**Working paper**

# Urbanisation, demographic transition, and the growth of cities in India, 1870-2020

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# Urbanization, Demographic Transition and the Growth of Cities in India, 1870-2020

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## Abstract

This paper examines the nature of urbanization and urban growth in India since the late 19th century against the backdrop of the unfolding demographic transition. It argues that (a) Urbanization within India exhibits a tight relationship with economic growth at the regional level (b) The demographic divergence between rural and urban natural growth rates since the 1970s that is attributed to stagnant agricultural productivity and rural literacy levels in large parts of India has slowed down the pace of urbanization, especially in the Northern hinterlands (c) City population growth rates peaked in the 1980s and will see a marked deceleration in the coming decades with substantial variations driven by investments in specific sectors such as Information & Technology (d) Human capital externalities in a period of demographic transition draw in migrants but also reduce fertility such that its relationship with city growth rates, as observed in Indian data is mixed (e) Labour mobility in India is high but is mostly male-dominated, semi-permanent, and remittance-based in nature leading to masculine urbanization with important implications for urban growth and urbanization. By integrating the demographic transition with urban processes, this paper explains India's relatively slow pace of urbanization, the inter-city variation in population growth rates and the paradox of faster urban growth combined with slower urbanization in the North relative to the South.

"Why has Indian urbanization been so slow?" (Davis, 1962)

# 1. Introduction

When the demographer Kingsley Davis asked a question on India's relatively slow pace of urbanization over five decades ago, he proceeded to answer that question on the basis of the "relative slowness of economic development in India." Since then and especially in the past two decades, India's economic growth rates have risen but the question asked by Davis continues to be relevant. For its level of income, urbanization appears to be low in India (Deshingkar & Anderson, 2004), even though the size of its urban population is significant and larger than the population of the United States of America.

It is in this context that this paper examines the nature of urbanization and urban growth in India since the late 19th century.[1] Crucially, it locates urbanization and urban growth against the backdrop of the unfolding demographic transition in India. The word – Urbanization- is used in this paper both as a statistic and a process. As a statistic, it denotes the share of urban population in total population and as a process it indicates the upward movement of the statistic. Urbanization depends not only on urban growth but also on rural growth, a key point emphasized in this paper. The demographic transition, on the other hand, refers to the transition from high birth and death rates to low birth and death rates. Despite the empirical regularity of both these processes, the interaction between them is a very nascent field of research (Dyson, 2011). This paper studies these interactions and argues that they explain several features of India's urban trajectory. Thus, it contributes to the growing research enterprise on urban processes outside the Western domain (Chauvin, Glaeser, Ma, & Tobio, 2016).[2]

For instance, we find that India has been de-urbanizing in the past four decades in the absence of migration and reclassification effects due to a demographic divergence between rural and urban natural growth rates, a phenomenon that is rarely studied in urban studies. Another example is the role of human capital in explaining cross-city growth variation. The urban economics literature developed in the West over the past five decades at a point of time when the societies were at the *end* of the demographic transition. As a result, human capital accumulation had a positive impact on city population growth primarily through the migration channel. Yet, for societies undergoing a demographic transition, human capital accumulation also has a potential *negative* effect on city growth rates as fertility rates are dampened. The urban economics literature has little to say about fertility because there is meagre variation in cross-city fertility rates at the end of the demographic transition. As this paper documents, this is not the case in a country like India which is undergoing the demographic transition.

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[1] Figure 1 shows the political boundaries within India in 2011 and the location of the ten largest Indian cities.
[2] For instance, Sub-Saharan Africa faced urbanization without economic growth in the late 20th century posing a challenge to standard urban theories (Fox, 2012). Urban growth forecasts in developing countries are also problematic (Cohen, 2004).

Understanding long-duration processes such as urbanization and the demographic transition require a historical analysis and so the time period for our analysis begins in the 1870s with the first Indian Census.[3] It ends in 2020 with a comment on future urban scenarios. The analysis itself is based on a unique database of demographic, economic, geographic and social indicators covering regions and cities over time. It assembles a database on the population of nearly 400 urban agglomerations (1871-2011) that collectively comprise of over 60% of the Indian urban population. Data on 4,000 urban units in 2001, district level metrics and a State level panel between 1971 and 2011 are also analysed. The Appendix to this paper provides details on the compilation of the database along with summary statistics of key variables.

The rest of the paper is arranged as follows. Section 2 documents four distinct features of Indian urbanization based on a historical and comparative analysis. Section 3 analyses the relationship between urbanization and the demographic transition. Section 4 studies the growth of cities in India over the short and long run and section 5 concludes.

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[3] The Census of India in 1872 was asynchronous. Since 1881, it has been synchronous and has been held regularly every ten years. The 15th All-India Census was held in 2011.

## 2. Urbanization in India

India's rate of urbanization rose gradually from around 10% at the end of the 19th century to 31% in 2011 (Table 1) with wide regional variations (Figure 2).[4] We document four important features of this process below:

a) **Masculine Urbanization:**

India is one of the few countries of the world where urban sex ratios are relatively more masculine than rural sex ratios (Figure 3A). While most parts of India have female deficits in their aggregate sex ratios, this deficit is more pronounced in urban areas than rural areas , is widespread across districts (Figure 3B) and has been a persistent feature for over a century (Table 1, Col. 10 and 11).    It occurs primarily because migration to cities for work is overwhelmingly male-dominated in nature (Tumbe, 2015b). Major cities such as Mumbai and Kolkata were male ghettos in the early 20th century with sex ratios hovering around 500 females per 1,000 males and rising over time mainly on account of natural growth within the cities (Figure 4). Delhi and Surat's phenomenal growth in the first and second halves of the 20th century respectively were closely associated with worsening of sex ratios due to large inflows of male migrants. In these male-dominated migration streams, younger cohorts of migrants often replace older cohorts of migrants who leave the cities to retire in the native regions with their left-behind families (Tumbe, 2015a). Families are separated for long periods of time because of restrictions on female mobility either due to cultural norms or adverse housing conditions. These migration streams are also not seasonal but semi-permanent in nature yielding large remittance flows to the source regions (Tumbe, 2012). This phenomenon has an important implication that net rural-urban migration flows are considerably smaller than gross rural-urban migration flows due to return migration, leading to slower urban growth and urbanization.

b) **Service Sector Urbanization:**

Between 1901 and 2016, the share of the manufacturing sector in Gross Domestic Product (GDP) in India rose from less than 5% to around 15% while the share of the service sector rose substantially from 25% to nearly 70% (RBI, 2016; Sivasubramonian, 2000). The skipping of the manufacturing revolution in India is in stark contrast to the experience of East Asian countries, and is reflected in its cities where most people earn a living from the services sector. Virtually all Indian districts have over 50% of the main urban workforce engaged in the services sector with the average crossing over 80% (Figure 5).  While major cities such as Mumbai and Kolkata did have a sizable share of the workforce in the manufacturing sector in the early 20th century, by the early 21st century, the figure was less than 30%. Barring

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[4] The urban definition has broadly remained unchanged between 1961 and 2011. A substantial change occurred between 1951 and 1961 leading to a reduction in the number of towns. Currently, the Indian Census defines urban areas as (a) All settlements with a local urban body and (b) Settlements with a population of at least 5,000 persons, density of at least 400 persons per sq. km. and at least 75% of the male main working population engaged in non-agricultural activities.

Surat, all the Top-10 cities of India are service-dominated cities (Table 2) and formal sector manufacturing plants appear to be moving to rural locations (Ghani, Goswami, & Kerr, 2012).

### c) Strong Linkages between Economic Growth and Urbanization:

Globally, there exists a tight positive relationship between per capita income levels and urbanization rates but limited evidence on the level of urbanization affecting economic growth (Bloom, Canning, & Fink, 2008). Within India, there is a strong relationship between per capita income levels and urbanization rates at the State level with the correlation coefficient as high as +0.9 (Figure 6A). Relatively richer states such as Maharashtra, Kerala, Tamil Nadu and Gujarat have urbanization rates above 40% while poorer states such as Odisha and Bihar have urbanization rates less than 20%.

In addition, there also appears to be evidence that urbanization rates affect economic growth rates at the sub-national level. The correlation coefficient between growth rates of per capita incomes between 1971 and 2011 and urbanization rates of 1971 at the State level is +0.8 (Figure 6B). It is also possible to replicate a Granger-Causality test on urbanization and income levels conducted by Bloom et al. (2008) at the cross-country level, using panel data on Indian states for the period 1971-2011 at ten-year intervals. Urbanization is said to 'Granger-cause' income if on controlling for past income levels, lagged urbanization rates have predictive power for future levels of income. Table 3 reports the results of such a test whereby bi-directionality of the Granger-causality between variables is established. This demonstrates the intimate relationship between urbanization and economic growth within India over the past four decades. This relationship can be attributed to the productivity advantages of industry and urban agglomerations that have been documented in the Indian context (Shukla, 1996; Lall, Shalizi, & Deichmann, 2004; Mohanty, 2014).

### d) Relatively low level and slow pace of urbanization in India

At a global level, India's urbanization rate is observed to be more than 10 percentage points lower than the rate predicted for its level of per capita income (Deshingkar & Anderson, 2004). Further, the pace of urbanization has been slower in India than in many other countries. Between 1971 and 2011, India's urbanization rate increased from around 20% to 31%. In the same time period, many Asian and African countries more than doubled their urbanization rates from similar starting points. China's rate of urbanization has crossed the 50% threshold. India thus poses two challenges to urban trends: Why is the *level* of urbanization so low relative to its per capita income level and why has the *pace* of urbanization been slow in the last four decades?

Two explanations often discussed pertain to urban definitions and migration restrictions. India uses a conservative urban definition that assigns many settlements to be 'rural' when they would have been classified as 'urban' in other countries. A more liberal definition

would raise the urbanization rate and explain part of the difference between the actual urbanization rate and the rate predicted at the corresponding per capita income level. As shown in Figure 7, the urbanization rate in India in 2011 could vary between 31% based on the official definition and 47% if rural settlements with population exceeding 5,000 were classified as urban areas, a practice followed in many countries. However, Figure 7 also shows that irrespective of the definition used, the change in urbanization rate between 2001 and 2011 remains constant at 3 percentage points. That is, a definition-based explanation addresses the issue of low urbanization but not slow urbanization.

Another explanation on the relatively low level and slow pace of Indian urbanization focuses on migration restrictions. Census statistics on in-migration show low rates of mobility especially for non-marriage related reasons.[5] As per one argument, caste networks provides an important source of informal insurance in rural settings and thus acts as a barrier to migration (Munshi & Rosenzweig, 2016). There are, however, other perspectives on Indian migration. Census based statistics on work-related migration have been shown to be seriously deficient (Deshingkar & Akter, 2009) and the average Indian district's male out-migration rate (for work) computed from the National Sample Surveys is above 5% (Tumbe, 2015b), a threshold denoting 'mass migration' (Hatton & Williamson, 1998, p. 9-10). As pointed out earlier, the gendered nature of rural-urban migration for work and eventual return migration considerably slows down the pace of urban growth and urbanization.

Definition and migration-based explanations have, however, overlooked another potential reason for India's relatively low level and slow pace of urbanization. This is related with the fact that urbanization also depends on rural-urban differences in natural growth rates which correspond to their respective demographic transitions and this reason, as the next section will elaborate, is vital in resolving a major urban puzzle.

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[5] Female migration rates are extremely high on account of marriage due to village exogamy.

## 3. Urbanization and the Demographic Transition

The population of India grew at an annual rate of less than 1% between 1872 and 1921 in a period marked by intense famines in the 1870s and 1890s, plague in the first decade of the twentieth century and the influenza epidemic of 1918-19. Since 1921, the annual population growth rate steadily climbed upwards as disease and climate-linked mortality rates plunged. The fertility transition began only in the 1960s as birth rates gradually declined from 45 births per 1,000 to 24 births per thousand in 2011. These trends in birth and death rates over the long run are depicted in Figure 8 which also shows the inverted U-shape path of natural growth rates that peaked in the 1970s.[6]

The transition of natural growth rates has however varied substantially at the sub-national level. For instance, in 2011, Bihar in the north experienced a natural growth rate of 21 per 1,000 or 2.1% per annum as compared to the relatively richer state of Tamil Nadu in the south that experienced a natural growth rate of only 9 per 1,000 or 0.9% per annum (Figure 9). These wide variations in natural growth rates were driven primarily by differences in birth rates as death rates have converged across states in the past four decades.[7] The differing pace of the regional fertility transition has been attributed to differences in human capital accumulation (Murthi, Guio, & Dreze, 1995) and slow diffusion of low-fertility norms from the coastal south (Guilmoto & Rajan, 2001). As a result, there exists a broad North-South fertility divide with the poorer states of the northern hinterland exhibiting higher birth rates than other regions. This is a well-documented feature of Indian demography.

In addition to this North-South fertility divide, there exists another remarkable feature of India's demographic transition. This is the *demographic divergence* between rural and urban natural growth rates since the 1970s, as depicted in Figure 10. In the 1970s, birth and death rates were both lower in urban than rural areas but their difference or the natural growth rates was identical. Since then, rural and urban natural growth rates have diverged such that rural natural growth rates are now substantially higher than urban natural growth rates. This is a significant phenomenon as it indicates that in the absence of migration and reclassification effects, India has been de-urbanizing for four decades. In other words, the demographic divergence has dragged down the pace of India's urbanization and needs careful scrutiny.

A clearer picture emerges in the state-level analysis. As shown in Figure 11, the four southern states did not undergo the demographic divergence observed at the All-India level. In these states, the decline of rural and urban natural growth rates occurred at the same pace. This trend is also observed in the relatively richer states of Maharashtra and Gujarat in the west and Punjab in the north. The states which did undergo the demographic

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[6] Natural growth rate is the difference between Birth Rate and Death Rate.
[7] Across-state birth rates ranged between 25 and 45 births per 1,000 in 1971 and between 14 and 30 births per 1,000 in 2011. In contrast, death rates have converged across states ranging from 5 and 20 per 1,000 in 1971 to 5 and 8 per 1,000 in 2011.

divergence are shown in Figure 12. The poorer northern states - Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh, often referred to as the BIMARU states - exhibit a clear demographic divergence from the 1970s. As these states have a large demographic weight in India's population, the divergence within these states translates into the overall divergence noted at the All-India level. Assam, a relatively poor north-eastern state also exhibits the demographic divergence. In West Bengal, there is a large difference between rural and urban natural growth rates but no evidence of divergence from a common starting point. The difference owes itself to the fact that Kolkata, a city with very low fertility levels, comprises a large share of the state's urban population.

The data on birth and death rates make it clear that the proximate cause of the demographic divergence has been the stagnant rural-urban fertility differential in conjunction with a narrowing of the rural-urban mortality differential.[8] At the sub-national scale, the demographic divergence occurs in those regions where the rural-urban fertility differential does not exhibit narrowing tendencies.

In order to further understand the drivers of the demographic divergence, we analyse rural-urban differences at the district level. Standard fertility metrics such as Total Fertility Rate (TFR) and Birth Rate are not available separately for rural and urban areas at the district level. Instead, we construct a Fertility Index from Census data based on the child-woman ratio- Children aged 0-6/ Females aged 7+, that is available for rural and urban areas. This index correlates extremely well with standard measures of fertility at the state level. The correlation coefficient is above +0.9 between the Census based fertility index and TFR derived from the National Family Health Survey and Crude Birth Rate derived from the Sample Registration System statistics.

The rural-urban differences in the Census-based fertility index at the district level are illustrated in Figure 13. In line with the earlier analysis, the map shows districts within the BIMARU states and Assam with high values and most other districts especially in the south with low values.[9] Across-district variation in rural-urban fertility differences occurs primarily on account of large variation in rural fertility rather than urban fertility.[10] The question therefore is why some regions have lower rural fertility than others?

The vast literature on fertility stresses the significance of the negative relationship between fertility on the one hand and education and income on the other. Education expands the knowledge on contraceptive methods and education of females in particular increases the opportunity cost of child-rearing activities (Dreze & Murthi, 2001). The income effect on fertility has been theorized in the quantity-quality trade-off framework whereby higher

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[8] A narrowing of the rural-urban fertility differential in India based on child-woman ratios was observed before the 1960s (Robinson, 1961).

[9] This provides additional validity to the accuracy of rural-urban differences in natural growth rates revealed through SRS data.

[10] The correlation coefficient between the rural-urban fertility gap and rural and urban fertility is 0.8 and 0.26 respectively.

incomes are invested in increasing the 'quality' of fewer children (Becker, 1960). Accordingly, we take rural literacy rates and agricultural productivity per hectare as proxies for rural education and income in our regression framework to understand the drivers of cross-district rural-urban fertility differences.[11]

Table 4 reports the regression results. Both education and income variables are highly significant variables with the expected signs and together explain about 26% of the variation in rural-urban fertility differences. These variables are statistically significant even after controlling for state level conditions that absorb variation in policies and governance conditions (Column 2, Table 4). To guard against the concern that most of the variations are essentially North-South differences in demographic conditions, a separate regression is run on a sample of 90 districts within the southern states (Column 3, Table 4). Agricultural productivity continues to have strong explanatory power at the within-state level for southern states whereas rural literacy ceases to be an important factor, presumably due to limited variation in the variable in the south. The stability of the regression coefficients shows the robust relationship between rural education and income against rural-urban fertility differences at the district level.

Based on these empirical results, it appears that regions with relatively lower agricultural productivity and rural literacy rates are associated with higher rural-urban fertility differences. Conversely, boosting agricultural productivity and rural literacy rates would speed up urbanization by narrowing the rural-urban fertility differential. This would not necessarily increase or reduce out-migration as the observed link is weak in India.[12] Thus rural prosperity is demographically linked with the process of urbanization through a channel beyond migration.

Finally, it is possible to simulate the impact of the demographic divergence on urbanization rates. Table 5 reports results from a state level panel regression of urbanization rates on lagged values of rural-urban differences in natural growth rates and other variables. It shows the robust negative impact of the demographic divergence variable on urbanization rates. The results suggest that closing the rural-urban divide between natural growth rates would lead to an increase in urbanization rates by over 4 percentage points. This would explain nearly 50% of the observed gap between India's official rate of urbanization and that predicted at its level of income.

India's low and slow pace of urbanization thus hinges on three important factors. The *lowness* occurs partly because of the nature of India's urban definition and the *slowness* occurs because of the demographic divergence and the highly gendered nature of work-related migration that leads to considerable return migration from cities to villages.

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[11] Multicollinearity issues are avoided as rural literacy and agricultural productivity per hectare have weak correlation.
[12] The correlation between the out-migration variable depicted in Figure 21 and rural literacy or agricultural productivity across districts is close to zero.

## 4. The Growth of Cities in India

By the end of the 19th century, the British colonial state directly ruled 60% of the area of the Indian subcontinent and indirectly ruled the remaining area through princely states (Roy, 2006). The colonial state operated chiefly from the three port cities of Kolkata, Mumbai and Chennai[13] that reflected the significance of international commerce. By 1901, they were the three largest cities of India.[14]

Figure 14A shows the dominance of these three cities by mapping major urban agglomerations of 2001, scaled by the population in 1901.[15] New cities had sprung up in the late 19th century as transportation hubs due to the railways, hill stations and cantonments for the ruling elite, and market towns for exporting agricultural products in the first wave of globalization (Heitzman, 2008). Small industrial clusters for specialized products also emerged, notably in Tamil Nadu along the irregular quadrilateral of Coimbatore, Salem, Tiruchirapalli and Madurai (Ghurye, 1974). Other prominent cities in the early 20th century included cities in modern day Uttar Pradesh, Ahmedabad and Hyderabad (capital of a princely state).

After Independence in 1947, the Indian state built selected new cities for political administration at the state level (Chandigarh, Bhubaneshwar, Gandhinagar) and industrial townships but planning policies carried an anti-urban bias and a lopsided funding focus on rural development projects (Ramachandran, 1989). The liberalization of the economy in 1991 marked another milestone as India opened up to the world economy inviting foreign investment that was directed to specific sectors and cities (Shaw, 2012).

Figure 14B maps the population of major urban agglomerations in 2011 and a comparison with Figure 14A reveals important similarities and differences. Both maps have large vacant spots in central and north-eastern India reflecting the absence of major urban agglomerations in those spaces spanning a century. The most significant difference is the appearance of Delhi as a large city as it grew rapidly in the 20th century after it was chosen as the new capital of British India in 1911.[16] The triangle between Bangalore, Hyderabad and Chennai is also more prominent in 2011 than 1901. The rise of Pune, Surat and Ahmedabad relative to major cities in Uttar Pradesh is also visible.

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[13] They were called Calcutta, Bombay and Madras respectively in colonial documents. In this paper, current names are used to describe all locations.

[14] This was in contrast to the Mughal empire that operated out of six primate cities - Lahore, Delhi, Agra, Patna, Burhanpur and Ahmedabad- dominating internal trade. Surat, the port city, served an economic rather than a political function (Chaudhuri, 1978).

[15] 62 of the top 100 urban agglomerations in 2001 were also among the top 100 list of cities in 1901.

[16] Delhi is the second largest urban agglomeration after Mumbai as per the Indian Census of 2011 but the largest city of India as per the United Nations. Unlike the Census, the UN considers urban units outside the National Capital Territory to be a part of the Delhi agglomeration.

This brief overview of urban growth patterns follows the work of social scientists amidst a large body of research on the subject[17] and yet curiously enough, urban growth has not adequately been analysed in conjunction with the demographic transition. Even though natural increase contributed to over 50% of urban growth in the past four decades (Bhagat, 2011), most studies on urban growth in India focus on migration and not fertility or mortality.

Figure 15 shows how closely urban growth in India has followed the logic of the demographic transition. The annual population growth rate distributions of large urban agglomerations comprising over 60% of the Indian urban population shift in accordance with the national demographic transition outlined in Figure 8.[18] Between 1881 and 1921 the average annual growth rate was 0.8% with a large proportion of cities experiencing negative population growth rates. Plague and other epidemics of this era led to high death rates and the contribution of natural increase to urban growth would have been minimal. Average annual growth rates rose to 2.6% in the 1921-1951 period and 3.4% in the 1951-1991 period. In these periods, virtually no major city experienced population declines due to significant declines in mortality rates. Average annual growth rates then *fell* in the most recent 1991-2011 period to 2.6% mimicking the decline in natural growth rates observed at the national level. A few cities also observe population declines in the recent period.

While the demographic transition is the principal reason behind these distributional shifts, Figure 15 also shows the considerable variation in city growth rates within each selected period. Why did some Indian cities grow faster than others within particular time periods? We begin to address this question by considering the proximate determinants of urban growth for a time period where sufficient data is available i.e. 2001-2011. The three proximate determinants are natural increase as proxied by fertility[19], migration as proxied by the share of recent migrants in total population and area reclassification. The last factor is important as boundaries of municipalities and urban agglomerations expand or contract upon local considerations rather than clearly defined criteria.

Table 6 reports the results of a regression of annual city population growth rates (2001-2011) on the three factors and other geographical and political variables noted in the literature.[20] All the three core factors are highly significant variables and collectively explain

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[17] See Bose (1980), Kundu & Gupta (1996), Sivaramakrishnan et al. (2005) and Denis et al. (2012) and the references therein.

[18] This holds true even for the full sample of 4,000 odd urban units. Results not shown for the sake of brevity.

[19] City level death rates are unavailable but at the State level, there is little variation in urban death rates suggesting that differences in urban natural growth are due to differences in urban birth rates.

[20] The literature on the growth of cities (da Mata, Deichmann, Henderson, Lall, & Wang, 2007; Duranton & Puga, 2014; Henderson, 2003) outline many variables that are not easy to operationalize in the Indian context. Three studies on India (C. M. Becker, Mills, & Williamson, 1986; Mitra & Mehta, 2011; Sridhar, 2010) note the significance of growth-pole and market size effects linked with agglomeration.

nearly 60% of the observed inter-city variation in growth rates.[21] In addition, there is strong evidence of growth-pole or market size effects whereby cities further away from the leading eight cities experience significantly lower growth rates.

The 'area' variable is also highly significant and adds considerable explanatory power to the regression model. The coefficient size is substantially less than one suggesting that city expansion is linked with rising densities. This point is elaborated further in Figure 16 which shows the distribution of population densities of over 4,000 urban units in 2001 across Census city class sizes. Average population densities nearly double from 2,500 persons per sq. km. in tiny towns to 5,000 persons per sq. km. in large cities and the rise in densities is gradual across class sizes. Thus, Indian cities tend to grow by area and density as they grow larger.

The other two proximate determinants – fertility and migration- are studied in greater detail below. Figure 17 provides a schematic of city growth that combines combinations of high and low fertility with high and low rates of net migration. Thus, cities could be classified into four categories – internal growth (with minimal migration), external growth (with minimal fertility), explosion (with high fertility and migration) and stagnation (with low fertility and migration). The demographic transition is mostly a one-way transition from high to low fertility rates whereas cities can switch from low to high migration rates and vice versa. Such a schematic is useful to understand city growth in societies undergoing the demographic transition as there is considerable variation in fertility rates. Figure 18 fits Indian data to the schematic and shows the wide variation in fertility and migration rates across cities. Between 2001 and 2011, a city like Kolkata faced 'stagnation', Sambhal in Uttar Pradesh had 'internal growth', Bhubaneswar witnessed 'external growth' and Surat experienced 'explosion'. Thus the interplay between fertility and migration has a major bearing on the variation of inter-city growth rates.

Figure 19 maps the fertility index in major urban agglomerations and shows that the broad north-south divide in general fertility levels extend into the urban realm. The correlation coefficient between urban fertility and urban literacy rates was below -0.6 in 2011, revealing the significance of human capital formation in pushing down city growth rates via the fertility channel. In the absence of migration and area reclassification, northern cities are growing much faster than southern cities due to lower literacy rates, higher fertility rates and higher internal growth. This has important implications for urban planning as infrastructure requirements depend on the population base of the city. It also shows that reduction of urban population growth rates can be achieved by investing in urban education rather than restricting migration.

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[21] The unexplained part of the model is due to the effects of out-migration, mortality and the lagged nature of the in-migration variable due to data constraints. Migration data for Census 2011 was not available at the time of writing.

Migration to cities itself is the function of many variables including wages, employment opportunities and amenities and these are analysed in a regression framework. Wages are proxied by literacy rates to reflect the human capital-productivity links that is a standard feature of the urban economics literature. Employment opportunities are proxied by workforce shares in particular sectors that experienced high economic growth rates and temperature range is taken to be an important physical amenity in the Indian context. Table 7 reports the regression results with in-migration to cities in the 1990s as a share of city's population in 2001 as the dependent variable. After controlling for state level variables that absorb institutional factors, city level literacy rates are a strong predictor of migration to cities, confirming a stylized fact of urban economics. Two sectors – public administration and the Information and Technology (IT) sector – that saw considerable expansion in the 1990s also help explain inter-city variations in migration rates.[22] Temperature range is not a significant variable in the model that collectively explains over 40% of the variation in migration rates. Migration networks are also important in determining migration corridors to particular cities, though they are hard to operationalize at the cross-city level in a regression framework. Figures 20, 21, 22A and 22B show the clusters within India that receive migrants and send out migrants for work and towards particular cities. Networks from clusters in the Gangetic and coastal plains and other parts of India have sustained for long periods of time (Tumbe, 2012) and explains why some cities have had larger access to migrant pools than others.

Taken together, the results above show the mixed impact of human capital on city growth in a country undergoing the demographic transition. Human capital has a positive impact on city growth through the migration channel but a negative impact through the fertility channel. Unsurprisingly, it emerges as an insignificant variable in explaining the cross-city growth variations between 2001 and 2011.[23]

A long run regression analysis of city growth rates is constrained by data limitations. Working within these limitations, Table 8 shows some of the political variables associated with urban growth over the long run. Until 1921, cities associated with direct British rule experienced higher population growth rates after controlling for various geographic indicators. Since mortality was a major factor influencing urban growth in this period, it is likely that British ruled cities had better investments in health systems due to the residence of the ruling elite. Further, major political headquarters have had a statistically significant impact on city growth rates across most periods. The decline in the coefficient after 1991 suggests a weakening impact of political centralization on city growth. By using more historical data on Indian cities, future research can expand the range of variables that affect city growth over the long run.

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[22] The choice of sectors to be included in the regression was based on the level of statistical significance. Results do not change on the inclusion of non-significant sectors.
[23] That is, running the Table 6 regression by replacing fertility and migration with literacy rates. Results not shown.

## 5. Conclusion

Demographic transitions matter for urban transitions. As the evidence for India shows, the differing pace of demographic transition along the rural and urban axes can affect the pace of urbanization. The differing pace of demographic transition across cities can affect the inter-city variation in population growth rates. The regional dynamics within India lead to the apparent North-South paradox of rapid urban growth and slow urbanization in the North versus slower urban growth and rapid urbanization in the South. That is, northern cities are growing faster than southern cities on account of higher fertility rates but urbanizing slower than the south because northern *villages* are also growing much faster than southern villages. The dynamics of urbanization therefore requires a careful examination of urban and rural conditions as rural prosperity is demographically linked with greater urbanization. Boosting agricultural productivity and rural literacy levels in the northern hinterlands would arguably lead to greater urbanization, not less, by narrowing the rural-urban fertility differential.

City growth rates peaked in the 1980s and will see a marked deceleration in the coming decades with substantial variations driven by investments in specific sectors such as IT. It is worth re-emphasizing these two points of the paper – on slow urbanization and slower urban growth than before- because the discourse in media outlets is diametrically opposite, centred as it is on *rapid* urbanization and *booming* cities. The rural-urban fertility differential shows no signs of narrowing in recent data and fertility continues to decline in major cities. In Kolkata, some wards experienced population declines between 2001 and 2011.

The regional variations have significant policy implications as more urban infrastructure would be needed in northern India relative to the south due to existing fertility differentials and projected urban growth rates. Investment in urban education would reduce internal growth but also lead to external growth via the channel of human capital formation and migration. Finally, male-dominated migration streams for work leads to masculine and slower urbanization due to high rates of return migration. Investments in cities that support gender-balanced migration streams would go a long way in encouraging structural transformation and urbanization. It is ironic that better agricultural productivity and women's hostels in cities appear to be pre-conditions for faster urbanization in India.

## Appendix: Data Sources

Most of the data used in his paper come from three sources – Sample Registration System or SRS (Government of India, 2009), Central Statistical Organization (CSO), and the Census. Census data, where unspecified, refers to the Primary Census Abstract. Other datasets include the 64th round National Sample Survey (2007-08), United Nations Demographic Yearbook of 2013 and geographical variables based on satellite imagery.

A dataset on population of nearly 400 urban agglomerations in the broad jurisdiction boundaries of 2001, for all the Census years between 1872 and 2011 was compiled by linking data from Mitra (1980), Government of India (2007) and Census 2011. A sample of this series was cross-checked with Census reports of the early 20th century.

In 2011, there were 35 states and union territories, 640 districts, 468 urban agglomerations and 7,935 urban units or towns and cities in India.

**Summary Statistics: State panel database, 1971-2011, in 5 intervals of 10 years each**

| Variable | Obs. | Mean | Std. Dev. | Min | Max | Source |
|---|---|---|---|---|---|---|
| Urbanization % | 164 | 30.29 | 20.84 | 0.0 | 97.5 | Census |
| Log Number of Towns | 162 | 4.2 | 1.9 | 0.0 | 9.0 | Census |
| Rural-Urban Natural Growth Difference, Rate per 1,000 people | 138 | 2.98 | 3.60 | -4.7 | 13.6 | SRS |
| Log Per Capita Real Income, 2004-05 series (Net State Domestic Product Rs.) | 128 | 9.9 | 0.68 | 8.6 | 12.0 | CSO |

**Summary Statistics: District Database**

| Variable | Obs. | Mean | Std. Dev. | Min | Max | Source |
|---|---|---|---|---|---|---|
| Rural Fertility Index %, 2011 | 584 | 34.8 | 9.0 | 16.5 | 61.8 | Census |
| Urban Fertility Index %, 2011 | 590 | 28.8 | 5.9 | 16.5 | 57.2 | Census |
| Rural Urban Difference in Fertility Index %, 2011 | 581 | 5.94 | 5.39 | -10.5 | 31.7 | Census |
| Log Agricultural Yield per Hectare, 2003-04 | 541 | 10.2 | 0.6 | 8.0 | 11.9 | Chand et al. (2009) |
| Rural Literacy Rate, 2011, % | 584 | 69.5 | 10.5 | 34.7 | 97.6 | Census |

**Summary Statistics: Urban Agglomeration Database**

| Variable | Obs. | Mean | Std. Dev. | Min | Max | Source |
|---|---|---|---|---|---|---|
| Annual City Population Growth Rates %, 1881-1921 | 301 | 0.8 | 1.1 | -1.7 | 4.5 | Census |
| Annual City Population Growth Rates %, 1921-1951 | 349 | 2.6 | 1.3 | -10.5 | 8.4 | Census |
| Annual City Population Growth Rates %, 1951-1991 | 373 | 3.4 | 1.4 | 0.0 | 11.2 | Census |
| Annual City Population Growth Rates %, 1991-2011 | 383 | 2.6 | 1.6 | -0.5 | 14.3 | Census |
| Annual City Population Growth Rates %, 1881-2011 | 299 | 2.2 | 0.6 | 0.8 | 4.3 | Census |
| Annual City Population Growth Rates %, 2001-2011 | 385 | 2.6 | 2.6 | -1.6 | 25.8 | Census |
| Annual City Area Growth Rates %, 2001-2011 | 360 | 2.6 | 4.9 | -11.4 | 27.2 | Census |
| Urban Fertility Index %, 2001 | 394 | 32.5 | 6.5 | 19.8 | 50.5 | Census |
| Literacy Rate %, 2001 | 394 | 78.6 | 7.2 | 52.2 | 97.2 | Census |
| Recent Migrants (<10 Years) as % of Population, 2001 | 393 | 16.9 | 7.4 | 2.9 | 62.1 | Census, D-3 |
| Temperature Range (degree celsius) | 393 | 23.7 | 11.4 | 3.0 | 46.7 | Census |
| % of Workforce in Public Administration (NIC 75) | 327 | 9.8 | 5.1 | 0.9 | 35.9 | Census, B-22 |
| % of Workforce in IT sector (NIC 72) | 326 | 0.2 | 0.3 | 0.0 | 3.2 | Census, B-22 |
| British rule=1 | 394 | 0.7 | 0.5 | 0.0 | 1.0 | Map inspection |

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**Table 1: Urbanization and Urban Growth in India, 1871-2011**

| Year | Number of Towns and Cities | Number of Cities/UAs with Million+ Population | Urban Population (Million) | Total Population (Million) | Urbanization % | Annual Inter-Censal Urban Population Growth Rate % | Annual Inter-Censal Total Population Growth Rate % | Share of Major 10 cities as % of Urban Population | Share of Major 10 cities as % of Total Population | Urban Sex Ratio | Total Sex Ratio |
|------|------|------|------|------|------|------|------|------|------|------|------|
|      | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| 1871 |       | 1 | 18 | 212 | 8.7 |      |       |      |     |     | 944 |
| 1881 |       | 1 | 20 | 214 | 9.3 | 0.75 | 0.08 |      |     |     | 962 |
| 1891 |       | 1 | 22 | 234 | 9.4 | 1.03 | 0.92 |      |     |     | 962 |
| 1901 | 1,916 | 1 | 26 | 238 | 10.8 | 1.63 | 0.19 | 17.3 | 1.9 | 910 | 972 |
| 1911 | 1,908 | 2 | 26 | 252 | 10.3 | 0.04 | 0.56 | 19.4 | 2.0 | 872 | 964 |
| 1921 | 2,048 | 2 | 28 | 251 | 11.2 | 0.80 | -0.03 | 19.8 | 2.2 | 846 | 955 |
| 1931 | 2,220 | 2 | 33 | 279 | 12.0 | 1.77 | 1.05 | 19.0 | 2.3 | 838 | 950 |
| 1941 | 2,427 | 2 | 44 | 319 | 13.9 | 2.81 | 1.34 | 22.0 | 3.0 | 831 | 945 |
| 1951 | 3,060 | 5 | 62 | 361 | 17.3 | 3.52 | 1.26 | 24.4 | 4.2 | 860 | 946 |
| 1961 | 2,700 | 7 | 79 | 439 | 18.0 | 2.37 | 1.98 | 26.0 | 4.7 | 845 | 941 |
| 1971 | 3,126 | 9 | 109 | 548 | 19.9 | 3.29 | 2.24 | 26.5 | 5.3 | 858 | 930 |
| 1981 | 4,029 | 12 | 159 | 683 | 23.3 | 3.87 | 2.23 | 25.7 | 6.0 | 880 | 934 |
| 1991 | 4,689 | 23 | 218 | 846 | 25.7 | 3.16 | 2.16 | 25.4 | 6.5 | 894 | 926 |
| 2001 | 5,161 | 35 | 286 | 1,029 | 27.8 | 2.78 | 1.97 | 26.0 | 7.2 | 900 | 933 |
| 2011 | 7,935 | 53 | 377 | 1,211 | 31.2 | 2.80 | 1.64 | 24.6 | 7.7 | 929 | 943 |

Notes: Census in 1871 was asynchronous. Major ten cities refer to top ten cities in 2001 by population. Sex Ratio is females per 1,000 males. Source: Data before 1901 from Dyson (2004) and after 1901 from various Census volumes, especially Census 2001, Table A-2 and A-4.

**Table 2: Top Ten Indian Cities and Migrant Characteristics**

| City | General | | | | | | | Migrants | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Population (Million) | Annual Population Growth Rate % | Area in Sq. Km. | Population Density per Sq. Km. | Sex Ratio | % Slum Population | % Households with main occupation in mfg. sector | % of Population | Sex Ratio | % from Rural Areas | Migrant workers as % of total workforce | % of Migrant Workers in Mfg. Sector |
| | 2011 | 2001-11 | 2001 | 2001 | 2001 | 2001 | 2007-08 | 2001 | 2001 | 2001 | 2001 | 2001 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Mumbai | 18.4 | 1.1 | 1,135 | 14,478 | 822 | 54 | 27 | 43 | 726 | 66 | 63 | 31 |
| Delhi | 16.3 | 2.4 | 889 | 14,490 | 822 | 19 | 27 | 43 | 784 | 62 | 62 | 27 |
| Kolkata | 14.1 | 0.7 | 1,034 | 12,776 | 869 | 32 | 27 | 28 | 873 | 57 | 44 | 27 |
| Chennai | 8.7 | 2.9 | 702 | 9,346 | 955 | 19 | 25 | 25 | 881 | 38 | 39 | 17 |
| Bengaluru | 8.5 | 4.1 | 540 | 10,561 | 908 | 10 | 22 | 37 | 829 | 40 | 50 | 30 |
| Hyderabad | 7.7 | 3.0 | 822 | 6,985 | 931 | 17 | 18 | 25 | 860 | 47 | 53 | 20 |
| Ahmedabad | 6.4 | 3.5 | 438 | 10,322 | 884 | 13 | 32 | 34 | 918 | 55 | 47 | 34 |
| Pune | 5.0 | 3.0 | 669 | 5,619 | 899 | 19 | 27 | 45 | 912 | 54 | 59 | 30 |
| Surat | 4.6 | 5.0 | 237 | 11,868 | 760 | 21 | 64 | 58 | 681 | 77 | 72 | 62 |
| Jaipur | 3.1 | 2.8 | 485 | 4,792 | 876 | 16 | 27 | 27 | 915 | 48 | 36 | 26 |

Notes: Census Data for all cities refer to the urban agglomerations as defined by Census authorities except for Jaipur, which refers to its Municipal Corporation. Figures for percentages are rounded to nearest whole numbers. Slum population data refers to only the principal municipal corporation limits of each urban agglomeration. Manufacturing sector in Col. 7 refers to NIC 2004 codes 15-37 and in Col. 12 refers to Category D Census classification. Migration data is by 'place of last residence.'
Sources: Col. 1 & 2 from Census 2011, Col. 7 is computed from unit level data of NSS 2007-08. Data for all other columns are computed from Census 2001.

**Table 3: Granger-Causality Tests between Urbanization and Income Levels at the State Level, 1971-2011**

|  | Dependent Variable | |
|---|---|---|
|  | Log Per Capita Real Income | Urbanization % |
|  | (1) | (2) |
| Log Per Capita Real Income [T-10] | 0.75 | 7.21 |
|  | (0.134)*** | (2.092)*** |
| Urbanization % [T-10] | 0.01 | 0.50 |
|  | (0.006)** | (0.153)*** |
|  |  |  |
| State Fixed Effects | Yes | Yes |
| Time (Decade) Fixed Effects | Yes | Yes |
| Observations | 92 | 92 |

Notes: Panel data of Indian States at 5-time period intervals: 1971, 1981, 1991, 2001, 2011. Source: Various Census volumes and Central Statistical Organization. Income is Net State Domestic Product (Rs.), 2004-05 series, constant prices. Constant term not shown in table. Robust standard errors reported in parentheses. ***Significant at 1% level and **Significant at 5% level.

**Table 4: Determinants of Rural-Urban Fertility Differences at the District Level**

**Dependent Variable: Rural-Urban Difference in Fertility Index %, 2011**

|  | (1) | (2) | (3) |
|---|---|---|---|
|  |  |  |  |
| Log agricultural yield per hectare | -1.16 | -0.94 | -1.30 |
|  | (0.347)*** | (0.43)** | (0.51)** |
| Rural literacy rate, % | -0.24 | -0.24 | -0.04 |
|  | (0.021)*** | (0.022)*** | (0.04) |
| Constant | 34.32 | 32.40 | 18.04 |
|  | (3.25)*** | (4.31)*** | (4.77)*** |
| State Control Variables | No | Yes | Yes |
| Restricted sample of Southern States | No | No | Yes |
| Observations | 539 | 539 | 90 |
| R. Sq. | 0.26 | 0.61 | 0.23 |

Notes: District level database. Source: Census and Chand, Garg, & Pandey (2009). Robust standard errors reported in parentheses. ***Significant at 1% level and **Significant at 5% level.

**Table 5: Impact of the Demographic Divergence on Urbanization Rates**

**Dependent Variable: Urbanization %**

|  | (1) | (2) | (3) |
|---|---|---|---|
| Rural-Urban Natural Growth Rate Difference (10 year lag) | -0.68 | -0.71 | -0.56 |
|  | (0.213)*** | (0.214)*** | (0.202)*** |
| Urbanization % (10 year Lag) |  | -0.19 | -0.12 |
|  |  | (0.164) | (0.152) |
| Log Number of Towns |  |  | 6.54 |
|  |  |  | (1.783)*** |
| Constant | 30.07 | 34.62 | 5.59 |
|  | (1.264)*** | (4.208)*** | (8.79) |
| Observations | 105 | 105 | 105 |
| Time (Decade) Fixed Effects | Yes | Yes | Yes |
| State Fixed Effects | Yes | Yes | Yes |

Notes: Panel data of Indian States at 5-time period intervals: 1971, 1981, 1991, 2001, 2011. Source: Various Census volumes and SRS statistics. Standard errors reported in parentheses. ***Significant at 1% level and **Significant at 5% level.

**Table 6: Proximate Determinants of City Growth Rates, 2001-2011**

**Dependent Variable: Annual City Population Growth Rate, 2001-2011, %**

|  | (1) |  | (2) |  |
|---|---|---|---|---|
| Urban Fertility Index, 2001 | 0.10 | ** | 0.08 | *** |
| Recent Migrants (<10 Years) as % of Population | 0.07 | *** | 0.08 | *** |
| Distance from Major Top-8 Metro City: |  |  |  |  |
| (within 100 Km as base category) |  |  |  |  |
| Between 100-300 Km | -1.23 | *** | -0.76 | ** |
| Between 300-500 Km | -1.58 | *** | -1.00 | ** |
| More than 500 Km | -1.87 | *** | -1.30 | *** |
| Annual Growth Rate of Area, % |  |  | 0.31 | *** |
| Capital City Dummy | -0.13 |  | 0.48 |  |
| Hilly Region | -0.07 |  | -0.06 |  |
| Coastal City Dummy | 0.19 |  | 0.55 |  |
| River Dummy | -0.01 |  | 0.07 |  |
| State Dummy Variables | Yes |  | Yes |  |
| Number of Observations | 384 |  | 360 |  |
| R. Sq. | 0.31 |  | 0.59 |  |

Notes: Database of Urban Agglomerations. Source: Census. Standard errors not reported. ***Significant at 1% level and **Significant at 5% level. Constant term not shown in table.

**Table 7: Determinants of in-migration to cities, 1992-2001**

**Dependent Variable: Recent Migrants (<10 years) as % of population, 2001**

|  | (1) |  | (2) |  |
|---|---|---|---|---|
| Literacy Rate %, 2001 | 0.21 | *** | 0.15 | ** |
| % of workforce in Public Administration, 2001 | 0.21 | ** | 0.26 | ** |
| % of workforce in IT sector, 2001 | 8.00 | *** | 8.39 | ** |
| Temperature Range | 0.08 | ** | 0.01 | |
| State Dummy Variables | No | | Yes | |
| Number of Observations | 324 | | 324 | |
| R. Sq. | 0.20 | | 0.43 | |

Notes: Database of Urban Agglomerations. Source: Census Table B-22 for workforce data and D-3 for migration data. Robust standard errors not reported. ***Significant at 1% level and **Significant at 5% level. Constant term not shown in table.

**Table 8: Political Variables and City Growth Rates over the Long Run, 1881-2011**

|  | Dependent Variable: Annual City Population Growth Rates | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
|  | 1881 to 1921 | | 1921 to 1951 | | 1951 to 1991 | | 1991 to 2011 | | 1881 to 2011 | |
| Direct British Rule=1 | 0.39 | *** | 0.01 | | -0.15 | | -0.11 | | 0.01 | |
| Capital City=1 | 1.00 | *** | 0.43 | | 1.94 | *** | 0.65 | ** | 0.96 | *** |
| Control Variables | Yes | | Yes | | Yes | | Yes | | Yes | |
| R Sq. | 0.34 | | 0.08 | | 0.28 | | 0.04 | | 0.36 | |
| N | 279 | | 349 | | 370 | | 382 | | 277 | |

Notes: Database of Urban Agglomerations. Source: Census. Direct British rule=1 if city was not in a princely state. Capital City=1 refers to important political capitals within each time period. Robust standard errors not reported. ***Significant at 1% level and **Significant at 5% level. Constant term not shown in table. Control variables include dummy variables for Bihar, Uttar Pradesh, South India, coast, river and variables on temperature range and log of base population.

**Figure 1: States and Top Ten Cities of India, 2011**



**Top Ten Cities**
1  Mumbai
2  Delhi
3  Kolkata
4  Chennai
5  Bangalore
6  Hyderabad
7  Ahmedabad
8  Pune
9  Surat
10 Jaipur

**Codes**
AR   Arunachal Pradesh
CH   Chhattisgarh
HP   Himachal Pradesh
HR   Haryana
JH   Jharkhand
KN   Karnataka
MN   Manipur
MG   Meghalaya
MZ   Mizoram
NG   Nagaland
SK   Sikkim
TR   Tripura
UT   Uttarakhand
WB   West Bengal

**Figure 2: Change in State Urbanization %, 1901-2011**



Change in Urbanization %, 1901-2011
Less than 15
15 - 20
20 - 25
25 - 30
30 - 35
Above 35
No Data
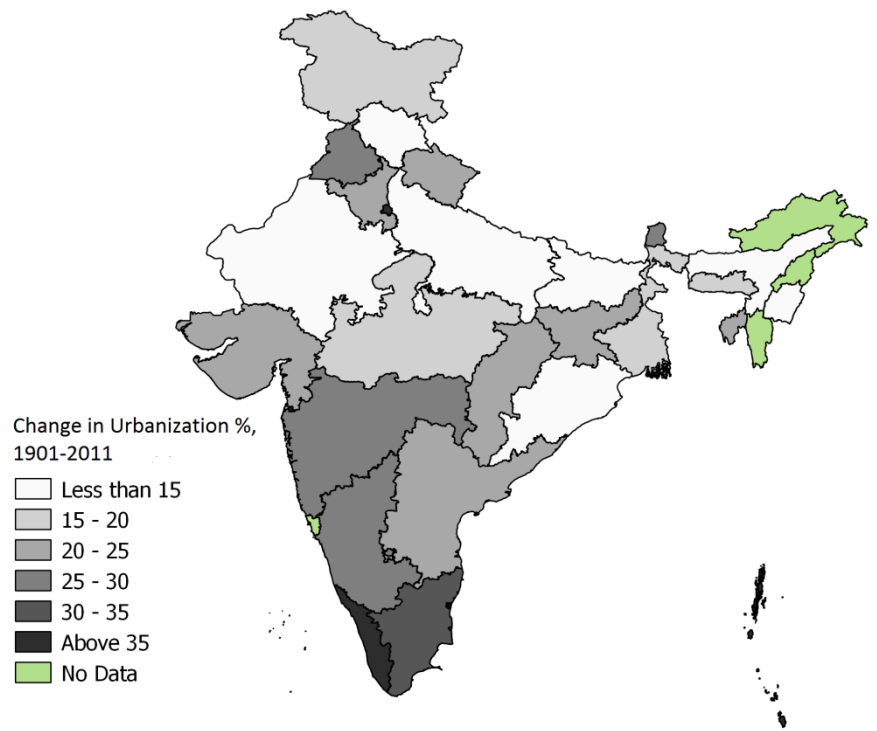
Source: Government of India (2005), Statement 4 & 8 and Census 2011.

**Figure 3 (A): Rural-Urban Sex Ratios across Countries**

**Figure 3 (B): Rural-Urban Sex Ratios across Indian Districts**
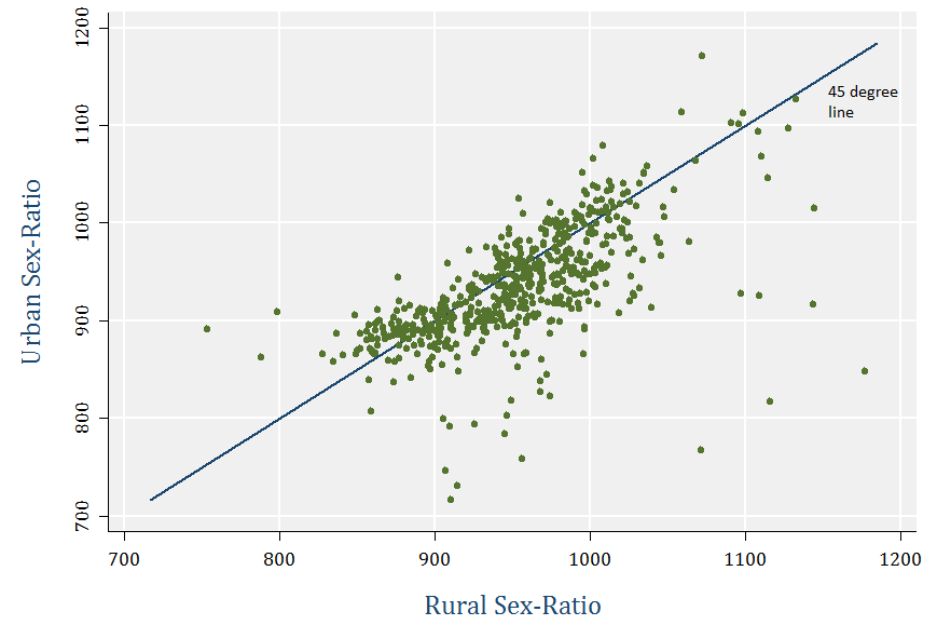


Sex Ratio is females per 1,000 males.

N=120.  Source: Table 7, United Nations Demographic Yearbook (2013)

N=572. Source: Census 2011, Primary Census Abstract.

**Figure 4: Selected City Sex Ratios, 1901-2011**
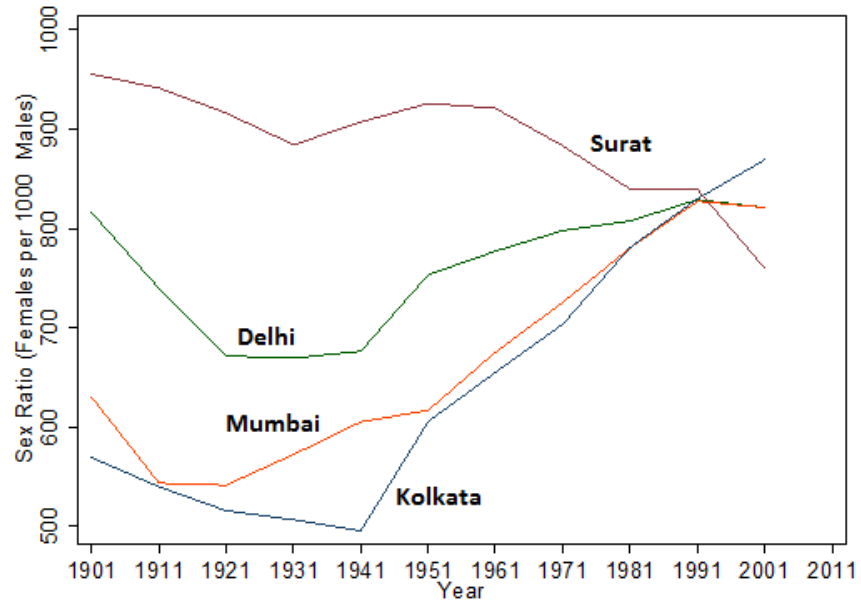


Source: Census 1901-2011. Data on Urban Agglomerations.

**Figure 5: District Level Distribution of Urban Workers, 2001**
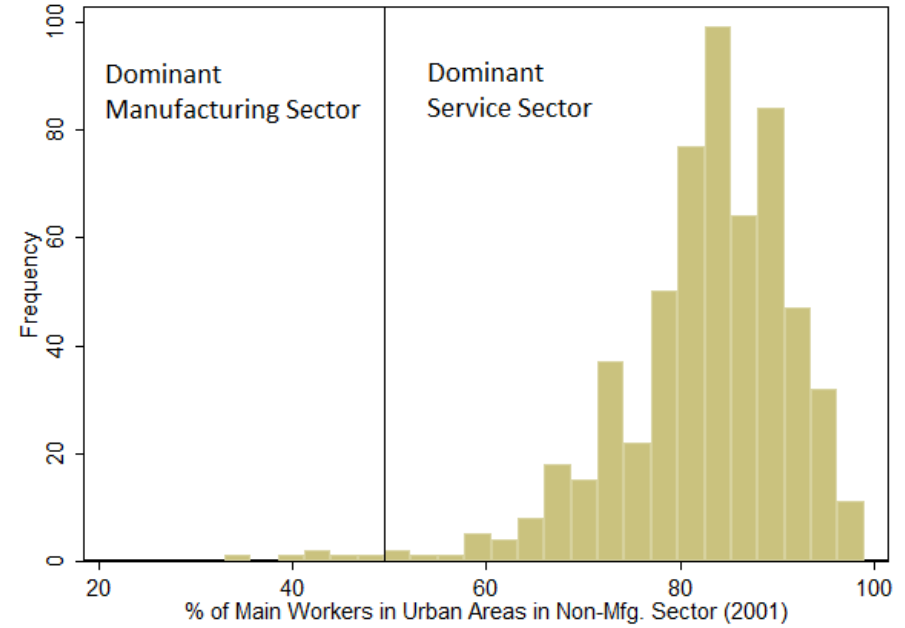


Source: Census 2001, Table B-4.

**Figure 6 (A): Income Levels and Urbanization within India**     **Figure 6 (B): Income Growth (1971-2011) and Urbanization in 1971**
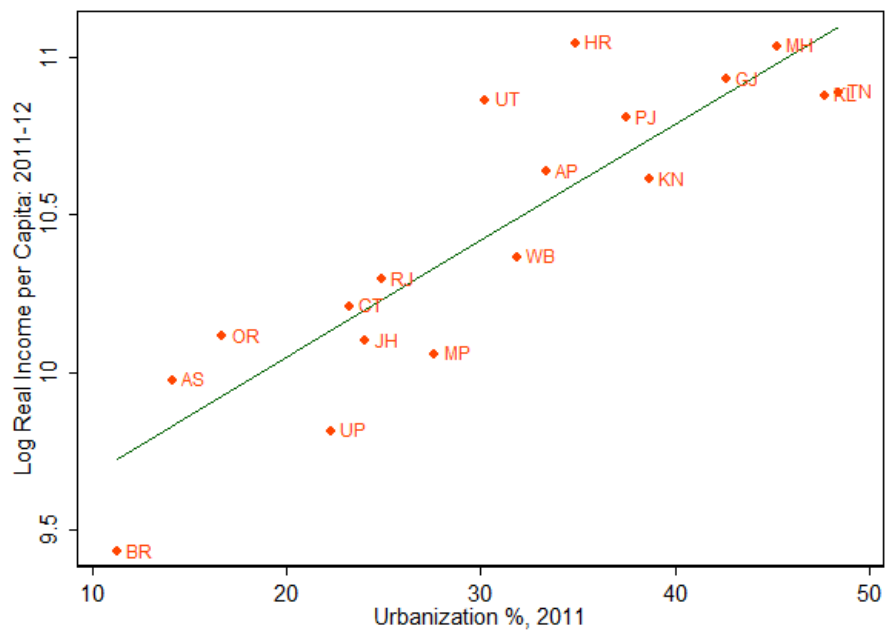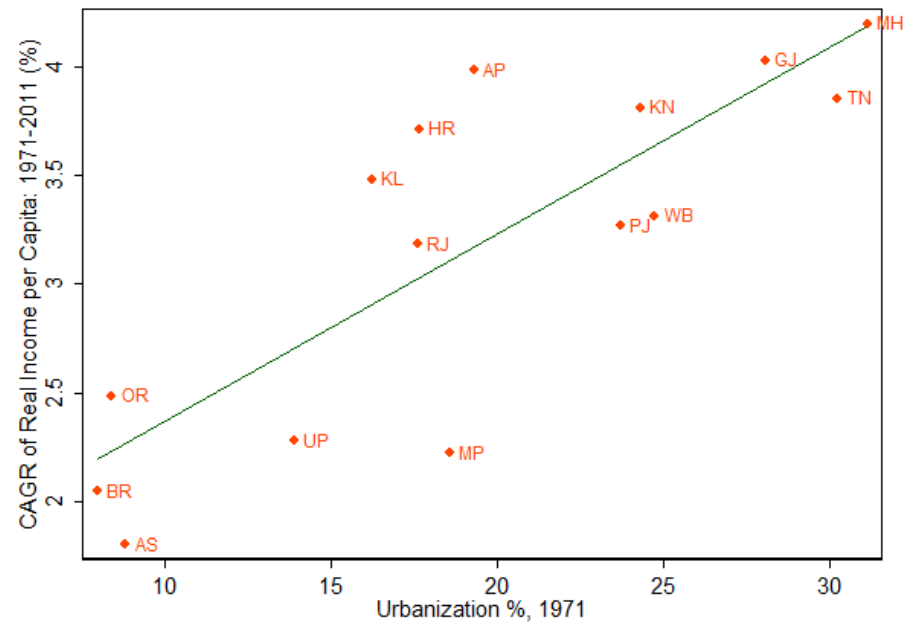


N =18 Large States, Correlation Coefficient=+0.9     N= 15 Large States, Correlation Coefficient= +0.8

Notes: CAGR is Compounded Annual Growth Rate. Income is Net State Domestic Product (Rs.) in 2004-05 constant prices. Two-Letter State codes formed by abbreviations of State names.

Source: Census volumes and Central Statistical Organization.

**Figure 7: Urbanization in India in 2001 and 2011 across definitions**
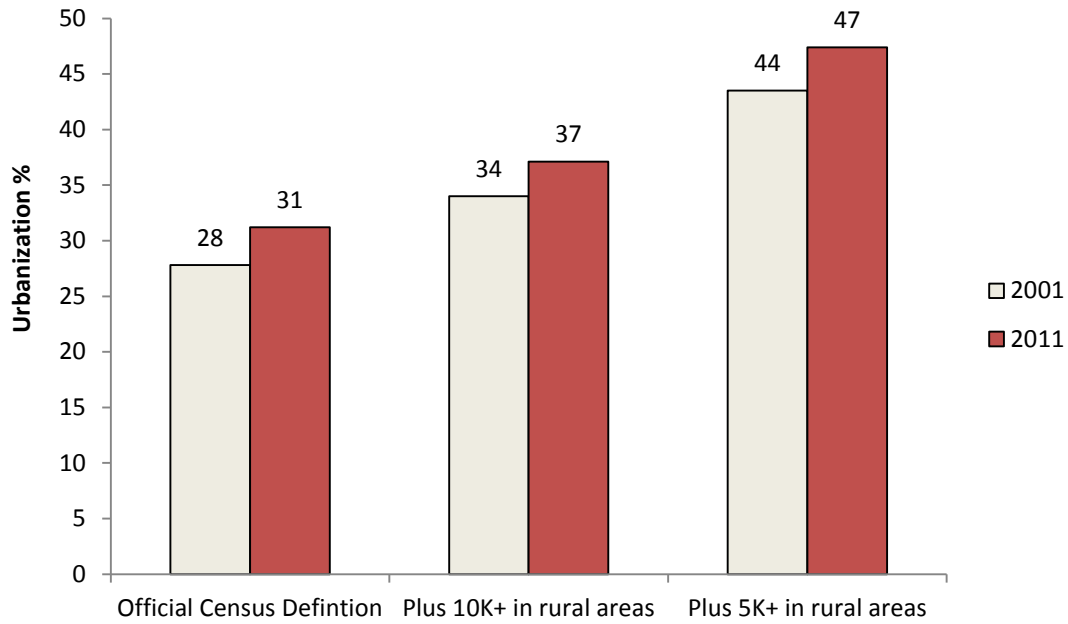


Notes: 'Plus 10K+' and 'Plus 5K+' refers to the inclusion of rural settlements with population more than 10,000 and 5,000 respectively in the definition of urban population. Source: Census 2001 and 2011.

**Figure 8: The Demographic Transition of India**
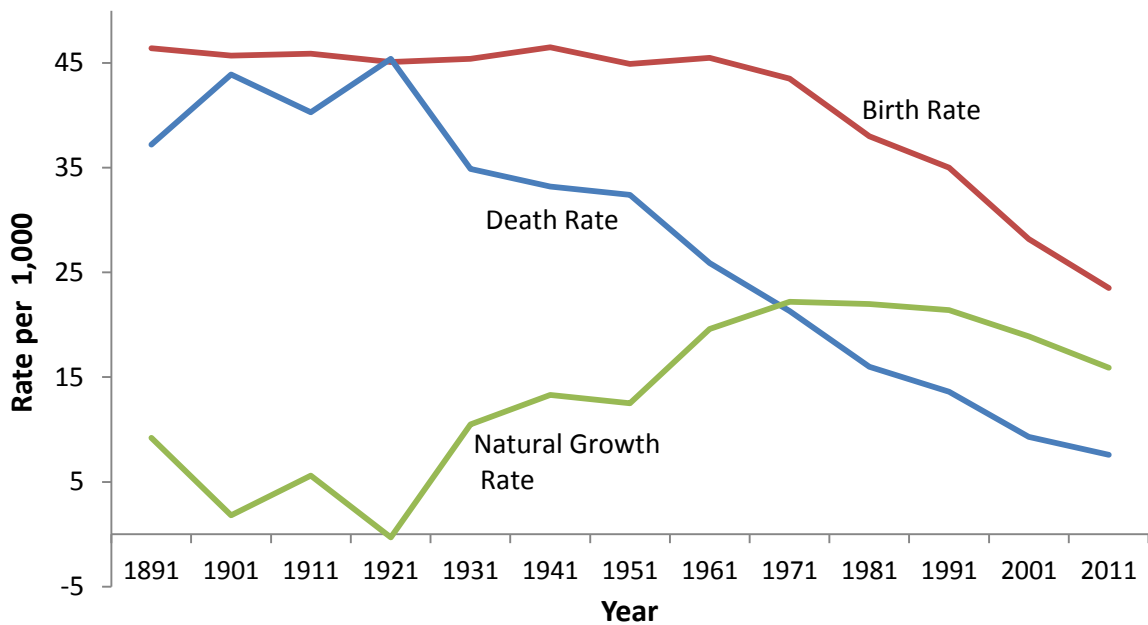


Source: Dyson (2004) and SRS statistics.

**Figure 9: State Level Natural Growth Rates in Rural and Urban Areas, 2011**
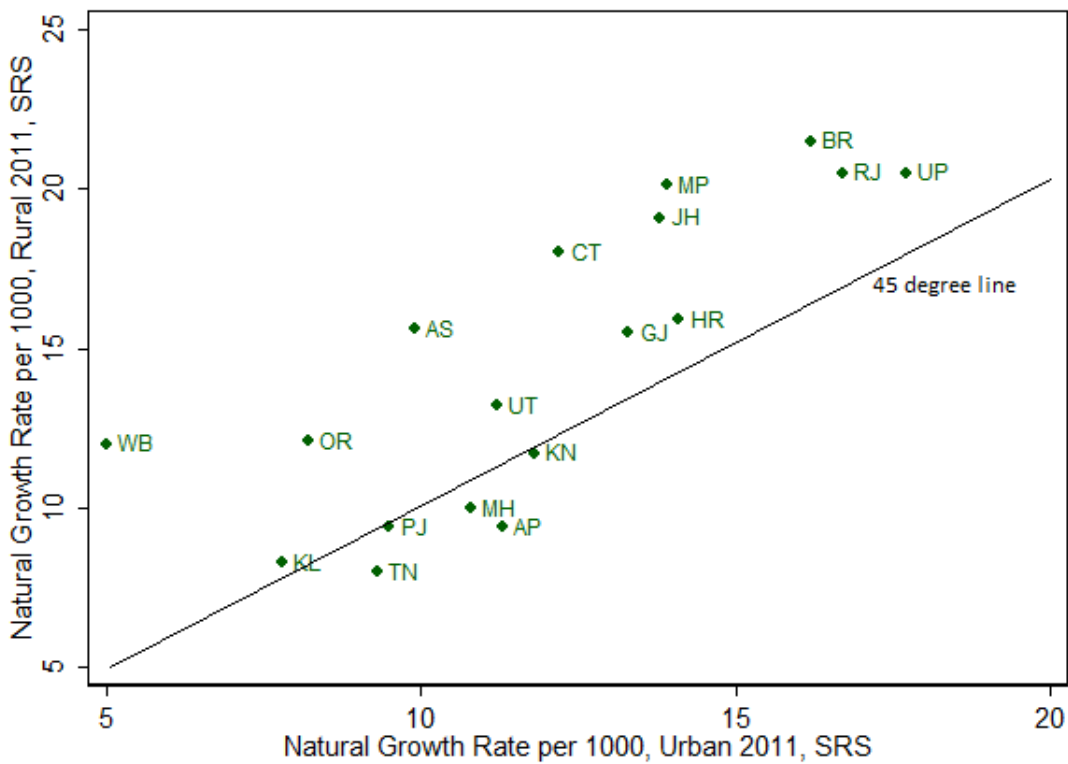
**Figure 10: Rural-Urban Demographic Divergence of Natural Growth Rates, 1975-2011**
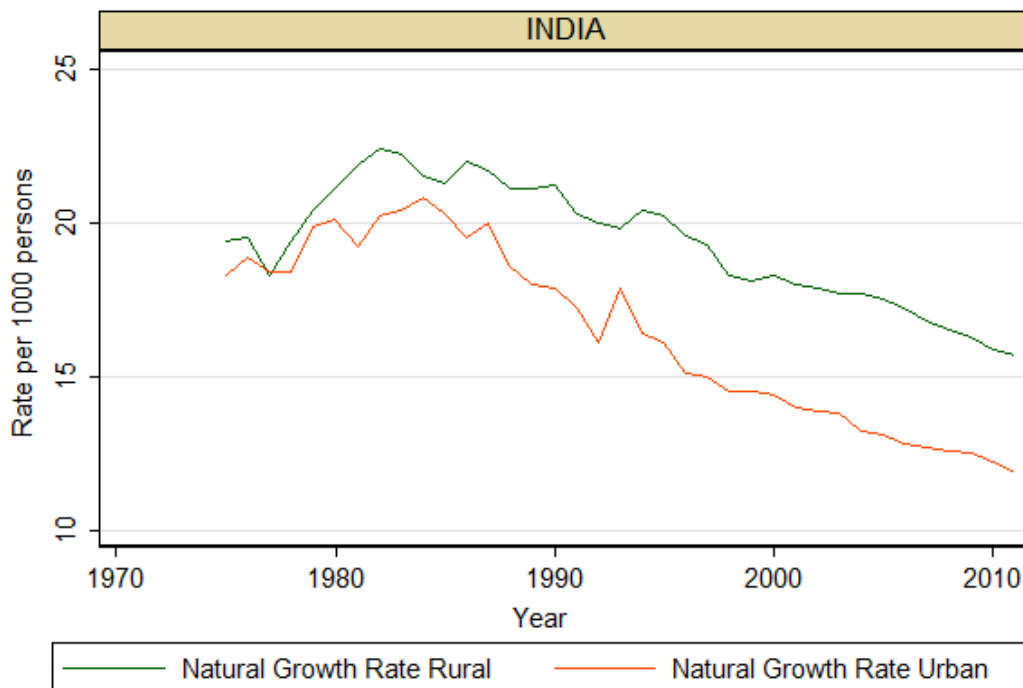
**Figure 11: Demographic Divergence in the Southern States, 1975-2011**
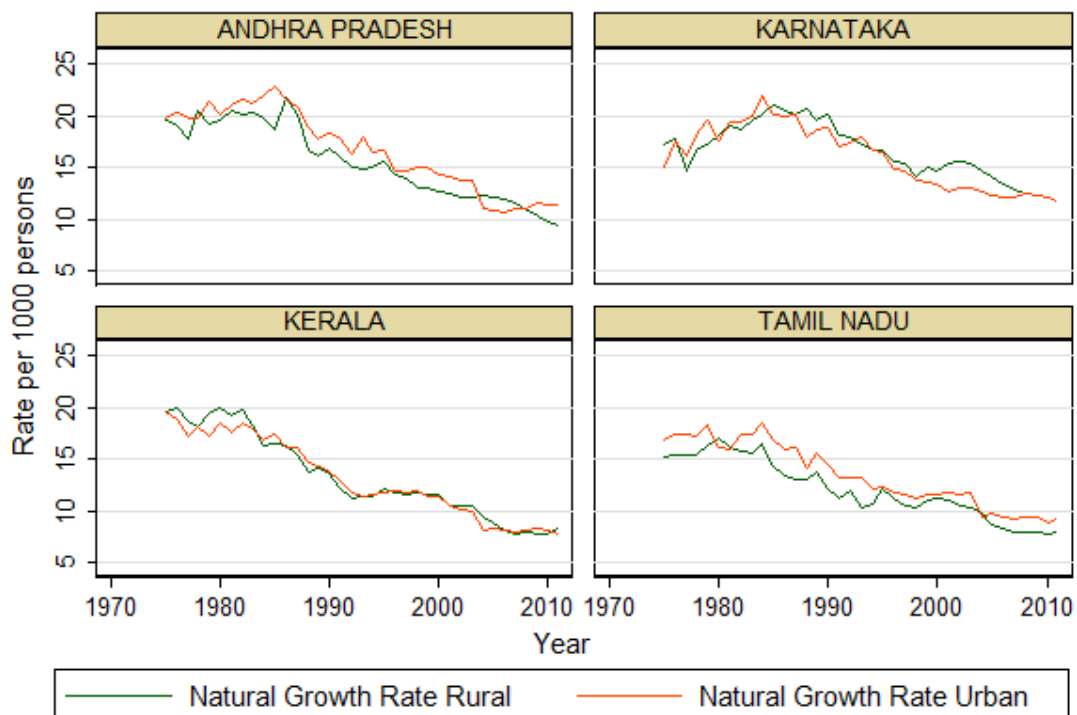


Source: Government of India (2009) and bulletins of the Sample Registration System, 2007-2012.

**Figure 12: Demographic Divergence in Selected Northern States, 1975-2011**
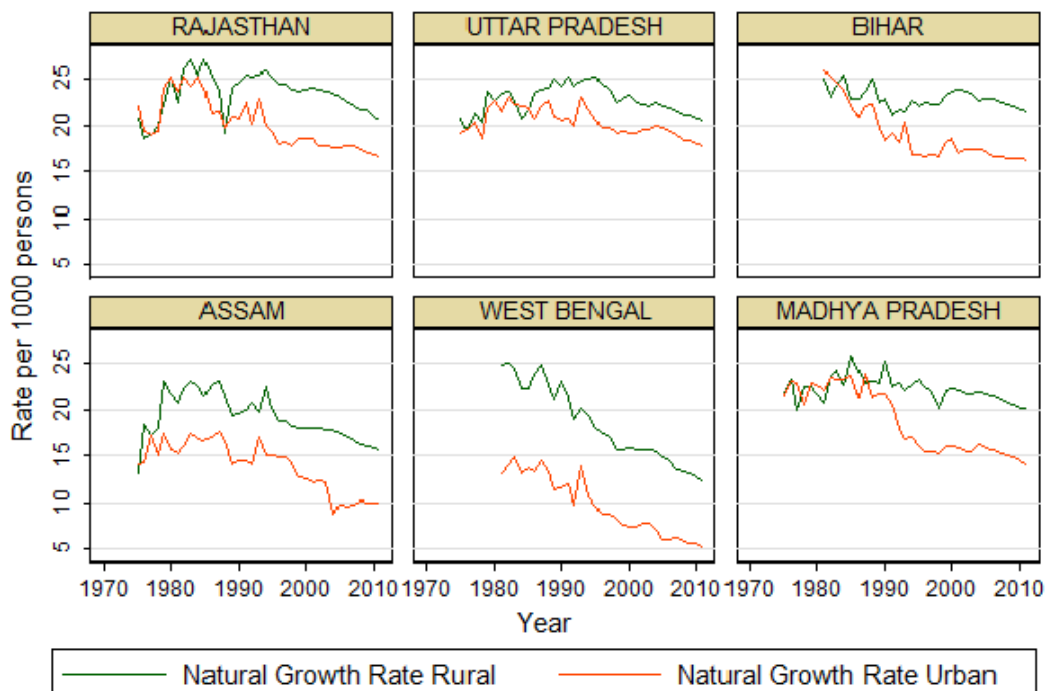


Source: Government of India (2009) and bulletins of the Sample Registration System, 2007-2012.

**Figure 13: Rural-Urban Differences in Fertility at the District Level**

Rural-Urban Differences in Fertility

Index

- <0
- 0.0 - 5.0
- 5.0 - 10.0
- 10.0 - 15.0
- >15
- No Data

Fertility=Child Woman Ratio (0-6 children/ 7+ women) %.
Source: Census 2011.
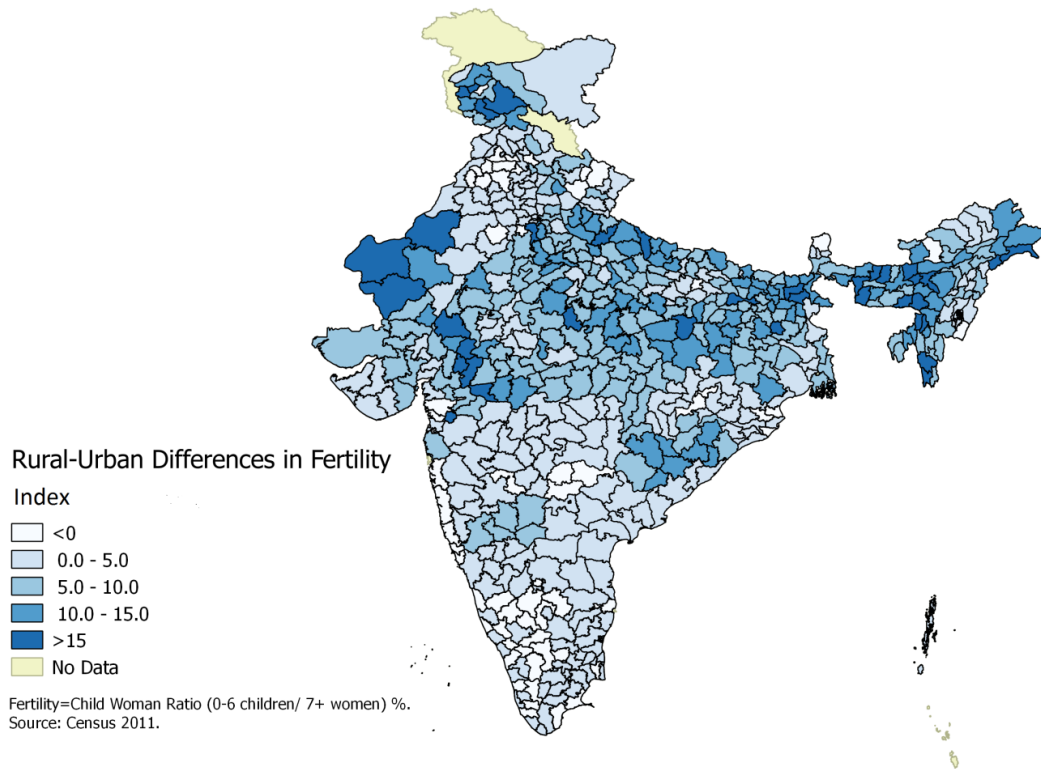
Source: Census 2011.

**Figure 14 (A): Population of large UA's in 1901 (in 2011 boundaries)**      **Figure 14 (B): Population of Large UA's in 2011**
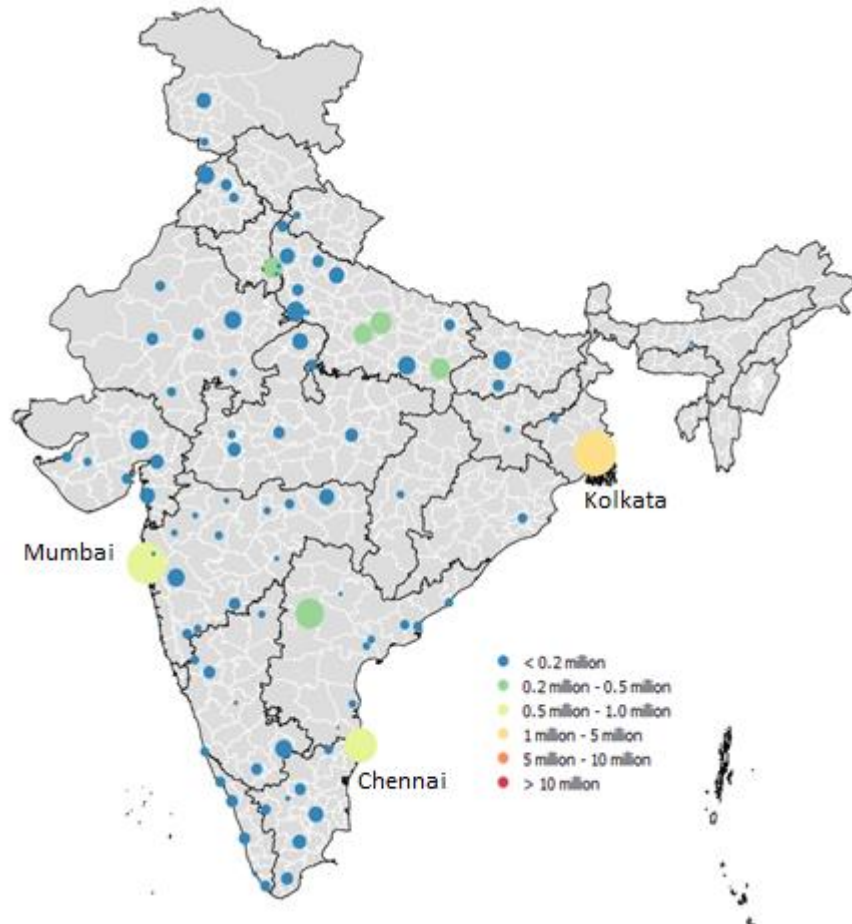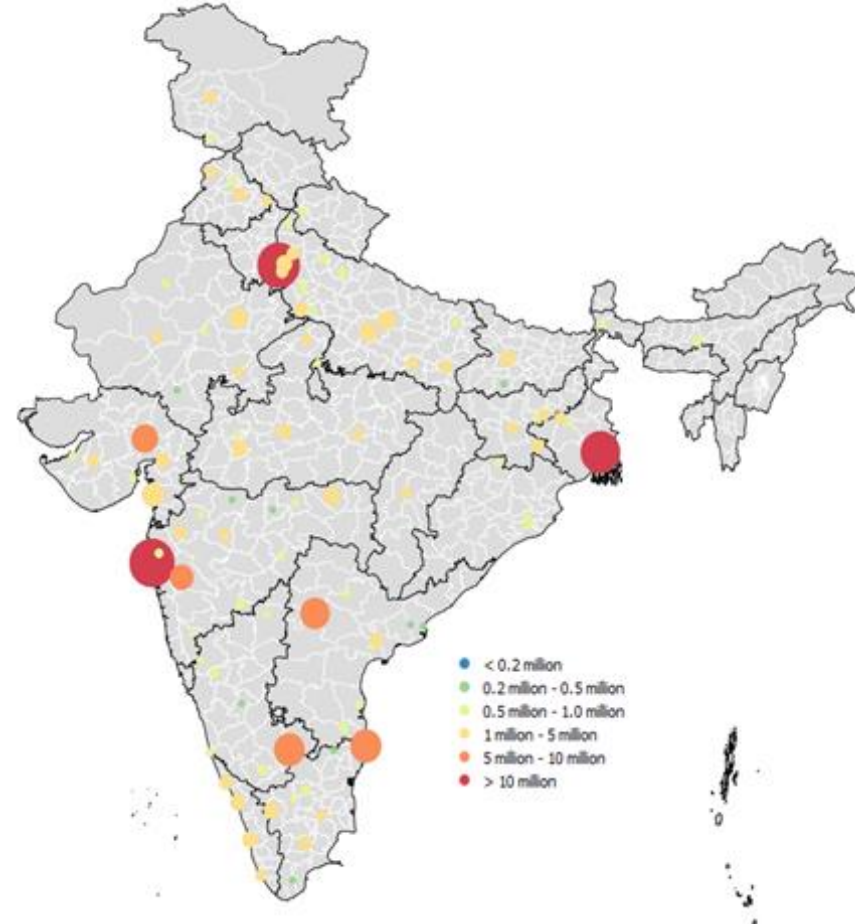


Source: Various Census Volumes. Top 100 Urban Agglomerations in 2001. City bubbles scaled to population size.

**Figure 15: City Population Growth Rate Distributions across Time Periods, 1881-2011**
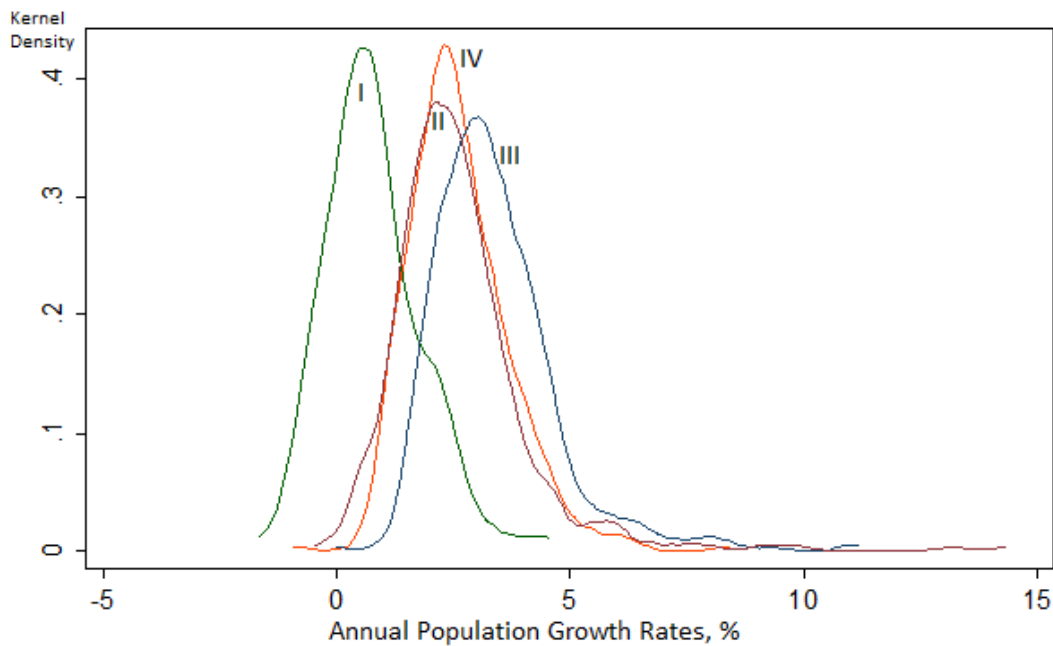


Source: Census 1881-2011. N=350+ agglomerations. Time Period I: 1881-1921, II: 1921-1951, III: 1951-1991, IV: 1991-2011.

**Figure 16: Town & City Level Population Density Distribution across Class Sizes, 2001**
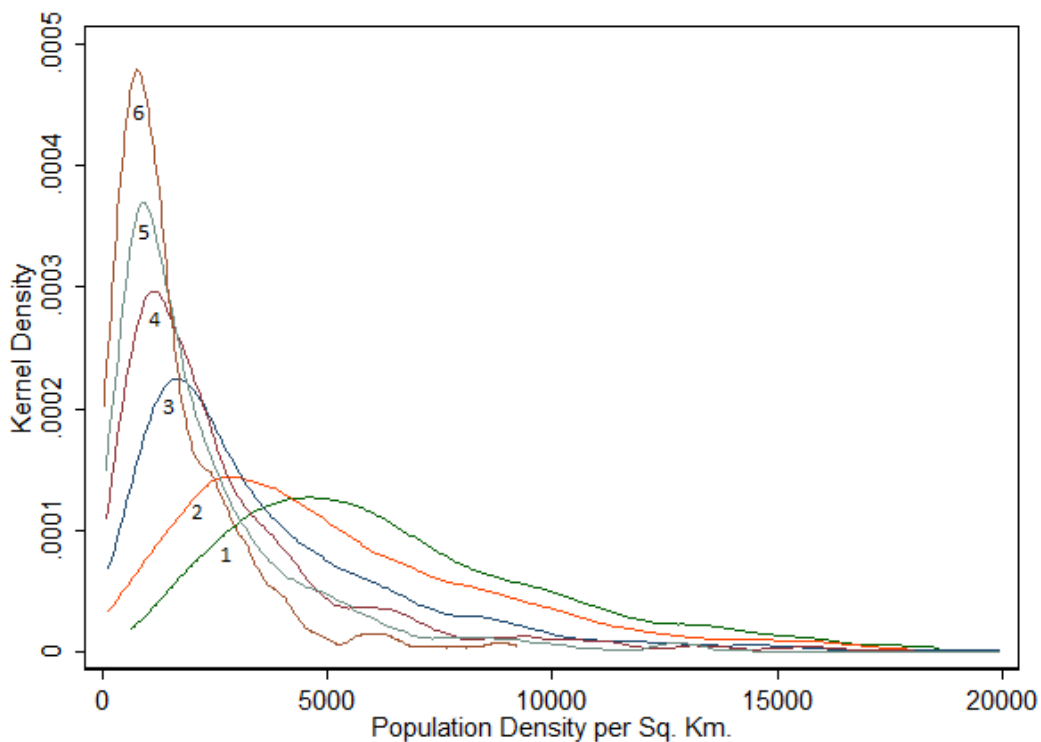


Source: Census 2001. Class Sizes: 1 (Above 100,000 population), 2 (50,000 - 99,999), 3 (20,000-49,999), 4 (10,000-19,999), 5 (5,000- 9,999), 6 (Below 5,000 population). 89 urban units out of 4,307 urban units with population densities exceeding 20,000 have been excluded.

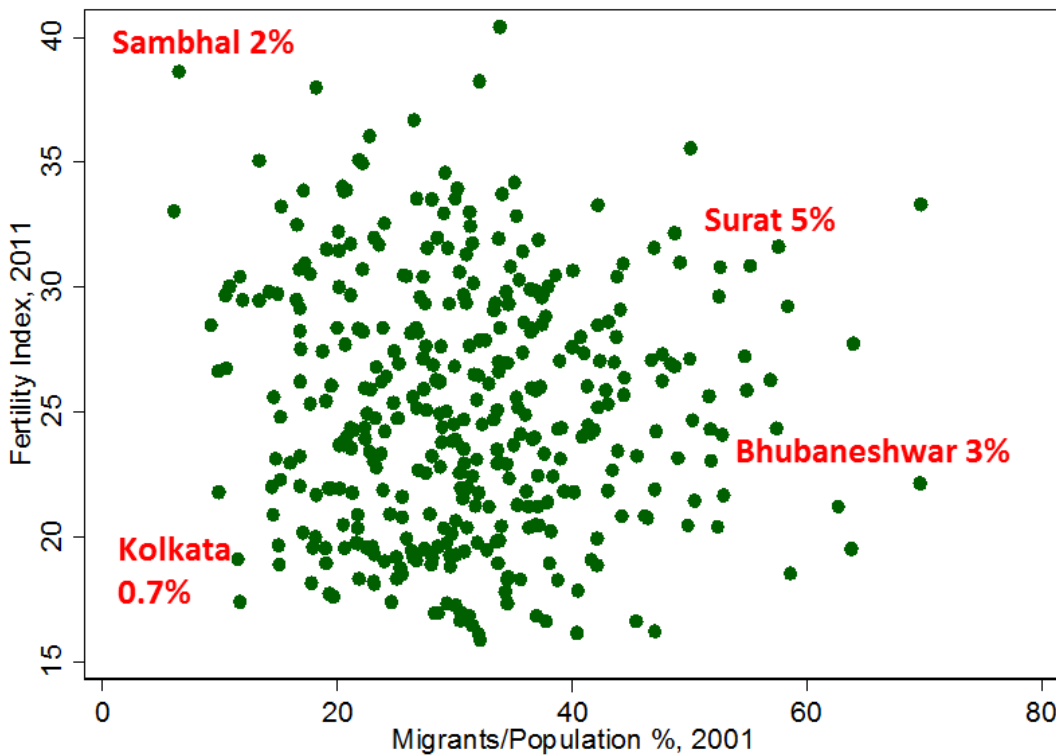**Figure 17: City Growth Typology based on Fertility and Migration**

# City Growth

| | | | |
|---|---|---|---|
| **Fertility** | **High** | Internal Growth | Explosion |
| (Human Capital) | **Low** | Stagnation | External Growth |
| | | **Low** | **High** |

**Migration**

**(Human Capital, Wage Differentials, Gender, Networks)**
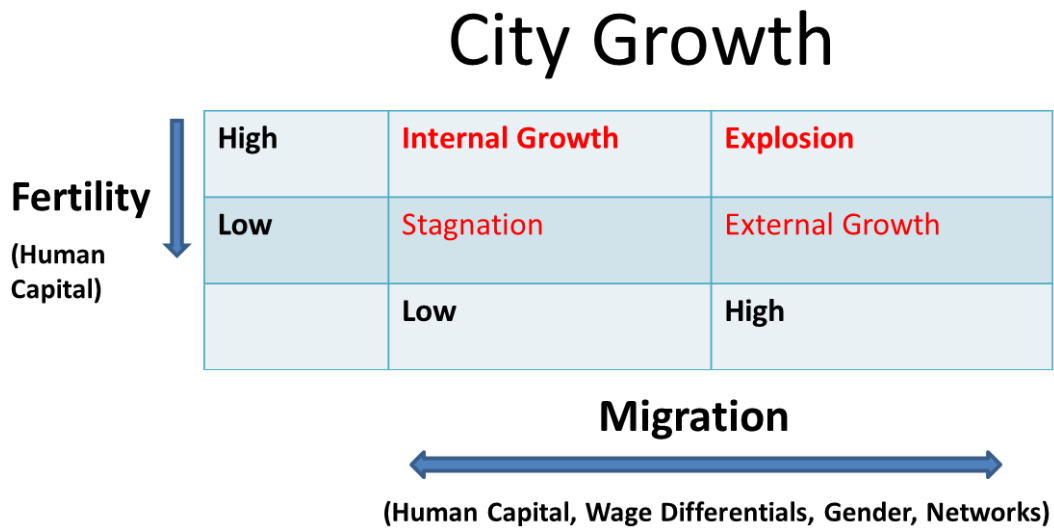
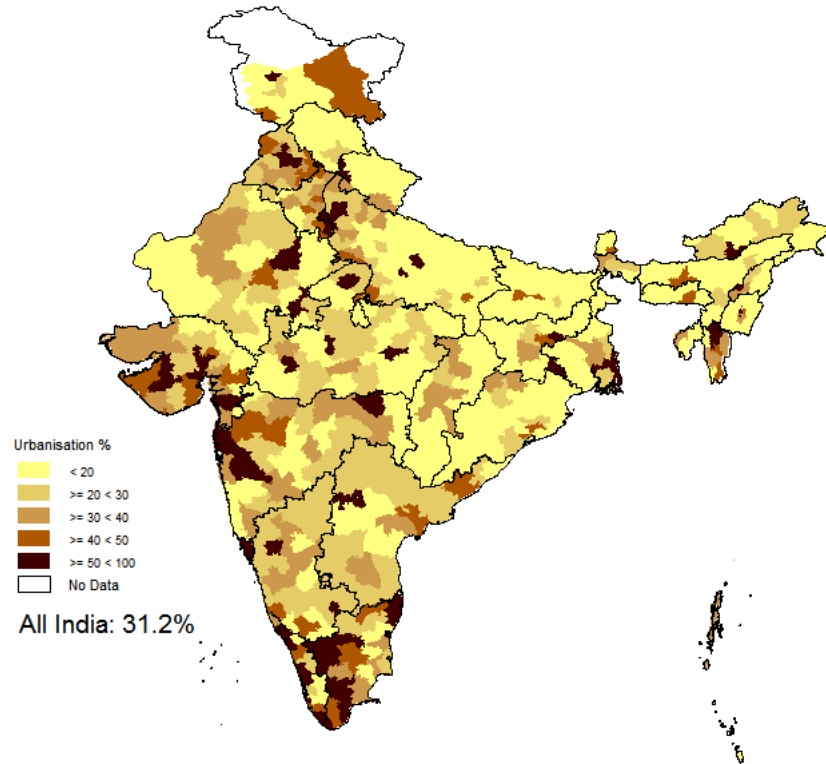**Figure 18: Fertility vs. Migration across Indian Urban Agglomerations**



Source: Census 2011. N= 350+ urban agglomerations. Figures next to marked cities reflect annual growth rate between 2001 and 2011. Fertility Index = % 0-6 Age Children / Women age 7+.

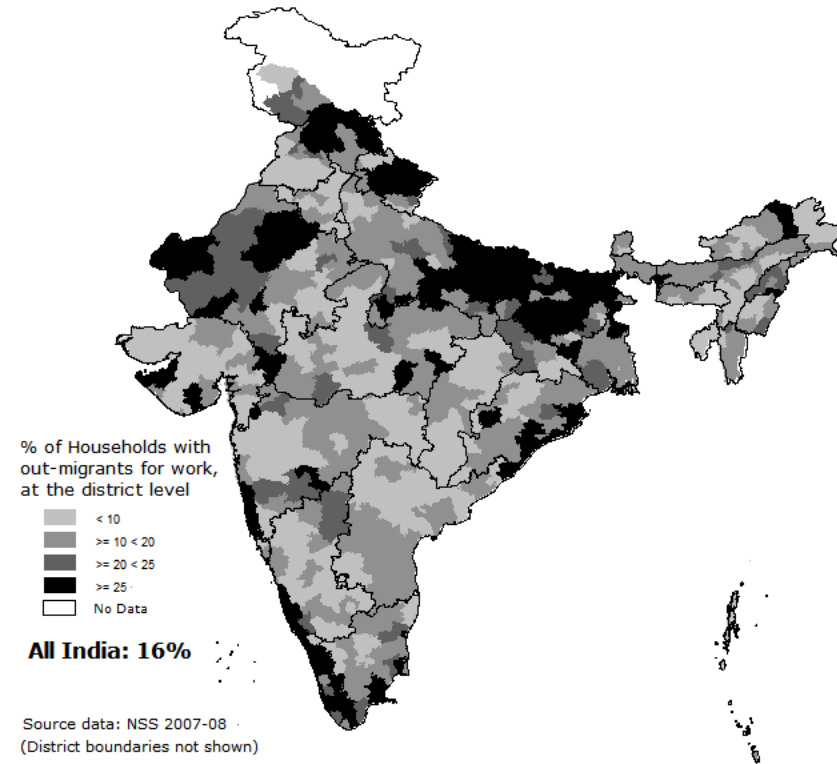**Figure 19: Fertility Index in Urban Agglomerations, 2011**
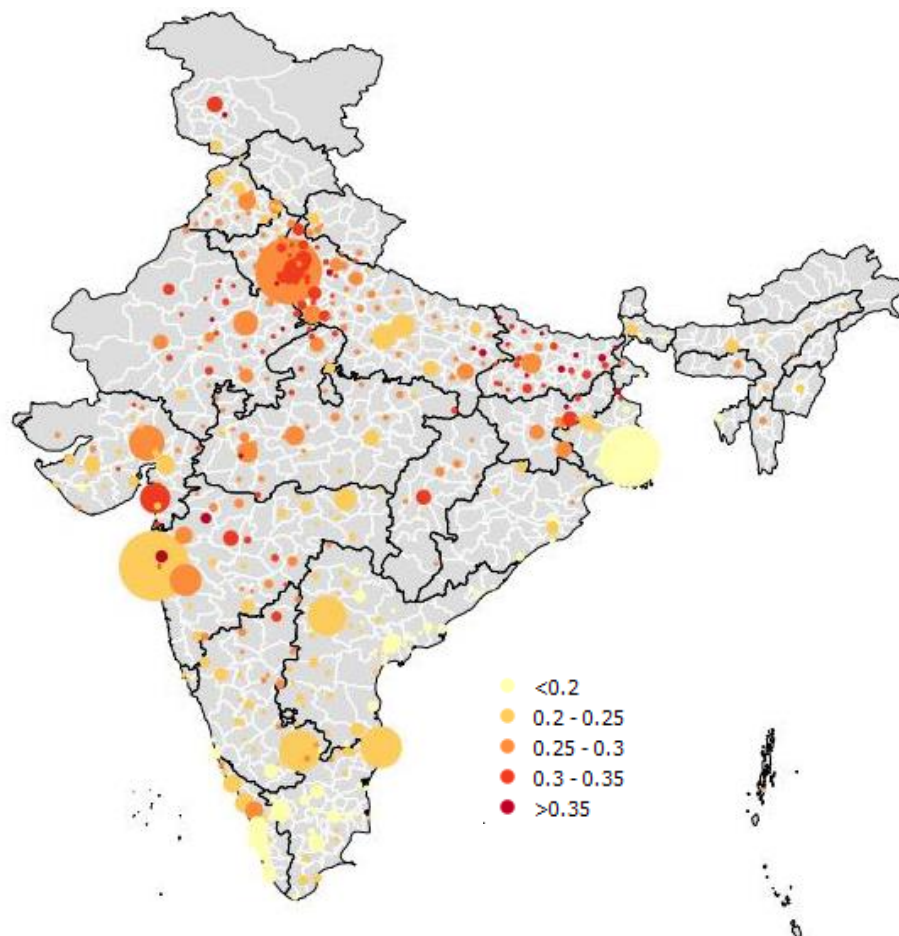
Source: Census 2011. 468 Urban Agglomerations. Map bubbles are scaled by population. Fertility Index = 0-6 Age Children / Women age 7+.

**Figure 20: Urbanization in India, 2011**



Urbanisation %
- < 20
- >= 20 < 30
- >= 30 < 40
- >= 40 < 50
- >= 50 < 100
- No Data

All India: 31.2%

Source: Census 2011

**Figure 21: Out-Migration for Work in India, 2007-08**



% of Households with out-migrants for work, at the district level
- < 10
- >= 10 < 20
- >= 20 < 25
- >= 25
- No Data

All India: 16%

Source data: NSS 2007-08
(District boundaries not shown)

Source: Tumbe (2015), based on NSS 2007-08 data

**Figure 22 (A): Source Region of Migrants in Major Cities, 1992-2001**
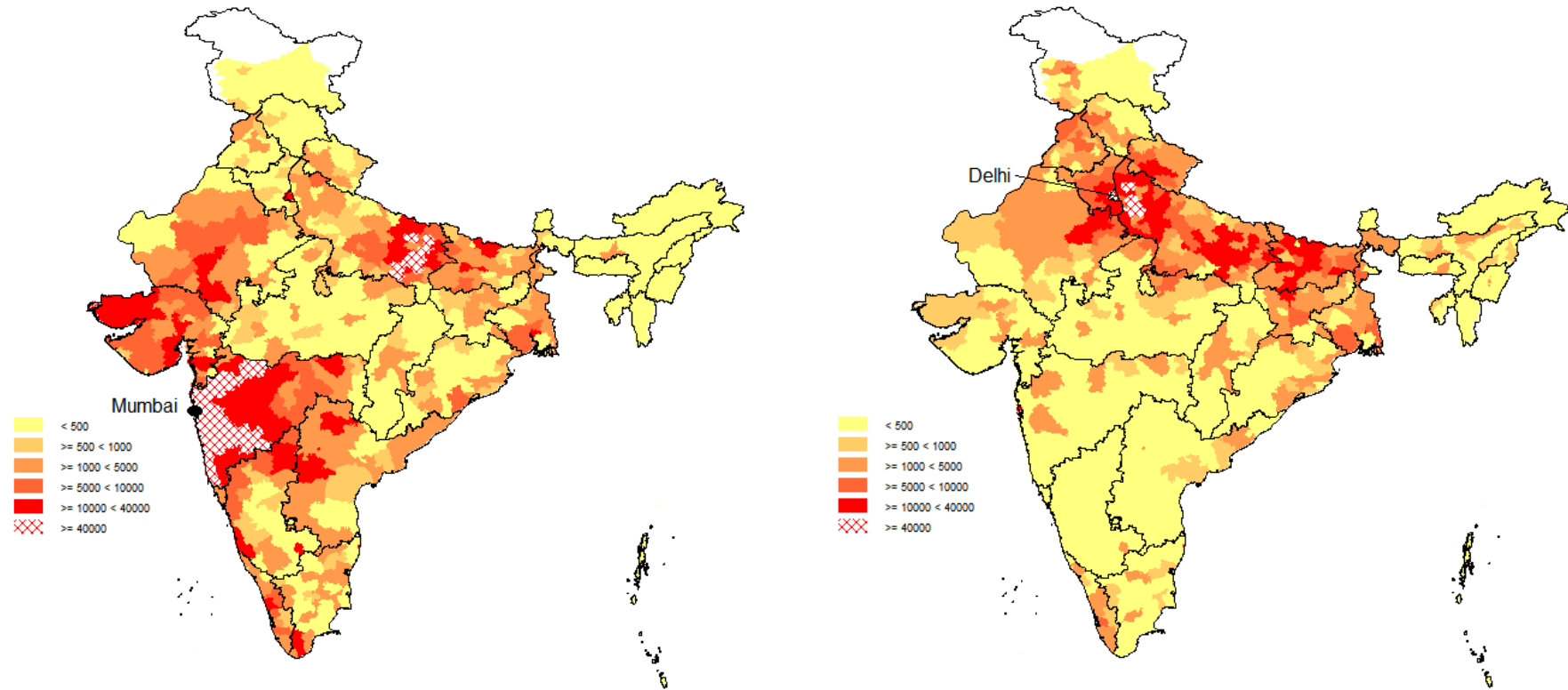


Source: Census 2001, Table D-13. Data refers to internal migrants who migrated between 1992 and 2001 to urban areas of district/s spanning the major city-urban agglomeration.

**Figure 22 (B): Source Region of Migrants in Major Cities, 1992-2001: Kolkata, Chennai, Hyderabad, Bangalore, Pune, Surat**
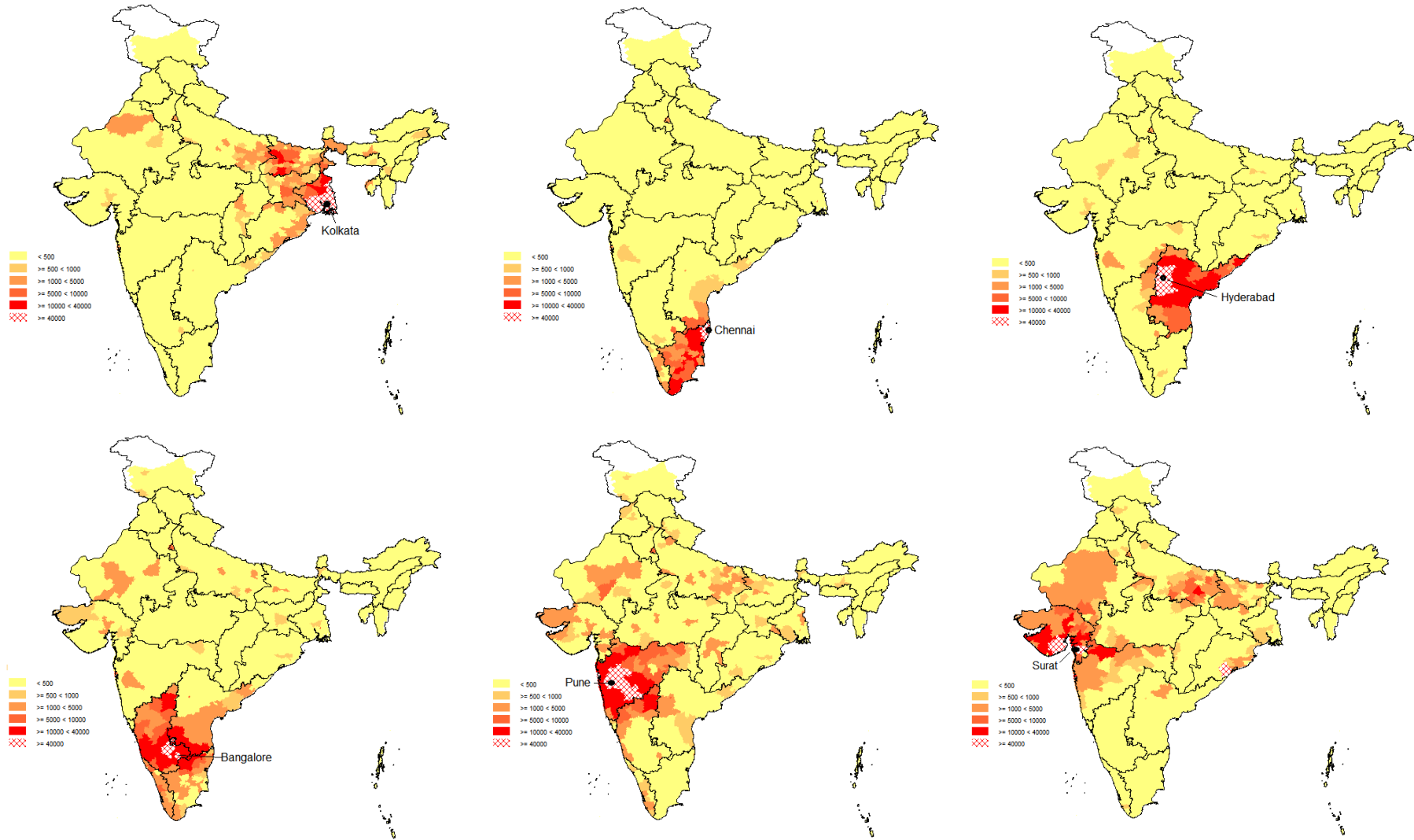


Source: Same as for Figure 22 (A).

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