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Urban Settlement: Data, Measures, and Trends¹

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Abstract

This paper examines data on urbanization. We review the most commonly used data sources and highlight the difficulties inherent in defining and measuring the size of urban versus rural populations. We show that differences in the measurement of urban populations across countries and over time are significant and discuss the methods used for these measurements, as well as for projecting urbanization. We also analyze recent trends and patterns in urbanization. Finally, we describe the principal channels of urbanization and examine their relative contributions to the global urbanization process.

Introduction

According to United Nations (UN) projections, more than half the world's population will live in urban areas by the end of 2008. If current trends hold, the urban share of the global population could reach 60 percent by 2030 (United Nations, 2005b). From an economic perspective, increases in the share of the population living in urban areas are usually considered to be a natural by-product of modernization and industrialization (Bradshaw and Fraser, 1989). When economic activities are clustered in small geographic spaces, firms have access to a larger labor pool and are in closer proximity to customers and suppliers, plus intra-industry specialization is encouraged (Becker, 2007; Ciccone and Hall, 1996). Advances in individual welfare parallel these firm-level economic advantages: on average, urban dwellers have higher incomes (Kamete, Tostensen and Tvedten, 2001; Njoh, 2003), better health (Montgomery et al., 2003), and greater access to education than their rural counterparts.

Despite these positive associations, the increasingly large urban population shares are a major concern in many developing countries. The growth of urban areas has promoted land, water, and air pollution (UN-HABITAT/DFID, 2002), and has resulted in the formation of large and rapidly growing slum populations around many major cities. According to the UN, more than 1 billion people, or about 14 percent of the total global population, lived in areas classified as slums in 2005 (UN-HABITAT, 2007). Characterized by unhealthy living conditions and a lack of the most basic services, in the developing world, slums are among the most graphic representations of social exclusion and extreme poverty.

The objective of this paper is to provide a descriptive statistical analysis of urbanization. In the next section, we review the data sources for urban populations. We analyze the difficulties of defining and measuring the populations of urban versus rural areas and discuss the statistical concepts used in the main database on the urban population share produced and published by the UN. We show that inconsistent definitions of the term urban across time and countries imply significant measurement errors in the data. We therefore compare official urban population numbers with alternative estimations based on spatial (as opposed to administrative) concepts. We find that the average urban population share in the world is similar across datasets, even though country-specific measures show significant variation. In the subsequent section, we provide a descriptive statistical analysis of past trends and patterns in the level of urban population shares and decompose the change in urban population shares into its main components. We show that population growth will naturally promote higher levels of urban population shares in the long run, because increases in the size of a given settlement either lead directly to increases in urban populations or, for smaller settlements, lead to their reclassification

from rural to urban settlements as populations exceed predetermined thresholds. In the absence of population growth, migration becomes the key determinant of changes in the urban population share. Migration toward cities can occur both from within and from outside a given country. Although migration flows in some countries, for example, China, are sizable, our analysis suggests that population growth is probably the principal driver of urban population growth in most countries, as observed over the last few decades. In section 3 we also analyze the UN's current urban population forecasts. We show that even though the basic model underlying current forecasts is simple, it nevertheless performs quite well because of the highly persistent and relatively stable nature of the urbanization process across countries and over time. We conclude with a short summary and a discussion of the implications of our work for future research.

Measurement and Data

The most basic concept underlying the measurement of urban populations is that of the city. According to the 2007 edition of *Merriam-Webster's Dictionary*, a city is “an inhabited place of greater size, population, or importance than a town or village” (Merriam-Webster). For statistical purposes, where more specific definitions are needed, three concepts are generally used to define urban areas and populations. The first is the city proper. The city proper is determined by legal and administrative criteria and typically comprises only those geographical areas that are part of a legally defined and often historically established administrative unit. However, many urban areas have grown far beyond the limits of the city proper, necessitating other measures. An urban agglomeration is the “de facto population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries” (United Nations, 2006, Glossary). Urban agglomerations are thus determined by density: the agglomeration ends where the density of settlement drops below some critical threshold. A still more comprehensive concept is the metropolitan area. This concept includes both urban agglomerations and any “surrounding areas of lower settlement density that are also under the direct influence of the city” (United Nations, 2006, Glossary). Populations in rural settlements can thus be counted as urban, as long as they fall under the direct political or economic influence of a city.

Using these varying definitions, highly different population numbers have been published for most cities. In 2001, London's official city population (city proper) was estimated at 7.5 million inhabitants, its urban area was estimated at 8.3 million, and its metropolitan area population was estimated at between 12 and 14 million (UK Census 2001, Demographia). In 2006, New York's city proper population was estimated at 8.2 million people, its urban

agglomeration population at 18.5 million, and its metropolitan area population at 22 million (US Census Bureau, 2007).

Table 1 ranks the world's 20 largest cities using the city proper and urban agglomeration definitions. Tokyo, the world's largest urban agglomeration, illustrates the important and quantitatively large differences between these definitions. Even though the greater Tokyo area has a population of 35 million people, that of Tokyo's city proper is 8 million. The 8 million city proper number reflects the population within 23 municipalities (wards) in the city center, which have historically been considered the city. Legally, each of these municipalities has independent city status and could therefore be listed as an independent city proper (Demographia). The Chinese city of Chongqing is another case in point. Even though the municipal district of Chongqing has a total population of more than 30 million inhabitants, less than 6 million actually live in Chongqing city proper. Depending on which classification is used, Chongqing is sometimes listed as the world's largest city, and in other cases does not even appear in the top rung of urban population rankings.

Table 1. The World's 20 Most Populous Urban Agglomerations, and 20 Most Populous Cities Proper in 2005

Rank	"Urban Agglomeration"		"City Proper"	
	Name	Population	Name	Population
1	Tokyo	35.2	Shanghai	15.4
2	Mexico City	19.4	Bombay	13.1
3	New York-Newark	18.7	Karachi	12.3
4	São Paulo	18.3	Buenos Aires	11.6
5	Bombay	18.2	Delhi	11.5
6	Delhi	15.0	Manila	10.7
7	Shanghai	14.5	Moscow	10.6
8	Calcutta	14.3	Seoul	10.5
9	Jakarta	13.2	Istanbul	10.3
10	Buenos Aires	12.6	São Paulo	10.1
11	Dhaka	12.4	Lagos	9.2
12	Los Angeles	12.3	Mexico City	8.7
13	Karachi	11.6	Jakarta	8.6
14	Rio de Janeiro	11.5	Kinshasa	8.4
15	Osaka-Kobe	11.3	Tokyo	8.4
16	Cairo	11.1	New York	8.1
17	Lagos	10.9	Lima	8.0
18	Beijing	10.7	Cairo	7.9
19	Manila	10.7	Beijing	7.7
20	Moscow	10.7	London	7.6

Source: United Nations (2006), www.world-gazetteer.com

These classification issues are not the only challenge involved in studying urban populations. Collecting accurate population data on cities is difficult. Censuses, which are the principal source of information, occur once a decade or less frequently, and tend to undercount urban populations because large, mobile populations are often difficult to reach (Cohen, 2004).

Comparing data across countries and time magnifies the problem. Countries can manipulate statistics on the size and number of cities by adopting different definitions (Hardoy, Mitlan and Satterthwaite, 2001; Satterthwaite, 2007). For example, in 1986, to cope with growing administrative demands at the local level, China essentially reclassified counties as cities to allow local city governments to control the surrounding areas. Although the UN has adjusted historical data ex-post whenever possible, a proper reclassification of historical data can be an arduous or even impossible task.

Statistical Population Datasets

The most commonly cited statistical population dataset for city and urban population data is the UN Population Division's *World Urbanization Prospects* (WUP). The Population Division produces a new revision of the WUP every two years. The dataset is based on data from the UN Statistics Division's *Demographic Yearbook*. The yearbooks track country-by-country population data, beginning in 1948, that are compiled using questionnaires dispatched annually to more than 230 national statistical offices. Even though the UN has devised general guidelines, countries use country-specific standards to designate urban and rural areas. As Figure 1 shows, the urban area definition applied by each individual country in the UN sample (United Nations, 2003) varies widely: 38 percent of the countries in the sample use administrative criteria (city proper); 35 percent use population (size) thresholds; 9 percent use economic criteria; and the remaining 18 percent have more complex definitions or no definitions at all.

Figure 1. Urban Area Definitions Used in WUP Samples

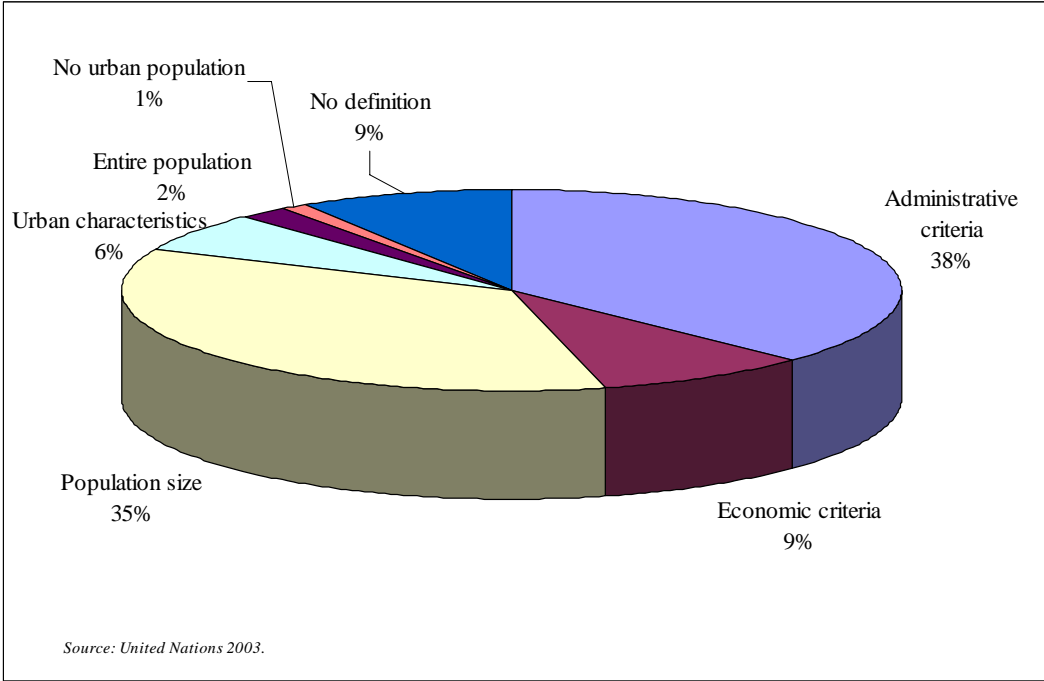


Table 2 displays the definitions used by all countries in the UN sample whose names start with the letters “A” or “Z.” The arbitrarily selected list of countries illustrates the large variety of definitions national statistical offices use. While some countries, like Afghanistan, include only the populations of locations officially classified as cities (the city proper definition), other countries rely on more general definitions that are usually based on population size. The threshold for a settlement to be classified as urban varies widely across countries, ranging from 400 in Albania to 5,000 in Zambia². Some countries, like Zambia, exclude settlements that are primarily agricultural, while others, such as Austria, include rural areas if they are closely connected to nearby cities in line with the definition of a metropolitan area.

² As we show later in this paper, a majority of the urban population lives in small- to intermediate-size urban settlements. In 2005, only 38.5% of the urban population lived in urban agglomerations larger than one million (United Nations, 2006).

Table 2. Examples of National Urban Definitions

Country	Urban Population Selection Criterion
Afghanistan	63 localities.
Albania	Towns and other industrial centres with more than 400 inhabitants.
Algeria	All communes having as center a city, a rural town or an urban agglomeration.
American Samoa	Densely settled territory that meets minimum population density requirements and encompasses a population of at least 2,500.
Andorra	Parishes of Andorra la Vella, Escolades-Engordany, Sant Julia, Encamp and La Massana.
Angola	Localities with a population of 2,000 or more.
Anguilla	Entire population.
Antigua and Barbuda	Saint John's.
Argentina	Population centers with 2,000 inhabitants or more.
Armenia	Cities and urban-type localities officially designated as such.
Aruba	Oranjestad and Sant Nicolas.
Australia	One or more census divisions with urban characteristics and representing a cluster of 1,000 people or more as well as known holiday resorts of less population if they contain 250 dwellings or more of which at least 100 were occupied on census night.
Austria	Based on the concept of a functional and structural urban area (Stadtregion) consisting of an urban core area (Kernzone) and surrounding urban areas (Aussenzone). The surrounding urban areas is defined as an area in which at least 30 percent of working adults commute daily into the corresponding core area.
Azerbaijan	Cities and urban-type localities, officially designated as such, usually according to the criteria of number of inhabitants and predominance of agricultural or non-agricultural workers and their families.
Zambia	Localities of 5,000 inhabitants or more, with a majority of the labor force not in agricultural activities.
Zimbabwe	Not defined.

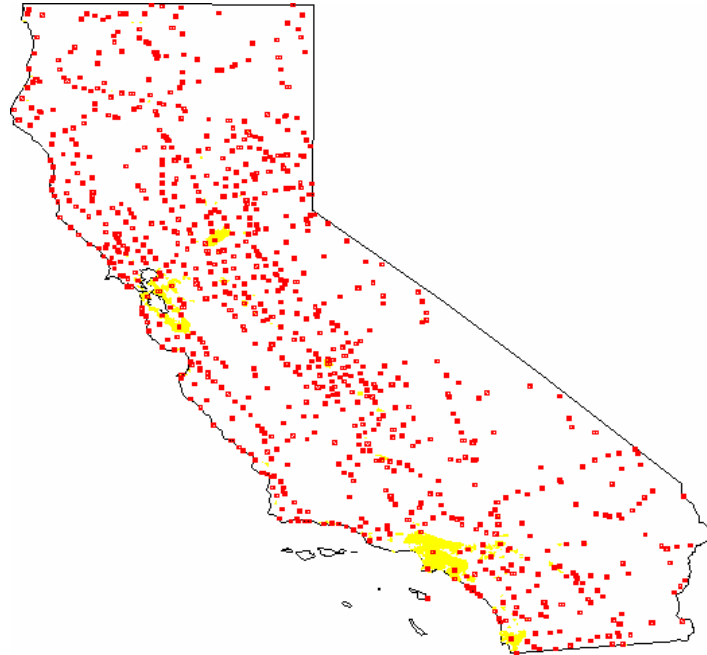
Source: United Nations 2003.

Geo-referenced Datasets

Two main geography-based spatial systems have emerged over the last 20 years in the pursuit of better measures of the global spatial distribution of urban populations. The first such system was the Digital Chart of the World (DCW), created in 1992 by the Environmental Systems Research Institute for the US Defense Mapping Agency. The DCW is based on a set of computerized global maps, which for the most part were created by scanning and digitizing available paper sources. These digitized global maps enabled geo-referenced datasets for cities,

country boundaries, and other characteristics to be made available country by country. In these maps, officially registered settlements appear as points, while polygons represent urbanized or built-up areas that do not necessarily conform to political boundaries. Figure 2 shows a typical DCW map, for the State of California. Points indicate individual settlements and the shaded yellow polygons show larger urban zones.

Figure 2. DCW Map of California



Source: <http://www.maproom.psu.edu/dcw/>.

From the perspective of studying the dynamics of urban population shares, the usefulness of the DCW database is limited. The points database does not provide population information and the polygons tend to be conservative and inconsistent measures of urban areas.

The second source of information on the spatial distribution of urban areas is the Nighttime Lights dataset from the National Oceanic and Atmospheric Administration. This dataset consists of data collected by the Operational Linescan System of the U.S. Air Force's Defense Meteorological Satellite Program. Even though development of this dataset began in the 1970s, it has only been used to develop a global image complete with the spatial distribution of human settlements since 1997. Figure 3 shows typical nighttime lights for North America and for the world as a whole.

Figure 3. Nighttime Lights

North America



The World



Source: Defense Meteorological Satellite Program; National Aeronautic and Space Administration.

The Defense Meteorological Satellite Program has created and released four datasets, including a time-series dataset and map images showing light sources and changes covering 1992–93 and 2000. These datasets have several problems. First, electricity may be correlated with economic development, so more developed areas appear to have higher densities on the nighttime lights map than less developed areas. Second, the nighttime lights images tend to overestimate the actual extent of urban areas because of the relatively long exposure necessary, which is commonly referred to as the blooming effect (Elvidge et al., 1997; Elvidge et al., 2004). Attempts have been made to correct this effect (Imhoff et al., 1997), but the result is a loss of small settlements with modest nighttime lighting. Another technical problem occurs in the northern hemisphere above 40 degrees latitude, where snow affects the extent and brightness of lights. Various attempts are under way to correct for these biases, and the increasing availability of satellite imagery is likely to sharply improve the spatial precision of settlement estimates in coming years (Elvidge et al., 2004). As pointed out by Montgomery and Balk (2007), continued interaction between social and physical scientists will be crucial to ensure the usefulness of resulting data sets in demographic and economic research.

Geo-referenced Global Population Distribution Databases

To move from settlement to population density measures, spatial data need to be matched to population data. Since satellite data are often used in these efforts, population is generally represented in grids, rather than in the irregular administrative units from which they originate. Two main databases combine geo-referenced data with population data: the Gridded Population of the World (GPW) database and the LandScan Global Population database.

As described in further detail in Salvatore et al. (2005) the GPW was established by the National Center for Geographic Information National Center for Geographic Information and Analysis at the University of California, Santa Barbara, with partial support from the Center for International Earth Science Information Network (CIESIN) at Columbia University (SEDAC, 2007). The GPW is based on population data for the smallest administrative units available across countries. The GPW assumes a uniform population distribution within a given geographical unit or grid cell, and has focused on finding the most disaggregated data possible. The first round of GPW (v1) was released in 1995 and was based on 19,000 sub-national geographic units. The latest version of the GPW (v3) was launched in 2005, and contains land area and population density data derived from almost 400,000 administrative units (SEDAC, 2007).

The second widely known geo-referenced global population distribution database, the LandScan Global Population database, was established by the Oak Ridge National Laboratories

in 1998 (Dobson et al., 2000). While the GPW has aimed at getting actual population numbers for the smallest geographical units possible, LandScan has focused on a detailed population distribution modeling within relatively large geographic units. Landscan receives population estimates from the US Census Bureau's International Program Center, and uses geographic information (slope of the territory, land cover, elevation), information on infrastructure (roads and railways) as well as nighttime light data to impute the within-cell distribution of populations (Dobson et al., 2000; Salvatore et al., 2005).

From an urbanization perspective, the most promising database is GRUMP, the Global Rural Urban Mapping Project (Balk et al., 2005). GRUMP is a result of the cooperation of the Center for International Earth Science Network (CIESIN) with the International Food Policy Research Institute (IPFRI), the World Bank and the Centro Internacional de Agricultura Tropical (CIAT), and directly aims at distinguishing rural from urban areas (SEDAC, 2007). The GRUMP database offers three different data sets: the Human Settlements database (CIESIN, 2004b), the Urban Extent Mask database (CIESIN, 2004c), and the Rural-Urban Population Grid database (CIESIN, 2004a). The settlement database contains around 55,000 settlement points with population larger than 1,000 persons, with corresponding geographic coordinates and official population sizes (Salvatore et al., 2005). The Urban Extent database contains the actual spatial extents of urban settlements, which are based on a variety of sources such as the Digital Charts of the World, nighttime lights and tactical pilot charts. The Population Grid database contains the global population distribution with a systematic classification of rural and urban populations. The Population Grid database combines population numbers from the smallest administrative unit available with data on urban extents and urban populations, and uses a relatively simple algorithm to impute local population densities. Although urban population data are currently available for three time periods (1990, 1995, and 2000), all current estimates are constructed based on the 1994/1995 nighttime lights data, which severely limits the usability of GRUMP data in time-series analysis (Balk et al., 2005).

Table 3 below compares the GRUMP estimates to the latest numbers published by the UN (2006) for the ten countries with the largest populations. Although the average level of urban population shares of the two estimates is nearly identical, the country-by-country comparison illustrates the differences in measurement methodologies across countries. The two estimates are

quite similar for some countries, but deviate considerably for others: the UN estimates for Nigeria are 40 percent higher than the GRUMP estimates, and for India are almost 15 percent lower. The correlation between the two data sources is 0.78. The GRUMP data also provide information on the fraction of countries covered by urban regions. As Table 3 shows, the fraction of land covered by urban clusters is on average relatively small (5%), but shows a high degree of variation across countries.

Table 3. Data Comparison: GRUMP vs. UN Data, Year 2000

	Population (Mils)	Urban Population Share (UN)	Urban Population Share (GRUMP)	Land Area Urban (GRUMP)
China	1,260	36.7	34.2	2.8
India	1,020	27.9	32.6	6.4
USA	282	77.4	81.4	8.2
Indonesia	206	42.1	40.7	1.7
Brazil	174	81.7	72.9	2.2
Russia	146	72.9	67.2	1.1
Pakistan	138	33.4	35.3	3.4
Bangladesh	129	25.6	25.2	7.5
Japan	127	78.9	89.1	28.0
Nigeria	118	44.9	32.1	1.6
<i>Weighted Average Top 10</i>		42.6	42.6	5.1

Source: SEDAC 2007, United Nations 2006.

Given their unified framework and the comprehensive use of available datasets, geo-referenced datasets are likely to become the standard in the future. However, for the time being, global grid cell-based data are only available for cross-sectional analysis, and no other spatial data represent urban population beyond those for selected countries. For panel analysis, the WUP data are the best source available; in dynamic analysis, the effect of different measurement standards can be minimized by basic first-differencing or fixed-effects approaches.

Urbanization Dynamics, Trends, and Patterns

Before going into a detailed description of the currently available data on urban population shares it is important to briefly outline a few basic concepts used in the statistics on urbanization. In any period of time t , the urban-rural ratio URR_t is given by

$$URR_t = \frac{PU_t}{PR_t}, \quad (1)$$

where PU and PR denote the urban and rural populations, respectively. Another commonly used measure of the degree of urbanization is the fraction of the population living in urban areas which we denote by $Urban_t$, and which is defined as

$$Urban_t = \frac{PU_t}{PU_r + PR_t}. \quad (2)$$

It is easy to see that the two concepts closely relate to each other since

$$Urban_t = \frac{PU_t}{PU_r + PR_t} = \frac{PU_t / PR_t}{PU_r / PR_t + PR_t / PR_t} = \frac{URR_t}{1 + URR_t}. \quad (3)$$

Using the rural-urban ratio as proxy for the urban population share has some intuitive properties when analyzing the dynamics of urbanization over time. The growth in the rural-urban ratio g_{urr} , between period t and period $t+1$ can be expressed as

$$g_{urr} = \ln\left(\frac{URR_{t+1}}{URR_t}\right) = \ln\left(\frac{PU_{t+1} / PR_{t+1}}{PU_t / PR_t}\right), \quad (4)$$

which simplifies to

$$g_{urr} = \ln\left(\frac{PU_{t+1}}{PU_t}\right) - \ln\left(\frac{PR_{t+1}}{PR_t}\right) = g_{pu} - g_{pr}. \quad (5)$$

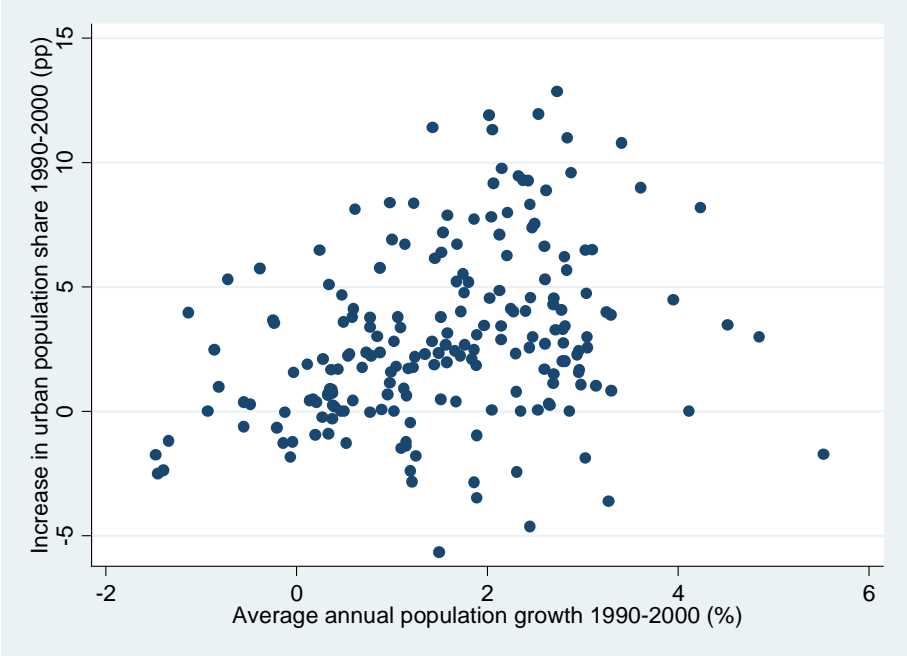
The growth in the urban-rural ratio over time is thus simply the difference in the growth rates of the urban and rural populations, respectively. This is to some extent intuitive; if rural and urban populations grow at the same pace, total population increases without affecting the relative share of people residing in rural and urban areas. In practice, urban populations nearly always grow faster than rural ones due to population growth and migration.

Migration from rural to urban areas is the most intuitive reason for increases in the urban population share, and mechanically increases the relative growth of urban and rural areas. Even though most migration occurs between cities and across rural areas (Mazumdar, 1987), migration is an important contributor to urban population growth, especially in developing countries (Mills and Nijkamp, 1987). On average, it is estimated to contribute between 40 and 50 percent of total urban population growth (Keyfitz, 1980; Preston, 1979).

The effect of population growth is more complex, and growth rates in rural and urban areas may differ substantially. In practice, both fertility rates and premature death rates are typically higher in rural areas, so the difference in natural growth rates between urban and rural areas is generally small. Nevertheless, even if the natural growth rates in rural and urban areas are the same, the growth rate of the urban population g_{pu} will always be larger than the growth rate of the rural population g_{pr} , since any growing rural settlement will eventually be classified as

urban. Figure 4 compares the increase in the fraction of the population living in urban areas to the annual growth rate of total population in the period 1990-2000; while the correlation is positive, it is not very strong.

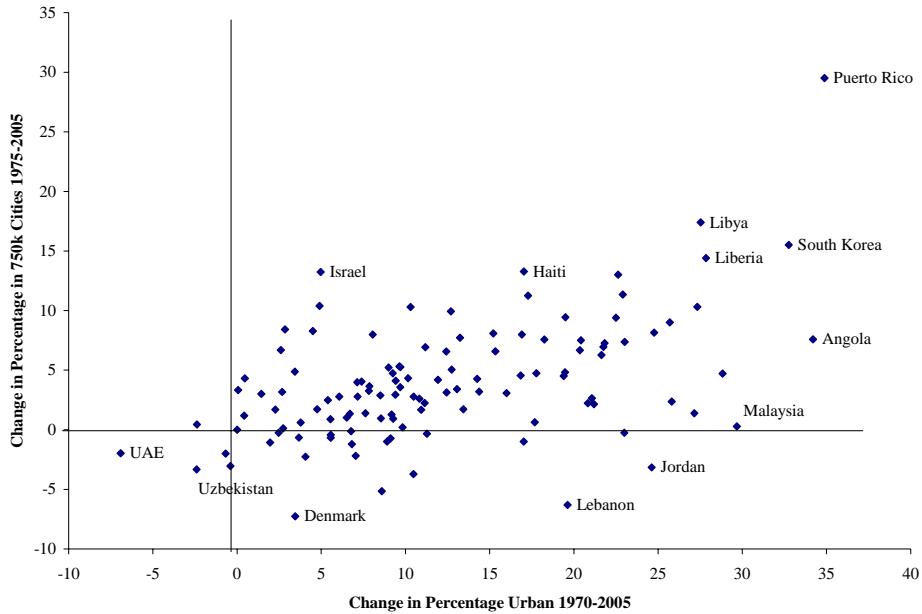
Figure 4. Population Growth and Absolute Increase in Urban Population Share 1990-2000



Source: United Nations 2006.

One way to distinguish the actual growth of cities from the reclassification of rural areas as urban areas is to look at a restricted set of urban settlements, and analyze their growth over time. The WUP dataset provides this statistic for cities with populations larger than 750,000 in 2005. In Figure 5 below, we plot the absolute change in the urban population share relative to the change in the fraction of the population living in cities larger than 750,000 as measured in 2005 over the period 1975–2005.

Figure 5. Change in Percentage Urban and Percentage in Cities > 750,000, 1975-2005.



The increases in the big city population shares are smaller than the increases in the total urban population shares for most countries, and the correlation in the time trends is positive (0.51) but far from perfect. While some countries like Libya and South Korea have seen rapid increases both in the fraction of the population living in big cities and the fraction living in urban areas, others like Malaysia and Jordan have seen increased urban population shares without growth in the population of large cities.

Forecasting

The principal source of current urbanization forecasts is World Urbanization Prospects (United Nations, 2006). The forecasts published by the UN are based on a relatively simple, but rather intuitive model. The model directly builds on the basic relation outlined in equation (5), and essentially predicts future rural-urban growth differentials. The model has two main components: a short-term country-specific trend, and a long-term generic trend. The short-term component corresponds to the most recent growth rates in urban and rural populations. Under the assumption that growth rates do not change significantly in the short run, the urban and rural population growth rates observed between period $t-1$ and period t are used to predict the evolution of urban and rural populations between period t and period $t+1$. The long-term trend is based on a panel regression of relative (urban - rural) growth rates on the initial level of urban population share. The regression yields a negative relationship between the initial urban population share and the urban/rural growth differential. This result is intuitive: as the fraction of

the population residing in rural areas declines, urban growth generated by within-country migration from rural to urban areas asymptotically approaches zero. The long-term growth differential is a function of the initial urban population share level only, and thus assumes a constant urbanization path across countries and time. While the UN's short-term forecasts mostly rely on the growth rates observed over the last few years in a given country, the long-term forecasts for all countries build exclusively on the empirical relation between urban population shares and their historically observed growth rates.

The main advantage of the UN model is its simplicity and transparency. It requires no detailed data and can be applied to a large number of countries. However, the UN projections have been shown to be unrealistic for countries near the beginning or end of their urban transition (Bocquier, 2005; Montgomery and Balk, 2007). The model implicitly assumes that all countries will follow the historical path of now-developed countries and does not take into consideration differences across countries. More important, the model does not have any theoretical foundations; all forecasts are pure extrapolations of past trends and thus do not distinguish urbanization generated by migration from fertility/mortality-driven changes in the composition of the underlying population.

As the basic methodology for UN projections has not changed for the past 20 years, the expected accuracy of the projections can be evaluated by examining the average error of past forecasts (Keyfitz, 1981). Comparing the mean percentage errors across 169 countries and territories whose boundaries have not changed substantially over the past 20 years, Cohen (2004) finds that urban population forecasts made in 1980 for the year were on average 14 percent (20.6 percentage points) too high, forecasts made 10 years ago were 17 percent (19.9 percentage points) too high, while forecasts made 5 years ago were on average correct. Projections have been most reliable for OECD countries and least reliable for countries in sub-Saharan Africa and for other low-income countries.

As shown in Bloom, Canning, Fink, and Finlay (2007), the accuracy of cross-country forecasting models depends both on the accuracy of a given model across countries and the stability of the estimated parameters over time. As Table 4 below shows, the basic fit of an autoregressive model is quite good. Regressing the percentage of a population urban on its own lagged value explains about 97 percent of the total variation in the urban population share, which implies that the basic AR(1) process is similar across countries. Clearly, the simple regression model could easily be expanded to a multivariate model to better fit the historical data. In column 2, we add country-specific fixed effects to the regression, and find these effects highly significant. The F-test of zero coefficients on the country fixed effects has a p-value of 0.000. In columns 3 and 4, we add initial fertility rates and income per capita levels to the model.

Although income per capita seems to have little direct effect, high fertility rates seem to slow down the urbanization process on average.

Table 4. Statistical Description of the Urbanization Process

	Dependent Variable: Urban Population Share (% of Total)			
	(1)	(2)	(3)	(4)
Urban Pop. Share t-10	0.978*** (0.007)	0.838*** (0.021)	0.795*** (0.026)	0.799*** (0.026)
Fertility t-10			-0.570*** (0.206)	-0.580*** (0.207)
Income per capita t-10				-0.000 (0.000)
Constant	5.647*** (0.404)	11.749*** (0.913)	16.346*** (1.893)	16.419*** (1.899)
R-squared	0.96	0.96	0.96	0.96
Country Fixed Effects	NO	YES	YES	YES
F-test (FE = 0): p-value		0.00	0.00	0.00

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Based on an unbalanced 10 year panel with 546 observations across 160 countries. Sample period is 1950 to 2000.
Urban population shares are from the World Urbanization Prospects 2005 (United Nations, 2006). Income per capita is from the Penn World Tables 6.2 (Heston, Summers and Aten, 2006), and fertility corresponds to the total fertility rate from the WDI (World Bank, 2006).

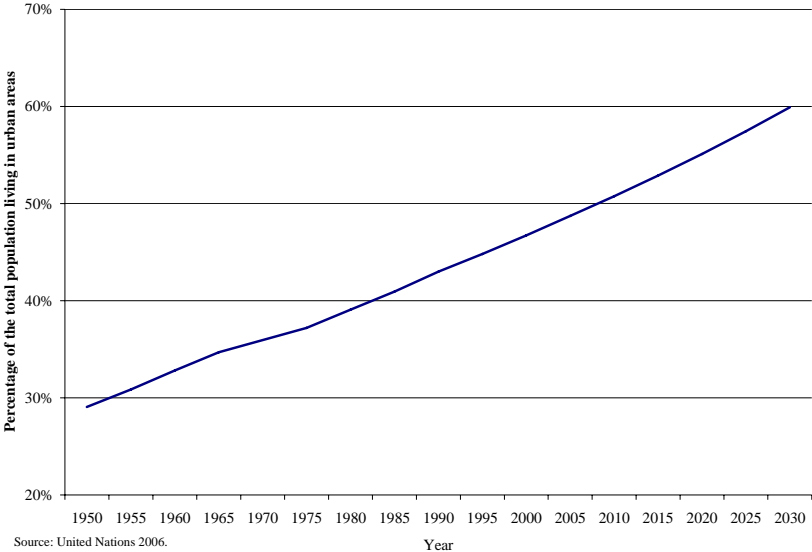
The results presented in Table 4 illustrate two main points: on the one hand, it seems clear that the basic fit generated by the AR(1) model used by the UN could be improved upon; on the other, the simple model does surprisingly well in explaining the variation across time and countries. From a theoretical perspective, a deeper structural model of the processes underlying the urbanization process across countries appears both desirable and feasible. In practice, proper identification of the global urbanization process appears difficult with the data currently available. More detailed data and further research will be needed to determine how much the simple projection model currently used can be improved upon.

The WUP Data: Trends Patterns and Forecasts

The principal and most commonly cited statistic on urbanization is the fraction of the global population living in urban areas. As summarized in Figure 6 (which is based on the latest release of the UN's *World Urbanization Prospects*), the fraction of the population living in urban areas has been growing rapidly. While only 29 percent of the global population resided in areas

classified as urban in 1950, the fraction of the urban population is currently close to 50 percent, and expected to pass the majority threshold very soon (United Nations, 2006).

Figure 6. Urban Population Share, 1950-2030



Most of the growth in urban areas currently occurs in Asia. As Figures 7 and 8 show, the number of people living in urban areas in developed regions, which already have high levels of urban population shares, will rise only slightly in the next 25 years, while the developing and least-developed countries³ will experience a sharp increase the number of urban dwellers if current trends continue. This is consistent with the empirical evidence on urban growth, which shows that urban concentrations tend to grow most quickly in the early stages of economic development (Alonso, 1980; Davis and Henderson, 2003; El-Shaks, 1972; Junius, 1999; Wheaton and Shishido, 1981; Williamson, 1965).

³ The least-developed countries, as defined by the United Nations General Assembly in 2003, currently include 48 countries, of which 33 are in Africa, 9 in Asia, 1 in Latin America and the Caribbean, and 5 in Oceania.

Figure 7. Regional Shares of Global Urban Population

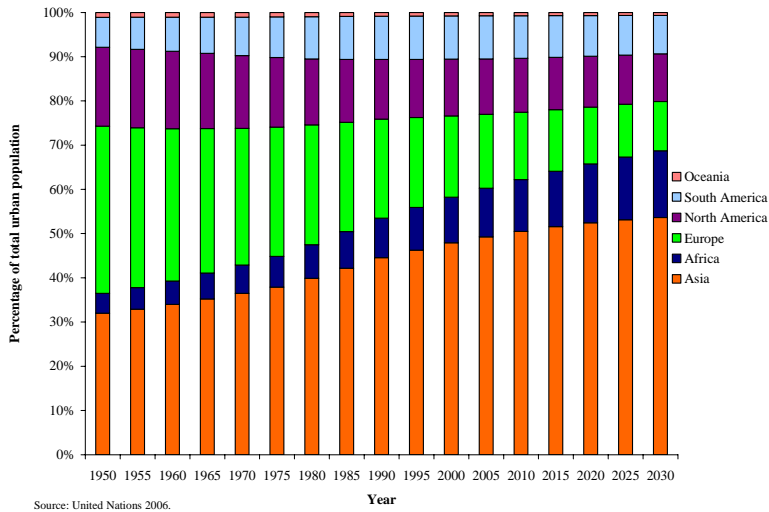
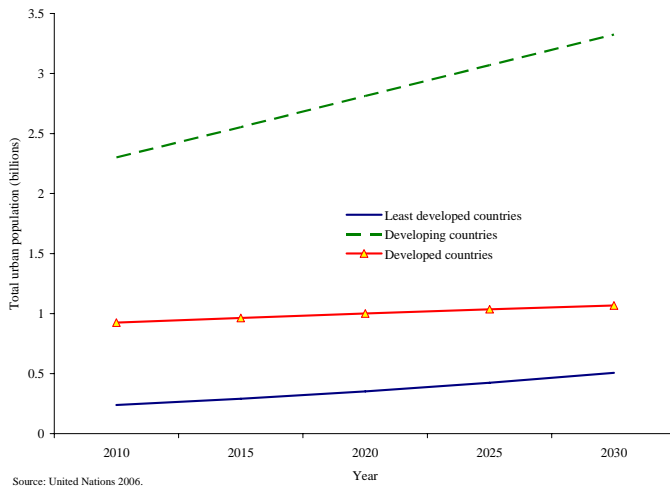


Figure 8. Urban Population in Developing and Developed Countries



Not surprisingly, countries with the fastest-growing urban populations are located predominantly in Africa and Asia (see Figure 9 and Table 5). As Figure 9 shows, the growth rate of urban populations has tended to decline during the past 50 years, and is expected to further slow in the decades to come.

Figure 9. Regional Urbanization Rates

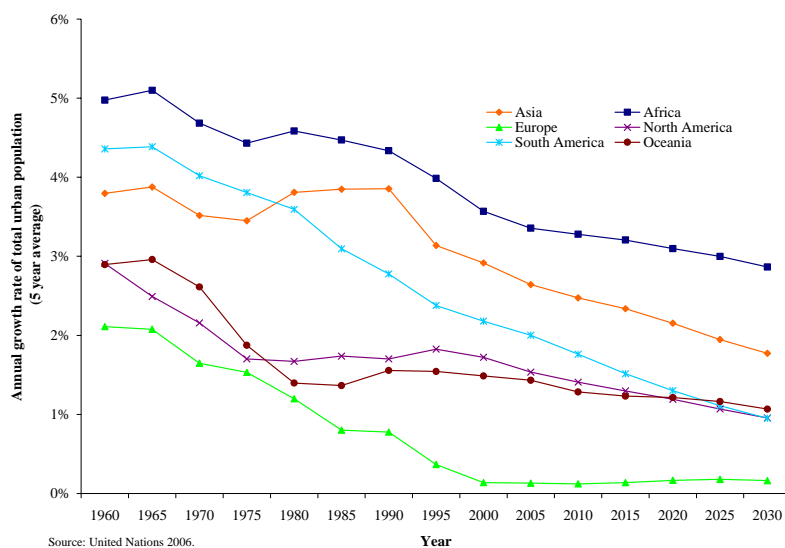


Table 5. Increases in Urban Population Share 1980-2005: Top 10 Countries

	Urban population share 1980	Urban population share 2005	Absolute change in urban population share 1980-2005
Botswana	16.5	57.39	40.9
Cape Verde	23.5	57.34	33.8
Angola	24.3	53.32	29.0
Gabon	54.7	83.60	28.9
Oman	44.3	71.49	27.2
Indonesia	22.1	48.14	26.0
Gambia	28.4	53.90	25.5
Malaysia	42.0	67.33	25.3
Philippines	37.5	62.71	25.2
Korea, Rep.	56.7	80.79	24.1
Turkey	43.8	67.28	23.5
Liberia	35.2	58.10	22.9
Cameroon	31.9	54.62	22.7
Jordan	59.9	82.27	22.3
Mozambique	13.1	34.50	21.4

Source: United Nations 2006.

Urban growth in these countries is often spearheaded by the growth of their largest city. For example, Gaborone, the largest city in Botswana, has grown from a population of 18,000 in 1971 to more than 186,000 people today. Even though the number of large cities has increased significantly over the past 30 years (Figure 10) just under 5 percent of the world’s population

currently resides in cities with more than 10 million inhabitants, which are generally classified as “mega-cities” (Figure 11 and Table 6). Of growing importance is the category that encompasses the very largest cities, also referred to as “meta-cities,” agglomerations with over 20 million inhabitants. The Tokyo metropolitan area already has over 35 million inhabitants, and it is likely to be joined in the meta-city category by Mumbai, São Paulo, and Mexico City by 2015 (Table 6).

Figure 10. Number of Cities by Size of Urban Agglomeration

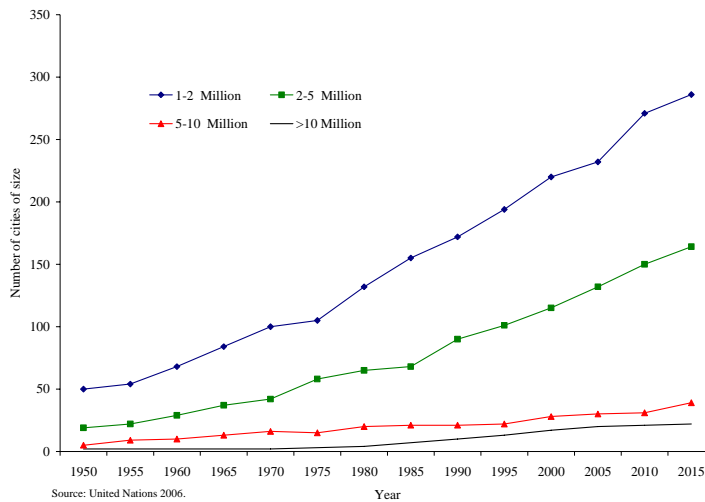


Figure 11. Distribution of Urban Population by Size of Urban Agglomeration

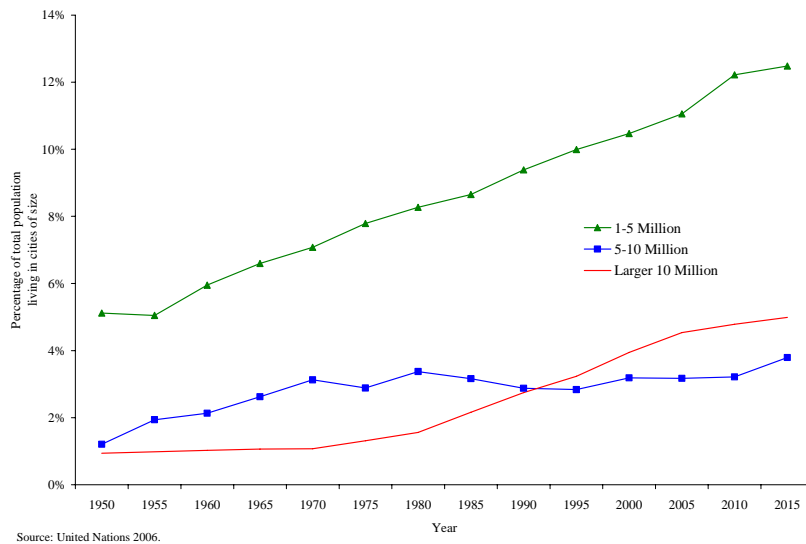


Table 6. City Size Forecasts

	Population			Classification 1970		Classification 2015	
	1970	2005	2015	Mega-city (10-20 Mil)	Meta-City (>20 Mil)	Mega-city (10-20 Mil)	Meta-City (>20 Mil)
	Tokyo	23.3	35.2	35.5		x	
Mexico City	8.8	19.4	21.6				x
New York	16.2	18.7	19.9	x		x	
São Paulo	7.6	18.3	20.5				x
Bombay	5.8	18.2	21.9				x
Delhi	3.5	15.0	18.6			x	
Shanghai	7.1	14.5	17.2			x	
Cairo	5.6	14.3	13.1			x	
Jakarta	3.9	13.2	16.8			x	
Buenos Aires	8.1	12.6	13.4			x	
Dhaka	1.5	12.4	16.8			x	
Los Angeles	8.4	12.3	13.1			x	
Karachi	3.1	11.6	15.2			x	
Rio de Janeiro	6.6	11.5	12.8			x	
Osaka-Kobe	9.4	11.3	11.3			x	
Calcutta	6.9	11.1	17.0			x	
Lagos	1.4	10.9	16.1			x	
Beijing	5.6	10.7	12.9			x	
Manila	3.5	10.7	12.9			x	
Moscow	7.1	10.7	11.0			x	

Source: United Nations 2006.

The challenges associated with ever-larger cities often reach their peak in mega-cities, particularly if their growth rate is high⁴. As Figure 11 shows, by 2015, 5 percent of the global population is expected to live in cities with more than 10 million inhabitants, and more than 21 percent of the global population is expected to live in cities with more than 1 million inhabitants. Providing jobs, housing, sanitation, transport facilities, education, and health care to burgeoning urban populations poses a major challenge to governments in developing countries, often exceeding the capacity of local governments. The political and economic status accorded to mega-cities is often disproportionate to their actual share of the population, which creates problems for governance and finance that may demand the formulation of new policies for managing the relationship between city and national government (Ahmad, 2007).

Welfare Implications

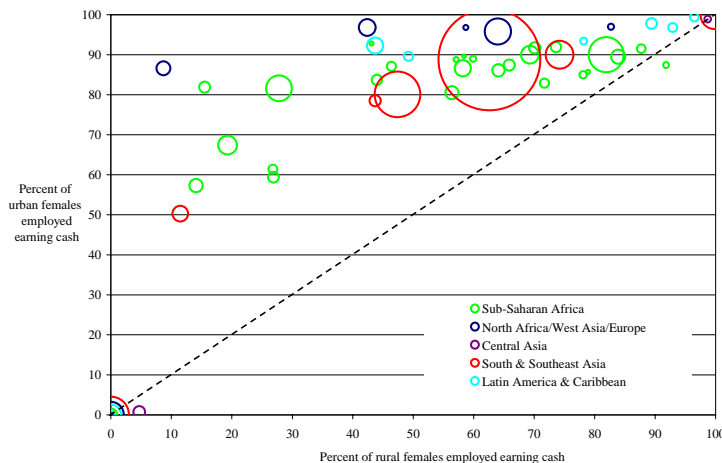
One of the most widely discussed characteristics of urbanization is the positive correlation between urban residence and average personal income (Montgomery et al., 2003). In China, for example, average income in urban households is almost three times greater than it is in rural households (UN-HABITAT, 2007). It follows that official poverty rates are generally

⁴ Over the last 25 years, growth in urban agglomerations with populations above 4 million has been slightly slower than growth in smaller urban agglomerations (Montgomery and Balk, 2007).

lower in urban areas; in Africa, the rural poverty rate is 59 percent, compared with 43 percent in cities (United Nations, 2005a). These income differentials between rural areas and cities arise for several reasons. First, governments often concentrate their investment in urban areas, which leads to stronger infrastructure and public services; this public investment facilitates economic development and raises the demand for labor in cities. Second, women are more likely to work in urban settings, supplementing family income. Third, foreign investment is also more likely to be directed to urban areas. Figures 12 to 20 provide some key statistics for rural and urban populations in developing countries based on 52 Demographic and Health Surveys (DHS)⁵ collected in the period 1998 to 2007. A full list of the countries used in the surveys is provided in the Appendix.

Figure 12 compares female employment in rural and urban areas; the fraction of females earning cash is on average significantly higher in the latter.

Figure 12. Females with Cash Employment in Rural and Urban Areas



Note: Each circle represents one country. The area of the circle reflects the population size of the country.

Several other factors associated with urban areas imply potential positive welfare effects. In developing countries, educational enrollment is generally higher in cities than in rural areas (Figures 13 and 14), with even urban slums outperforming rural regions (UN-HABITAT, 2007; Zhang, 2002). Similarly, female literacy rates are significantly higher in urban populations than in rural populations (Figure 15). And although cities used to be healthier than villages – with the historical London smog as a good example of the health problems created by urban industry

⁵ All statistics are available online at: <http://www.statcompiler.com/statcompiler/index.cfm>

– the reverse is generally true today (Woods, 2003).⁶ Greater access to health services, skilled health personnel, better nutrition, improved sanitation, access to clean water, and higher incomes and education levels mean that people living in cities are generally healthier than those in rural areas (Montgomery et al., 2003). This positive differential is apparent both in child height (Figure 16) and infant and child mortality rates, as summarized in Figures 17 and 18.

Figure 13. Female Education in Rural and Urban Areas

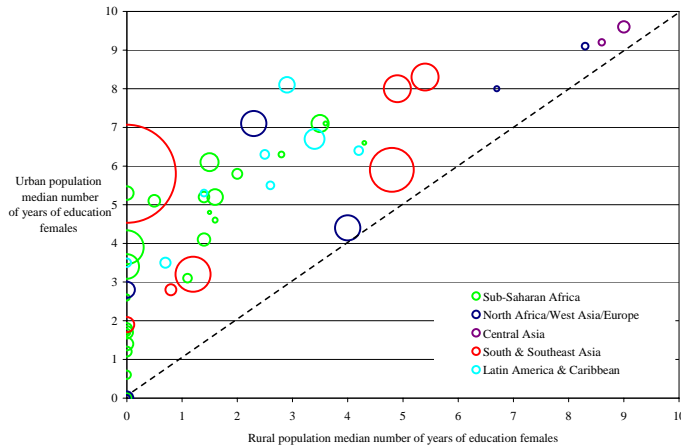
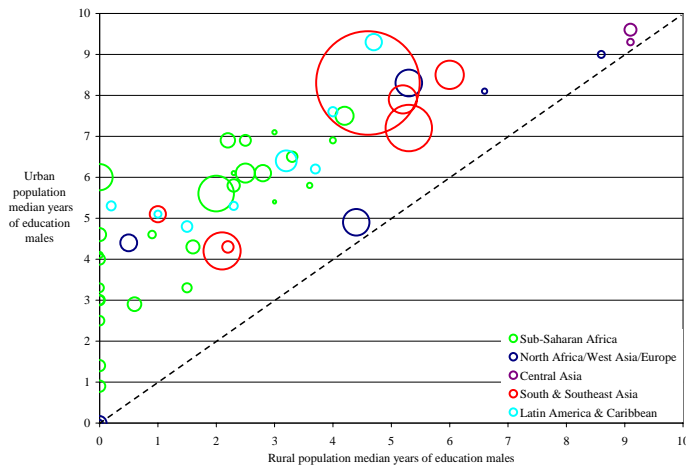


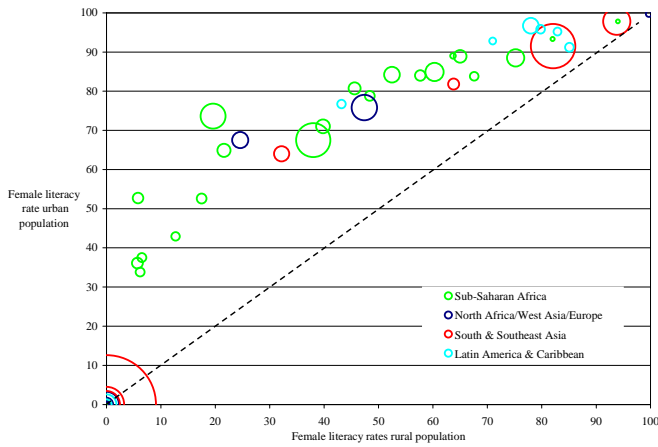
Figure 14. Male Education in Rural and Urban Areas



Note: Each circle represents one country. The area of the circle reflects the population size of the country.

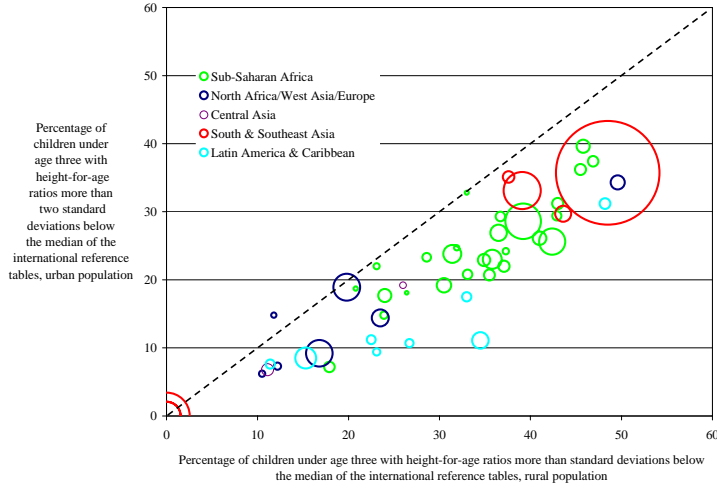
⁶ As Friedrich Engels wrote in *The Condition of the Working Class in England in 1845*, “Dirty habits do no great harm in the countryside where the population is scattered. On the other hand, the dangerous situation which develops when such habits are practiced among the crowded population of big cities must arouse feelings of apprehension and disgust.” On this same issue, see also Richard Easterlin, (1999). “How beneficent is the market? A look at the modern history of mortality.” *European Review of Economic History* 3(3): 257-294.

Figure 15. Female Literacy in Rural and Urban Areas



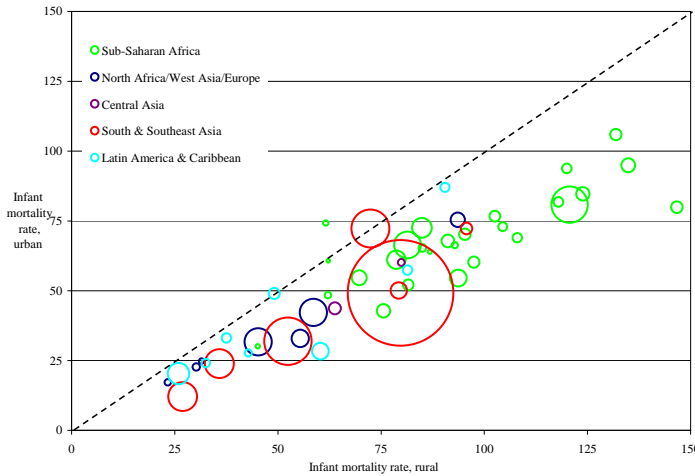
Note: Each circle represents one country. The area of the circle reflects the population size of the country.

Figure 16. Child Height in Rural and Urban Areas



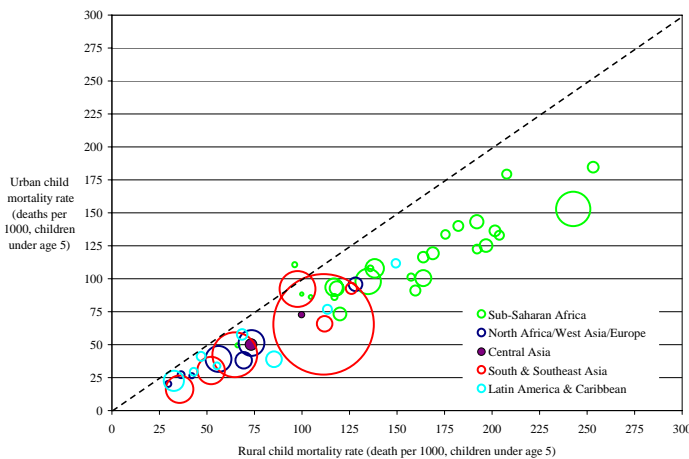
Note: Each circle represents one country. The area of the circle reflects the population size of the country.

Figure 17. Infant Mortality in Rural and Urban Areas



Note: Each circle represents one country. The area of the circle reflects the population size of the country.

Figure 18. Child Mortality in Rural and Urban Areas



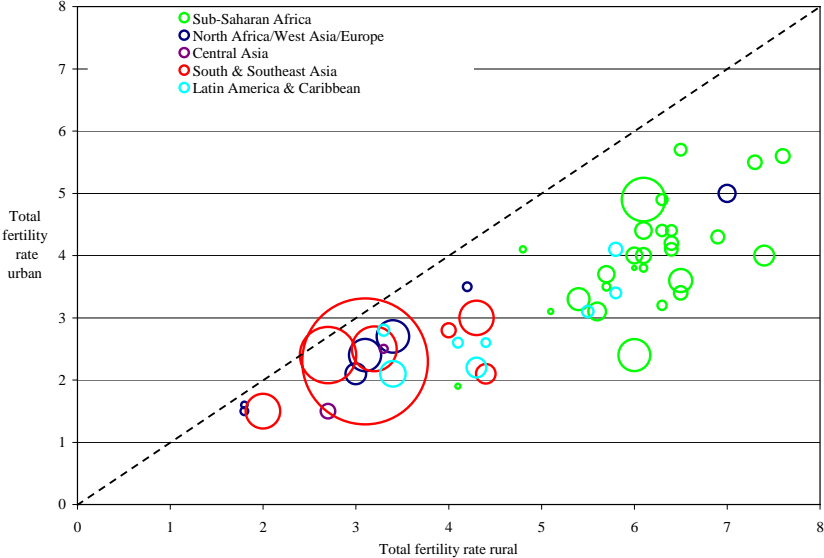
Note: Each circle represents one country. The area of the circle reflects the population size of the country.

It must be noted that these positive effects are unlikely to be experienced by the urban poor, who reside mostly in slum areas. The lack of clean water, sanitation facilities, garbage collection, and drainage in typical slums are serious health hazards. With more than 1 billion people living in slums, these problems are major global humanitarian concerns.

Another aspect of the long-term economic implications of urbanization is the interaction between urbanization and fertility rates. Two key mechanisms are at work in determining the

relationship between fertility and urbanization (see Figure 19). At first, the high fertility rates of rural immigrants to cities increase the urban population, sometimes rapidly. But in the slightly longer run, urban environments generally induce lower fertility. In cities, caring for children is more costly as parents generally work outside the home, urban housing is more expensive, and children have less value in household production. In addition, family planning and reproductive health services are more accessible in cities.

Figure 19. Total Fertility Rate in Rural and Urban Areas



Note: Each circle represents one country. The area of the circle reflects the population size of the country.

Clearly, economic conditions and fertility rates are not the only factors underlying the continued growth of cities. Migration to cities can be seen as evidence of broader social change. Young people may move to cities not only in pursuit of higher incomes, but also in search of modernity and change. City life offers entertainment, such as cinema, the arts, nightlife, and sports, which are not generally found in rural places. Another, and less positive, aspect of city migration may be the absence of job prospects or political stability in the countryside. Without employment opportunities, and with limited family resources, young rural workers may be pushed toward the city even when job prospects in the cities are grim. In the presence of rapidly growing populations and limited land resources, moving to urban areas may be the only option young workers have, independent of how much city life has to offer.

Discussion and Conclusion

The best available data suggest that the increases in urban population share will continue, even though their pace is likely to slow as the relative size of rural populations and thus also the potential inflows to cities decline. Beyond this basic understanding, it is difficult to specifically characterize urban population shares. As our review shows, each of the several measures of urban shares currently in use has specific strengths and weaknesses. Our review also shows the inconsistencies across time and countries in the datasets most commonly used. Given the rapid progress in global mapping technologies, more detailed and consistent datasets are currently under construction, and these will open the door for further studies of the urbanization process.

The evidence presented in this paper makes clear that the differing sources and mechanisms that underlie the increases in the level of urban population shares have policy implications that further research could clarify. If increases in urban population shares mostly represent the gradual growth of rural areas into urban settlements as population increases, the welfare implications are likely to be limited. This will not be the case if increases in the urban population share reflect a fundamental structural shift from agricultural to industrial societies. If migration to the cities is essentially demand driven, the flow of human capital toward high-skill jobs in the industrialized cities is likely to result in higher individual income and welfare. However, this will not take place if urban populations grow rapidly in a policy and planning vacuum. For example, urban populations that grow faster than employment opportunities are likely to lead to the formation of neighborhoods characterized by extreme poverty and high levels of crime.

Given the multiple channels and outcomes of changes in urban population shares, a complete evaluation of the urbanization process is rather difficult. From a research perspective, more detailed and structured data are needed; on this, much can be expected from the newly emerging datasets. From a policy perspective, general prescriptions with respect to urbanization hardly seem feasible. As much as urbanization can be a natural byproduct of a country's economic development path, it can become a major economic and social problem if effective institutional and policy frameworks are not in place.

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Appendix 1: DHS Data Survey List
(Country and year of survey)

Sub-Saharan Africa

Benin 2001
Burkina Faso 2003
Cameroon 2004
Chad 2004
Congo (Brazzaville) 2005
Cote d'Ivoire 1998/99
Eritrea 2002
Ethiopia 2005
Gabon 2000
Ghana 2003
Guinea 2005
Kenya 2003
Lesotho 2004
Madagascar 2003/2004
Malawi 2004
Mali 2001
Mauritania 2000/01
Mozambique 2003
Namibia 2000
Niger 1998
Nigeria 2003
Rwanda 2005
Senegal 2005
Tanzania 2004
Togo 1998
Uganda 2000/01
Zambia 2001/02
Zimbabwe 1999

North Africa/West Asia/Europe

Armenia 2005
Egypt 2005
Jordan 2002
Moldova 2005
Morocco 2003-2004
Turkey 1998
Yemen 1997

Central Asia

Kazakhstan 1999
Turkmenistan 2000

South & Southeast Asia

Bangladesh 2004
Cambodia 2000
India 1998/99
Indonesia 2002/2003
Nepal 2001
Philippines 2003
Vietnam 2002

Latin America & Caribbean

Bolivia 2003
Colombia 2005
Dominican Republic 2002
Guatemala 1998/99
Haiti 2000
Honduras 2005
Nicaragua 2001
Peru 2000