27	3.87
Jammu & Kashmir	230.16	382.70	10.10	12.53	3.62	4.24	5.81	7.36	1.58	2.36	9.04	11.59
Jharkhand	438.46	894.91	26.91	32.87	10.71	11.89	14.63	18.62	4.06	5.79	21.11	25.08
Karnataka	1365.16	2727.21	52.80	61.05	16.85	16.02	31.89	39.23	3.34	4.19	9.49	10.54
Kerala	904.50	1898.51	31.81	33.37	8.30	7.83	20.18	21.35	4.28	5.71	22.72	28.10
Madhya Pradesh	955.25	1781.44	60.19	72.54	23.25	24.30	32.66	42.53	8.45	11.11	36.95	43.86
Maharashtra	3184.39	7420.42	96.76	111.97	31.10	29.92	57.21	70.94	0.15	0.20	0.83	1.16

India/State/ Union Territory	Real GDP Billion Rupees		Population Million								Workers Million	
			Total		< 15 years		15-59 years		≥ 60 years			
	2000-01	2010-11	2001	2011	2001	2011	2001	2011	2001	2011	2001	2011
Manipur	39.71	66.81	2.16	2.85	0.71	0.86	1.31	1.79	0.11	0.14	0.85	1.06
Meghalaya	51.69	104.13	2.32	2.96	0.98	1.18	1.23	1.64	0.05	0.07	0.41	0.44
Mizoram	21.22	49.79	0.89	1.10	0.31	0.36	0.53	0.672	0.09	0.10	0.74	0.84
Nagaland	43.58	92.54	1.99	1.98	0.73	0.68	1.17	1.20	3.04	3.98	12.68	15.65
Odisha	564.75	1251.31	36.74	41.86	12.21	12.08	21.50	25.79	0.08	0.12	0.32	0.42
Puducherry	52.30	108.06	0.97	1.25	0.26	0.30	0.63	0.828	2.19	2.87	8.16	8.76
Punjab	829.81	1476.70	24.27	27.70	7.62	7.09	14.46	17.75	3.81	5.11	20.90	26.66
Rajasthan	1012.63	2130.79	56.22	68.28	22.54	23.73	29.87	39.44	0.03	0.04	0.23	0.28
Sikkim	12.92	47.84	0.54	0.61	0.19	0.17	0.32	0.403	5.51	7.51	24.92	29.30
Tamil Nadu	1851.01	4034.16	61.98	72.08	16.71	17.01	39.76	47.56	0.23	0.29	1.04	1.35
Tripura	64.06	143.87	3.19	3.67	1.08	1.02	1.89	2.37	11.65	15.44	46.43	55.79
Uttar Pradesh	2218.43	3963.09	165.46	198.19	67.92	71.31	85.89	111.44	0.65	0.90	2.77	3.39
Uttarakhand	175.71	556.67	8.47	10.07	3.09	3.13	4.730	6.04	5.70	7.74	26.77	31.74
West Bengal	1650.31	3088.37	80.06	91.16	26.65	24.74	47.72	58.68	76.60	103.82	357.64	426.67