Understanding Internal Migration to Urban Areas:

Evidence from Censuses and Surveys from the Developing World

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Abstract

The literature on internal migration presents ambivalent measures of migration. The "migration-defining" spatial boundaries and time periods are often inconsistent among data collected in different countries which hinders meaningful cross-national comparisons, as well as among censuses and surveys collected for the same country which prevents consistent urban in-migration estimations useful for urban population estimation and projection. Using hundreds of millions of records from 134 census microdata from the International Integrated Public Use Mirodata Samples (IPUMS-I) and 185 Demographic and Health Surveys (DHS) for 84 developing countries in Africa, Asia and Latin America collected from 1970s to 2018, this paper seeks to provide a comprehensive overview of urban in-migration patterns by age, gender as well as its correlation with urbanization levels at both the subnational and national level. The preliminary results suggest that although censuses and surveys often produce different levels of urban in-migration estimates, they constantly show similar patterns of urban in-migration in relation to demographic characteristics such age and gender. Finally, using mixed-effects regression models that controls for subnational and national-level population and economic conditions, as well as varied migration-defining spatial units, this paper also presents empirical evidence on how prevalence of migration to urban areas might change across urbanization stages.

Key words: urban in-migration, developing countries, urbanization, urban growth, GHSL

Introduction

Migration has been an important factor in understanding demographic change throughout the world. It is an increasingly important factor in urbanization and city growth in most lower and middle-income countries as many societies have gone through demographic transition characterized by low mortality and low fertility (Bell at al 2015; Dyson 2011; White 2016). As fertility falls, migration can be expected to play an even more substantial role in population growth particularly in urban areas (Montgomery, 2008). Much attention has been paid to estimation of international migration, but less to migration that takes place within national borders, with the notable exception of flows from rural to urban areas in the course of development. Nevertheless, the significance of internal migration in shaping population settlement patterns and driving economic growth is widely recognized (Bell et al 2002; White and Lindstrom 2005; Montgomery et al 2016; Rees et al 2016). While there are consistent measures and comparable estimates of fertility and mortality available for countries all over the world, there is no official standard on how internal migration should be measured. Systematic estimates of internal migration, especially at a subnational level, have only gained attention in recent years and are still largely absent, due to the complex multi-faced nature of migration (Goldstein 1976), as well as the lack of comparable internal migration measures and migration data (Bell et al 2015; Willekens 2016), while comparable estimates of international migration are becoming more feasible (Abel and Sander **2014**). Recent work by Martin Bell and colleagues at the IMAGE project (Bell et al 2014 & 2015a & 2015b; Bell and Charles-Edwards 2013; Bernard et al 2014; Bernard et al 2017; Charles-Edwards et al 2017) have done comprehensive work to make comparable estimates of internal migration (migration intensity) by adjusting type of migration data, time interval and also spatial framework. In this study, we will build on their work on international comparison of internal migration, and expand it by focusing exclusively on migration to urban areas and incorporating more developing countries in Africa, by making use of 134 census microdata and 185 DHS surveys in 83 developing countries from Africa, Asia and Latin America.

On the other hand, the complex relationship between internal migration and urbanization has generated a long debate among social scientists. There is a wide tendency to see rural-to-urban migration as the primary driver for urbanization, although some argue that mortality decline in urban areas or natural increase is the more important driver for urbanization and urban population growth (Dyson 2011; Cohen 2004; Zhang & Song, 2003). Recent research has started to quantitatively examine the relationship between migration and urbanization, with some studies suggesting that migration is a direct or significant cause of urban transition (Bocquier and Costa 2015; Charles-Edwards et al 2017), while other studies arguing that migration is a just component of development process and is intertwined with the demographic and urbanization transition (Dyson 2011; De Brauw et al 2014), depending on the country and historical period of the studies. Especially in rapidly growing low-income countries, Jedwab and Vollrath conclude that migrants tended to move towards areas with lower morality rates. This trend, coupled with the natural population growth due to the decline of morality rates, significantly contribute to the increase of "informal" urban sectors and the overall urban population late after (Jedwab &

Vollrath, 2019). In this study, we will expand previous literature by including all developing countries with migration data in Asia, Africa and Latin America. We will show that the relationship between migration to urban areas and urbanization is not linear or simple. Although we see some weak evidence that urban in-migration first increases at early stages of urbanization and then decreases as countries become mostly urban, but the trend of urban in-migration over time and place is not linear, and there is great heterogeneity across countries and continents (Menashe-Oren & Bocquier, 2021).

It is also widely assumed that most of the migration to urban areas is from rural, and most of the literature on consequences on internal migration has been on how massive rural-to-urban migration might affect urban livelihood and result in urban poverty, as demonstrated by various local government's programs to limit rural-to-urban migration across many developing countries (Tocoli et al 2008 & 2015). In this study, we will show that the common assumption that most migration to urban areas are from rural is problematic. We will demonstrate that in almost all developing countries in Africa, Asia and Latin America, a substantial migration to urban areas is in fact from other urban areas (i.e., cities or towns). In most more urbanized countries in Latin America, over half of the migration to urban areas are from urban (Riosmena & Balk, 2023). These findings align with Zelinsky's framework of migration and mobility transition, where after societies generally experienced a demographic transition, the urban growth attributed to inter-urban migration rather than rural-to-urban migration (Zelinsky, 1971). Other literature in the Global South shared similar findings, which highlight the increasing prominence of urban-to-urban migration and the decline of rural-to-urban migration as these cities underwent urban transitions (Deshingkar and Grimm, 2005; Cheng & Duan, 2021).

However, studies on migration and urbanization have not only been limited by the availability of migration data, the ways migration data collected, the time interval and spatial boundaries migration is defined, but also by the varied definition of urban across countries and time. Some countries classify urban population based on administrative criteria, while the rest use population-related criteria (Buettner, 2014; UN DESA, 2012). Although often neglected, some of urbanization (urban population growth) could actually come from reclassification, rather than natural increase or migration (Cohen, 2004; Frey and Zimmer, 2001). Previous studies by Rees et al (2016) and Charles-Edwards et al (2017) under the IMAGE Project often use population density to measure levels of urbanization, while other studies have used the proportion of population living in urban areas to indicate urbanization levels (Sadorsky, 2013;). In this study, we not only include traditional measures of urbanization levels such as proportion of population living in urban areas, but also more comparable measure using new data from the Global Human Settlement Layer (GHSL) project (Pesaresi et al. 2016a) of the European Commission's Joint Research Centre (JRC). This data makes it possible for the first time to evaluate change over time in the density of built-up structures. These satellite-derived land-cover based data (largely from Landsat missions) aim to capture the degree to which an area is built-up. GHSL is increasingly used as a proxy to measure urban land and change in urbanization (European Commission 2016; Leyk et al. 2018; Gao and O'Neill 2017; Balk et al. 2018). Because the censuses and DHS often only record a simple dichotomous stratum – urban vs. rural, with no record of past classifications,

GHSL data open up exploration into changes in the built-environment that are so closely coupled with economic development and urbanization.

The literature on internal migration is marked by inconsistent measures of migration, and limited studies have focused on migration to urban areas specifically, though most in-migration occur in urban areas, particularly in developing countries. There is also a dearth of empirical studies drawing out the implications from these different measures used in census and surveys, and also understanding migration to urban areas in developing countries where migration is most relevant for city growth and public policy implications. This paper aims to fill that gap. We make use of microdata from censuses available from the International Intergrated Public Use Mirodata Samples (IPUMS-I), as well as the Demographic and Health Survey(DHS) data to understand migration to urban areas in developing countries. This study offers a comprehensive overview of migration measures and migration estimates for a large collection of developing countries in Africa, Asia and Latin America, with more data than in any prior studies on internal migration in developing countries. This is also the first study that specifically examines subnational migration to urban areas. In this study, we used hundreds of millions' records from 51 countries representing 134 census micro-data. To understand subnational migration in developing countries where censuses are not publicly available, particularly in Africa, we also made use of 185 Demographic and Health Survey (DHS) data sets collected in 70 developing countries. By using all censuses and DHS data available for 84 developing countries in Africa, Asia and Latin America from 1970 to 2019 (as shown in Figure 1), this study not only provides a comprehensive overview of urban in-migration patterns across developing countries and offers important insights to understanding profiles of internal migrants, particularly both similar and variant patterns of internal urban in-migration by age, gender, origin and destination choices across a large collection of developing countries at various stages of urbanization, but also contributes to expand previous theory on migration and urban transition by quantitatively examining the relationship between migration and urbanization levels after controlling for various demographic, geographic and socioeconomic factors at both the subnational and national level.

In the remainder of this paper, we answer the following groups of questions about **subnational, internal, urban** in-migration: 1) What can we observe systematically about age and gender profiles of urban in-migrants in developing countries? (2) What do we know about the relationship between migration and urbanization levels? What do we know about migration between urban areas? Has the rate of urban in-migration change over time? The paper is organized as the following: We first synthesize prior work on international comparison of migration measures and migration estimates across countries, followed by a description of our data and method to generate migration estimates in this study. We then compare urban in-migration estimates across countries and identify key patterns of migration to urban areas by age, gender and also how it is related to urbanization stages. We conclude by summarizing our findings and calling for the need for more consistent ways to measure migration, particularly in low-income developing countries where censuses are largely absent.

Literature Review

Characteristics, patterns, dynamics and trends of migration and urbanization over time and across places have been frequently discussed by scholars and policymakers. Demographers prefer to consider urbanization as a process of population urbanization, which is determined by population redistribution and natural population growth (Brøgger & Agergaard, 2019; Jedwab et al., 2017; Lerch, 2014). Proponents of urban transition theory study the population mobility during urbanization, focusing on its importance in the early and late stages of urbanization (Zelinsky, 1971). Many previous studies have been devoted to describing the complex pattern of how migration changes along urbanization trajectories, but studies often reach different or even contrary conclusions, depending on the country and historical period of the studies. Mounting case studies suggesting that, population redistribution, consists of rural-urban, urban-urban, international and backflow migration, gradually outweighs the role of natural population growth in urbanization (Bhagat & Mohanty, 2009; Crankshaw & Borel-Saladin, 2019). Using historical data from Sweden and Belgium, Bocquier and Costa (2015) provided evidence that migration is the direct cause of urban transition in Sweden and Belgium. Using data from 26 countries from the IMAGE project, Rees et al (2016) find that the impact of internal migration on population distribution (rural/urban population change) first increases and then falls as societies transit from predominantly rural to urban, and then reaches equilibrium. Building on Rees et al (2016) theoretical framework, Charles-Edwards et al (2019) also suggest that internal migration plays a key role in urban transition in Asian countries, and that migration patterns in most countries are consistent with their progress through the urban transition. However, other studies contend that migration should be viewed as an integral part of urbanization, which closely linked with demographic shifts (Dyson 2011; De Brauw et al 2014; Randolph 2023). This perspective suggests that migration, mainly internal migration, is not merely a byproduct but also a fundamental aspect of the transitions seen in urban growth. De Brauw et al (2014) find that rural–to-urban migration has actually been relatively slow in a number of countries in Africa over the 1990s despite the fact that the share of rural population in those countries are still high. This finding aligns with the conclusions of Bocquier and colleagues, who argue that the primary driver of urban population growth in African countries remains natural increase (Bocquier et al, 2023). In a study in India, Randolph determined that urbanization in some parts of the country continues to be determined by natural population growth rather than migration, due to nativism in India's large cities, which protects the local population, and the structural transformation of the economy from agriculture to services, which does not create enough jobs to encourage migrants to move permanently (Randolph 2023). In a similar vein to these works that challenge Zelinsky's theory of mobility, Jiang and O'Neill (2018) and Preston (2019) have argued that in developing countries, and even in some developed countries, the process of urbanization is at odds with the familiar logic assumed of urban development in the global north: natural urban natural population growth dominates urban growth (Jiang & O'Neill, 2018; Preston, 1979). Bernard and his colleagues focus on Latin American countries and argue that migrants cannot be viewed from a single perspective: they suggest that some dimensions of migration (e.g., by age and distance) vary across countries and they are driven by different demographic, geographic and socioeconomic factors (Bernard et al. 2017). Given the disequilibrium of demographic and urban transition among and within countries, Jiang and O'Neill put forward the multiregional populational model to comprehensively analyze the effects of migration, natural population growth, and reclassification. Their conclusion shows that whether in the US, Mexico, or India, natural population growth is the main cause of urban

population change (Jiang & O'Neill, 2018).Using UN data from 1985-2015, Menashe-Oren and Bocquier's analysis conclude that migration rates decline after high levels of urbanization and that reclassification of migrants does not affect urbanization more than natural increase (Menashe-Oren & Bocquier, 2021). Additionally, some scholars argue that migration and the natural increase are not entirely mutually exclusive but influenced by the migratory origins. Randolph and Storper suggest that urbanization in the Global South follows distinct historical and geographical paths, where the influence of rural-to-urban migration wanes after a city's development phase, giving precedence to natural increase (); however, the significance of urban-to-urban migration on urban growth cannot be overlooked (Randolph & Storper, 2023). The availability body of literature shows a variety of findings, yet a significant portion of these studies are limited to their geographic scope. In contrast, our study broadens the research horizon by including 83 developing countries with migration data ranging from 1970 to 2015 in Asia, Africa and Latin America, trying to delve deeper into the dynamics of migration and urbanization, piecing together the intricate connections that define the relationship.

Besides the factors of natural population growth and redistribution, it is crucial to acknowledge the influence of migration on the growth of urban populations. In fact, migration could impact urban population growth and the city itself in many ways. Given migrants' preference for densely populated, their influx leads to urban population growth (Bakker et al., 2020). The inflow of young labor increase urban birth rate and lower urban mortality (Montgomery et al., 2013), while the effect may disappear with time passing by (Jedwab et al., 2017). In addition, many countries exhibit patterns of sex-selective migration. Gulczyński found that the expansion of women's educational opportunities led to a greater initial female migration to urban areas by looking at data from developed countries (Gulczyński, 2023). Rodríguez-Vignoli and Rowe, on the other hand, showed that internal migration indeed lowered the sex ratio in urban areas of Latin America. However, the male proportion of migrants rose again over time, and the proportion of young migrants entering cities declined – this pattern explains the waning impact of feminized migration and the reduction of the urban population window effect (Rodríguez-Vignoli & Rowe, 2018). Besides, economic growth accelerates with the influx of migrants. These have led to an increase in the urban population. What's more, internal migration itself has the potential to trigger urban expansion and spatial reclassification. As reclassification results from urban population growth, which is a consequence of migration (Jiang & O'Neill, 2018). When it comes to the effects of migration on cities, though migration stream is dominated by rural-urban migration, urban-urban migration is growing (Bhagat & Mohanty, 2009). Migration facilitates urban transition, while rapid urbanization could also bring poverty, congestion and overloading in cities as well as environmental hazards in the long run (Brøgger & Agergaard, 2019; Zhang & Song, 2003). Urban residents also establish different fertility patterns compared to non-urban ones, often choose to have fewer children as a strategic adjustment. Although literature highlights the strong impact of the expansion of education on fertility rates, the effect of place of residence (i.e., urban vs. non-urban) still persists in most low-income and middle-income countries (Adhikari et al., 2023). (Jedwab et al., 2017).

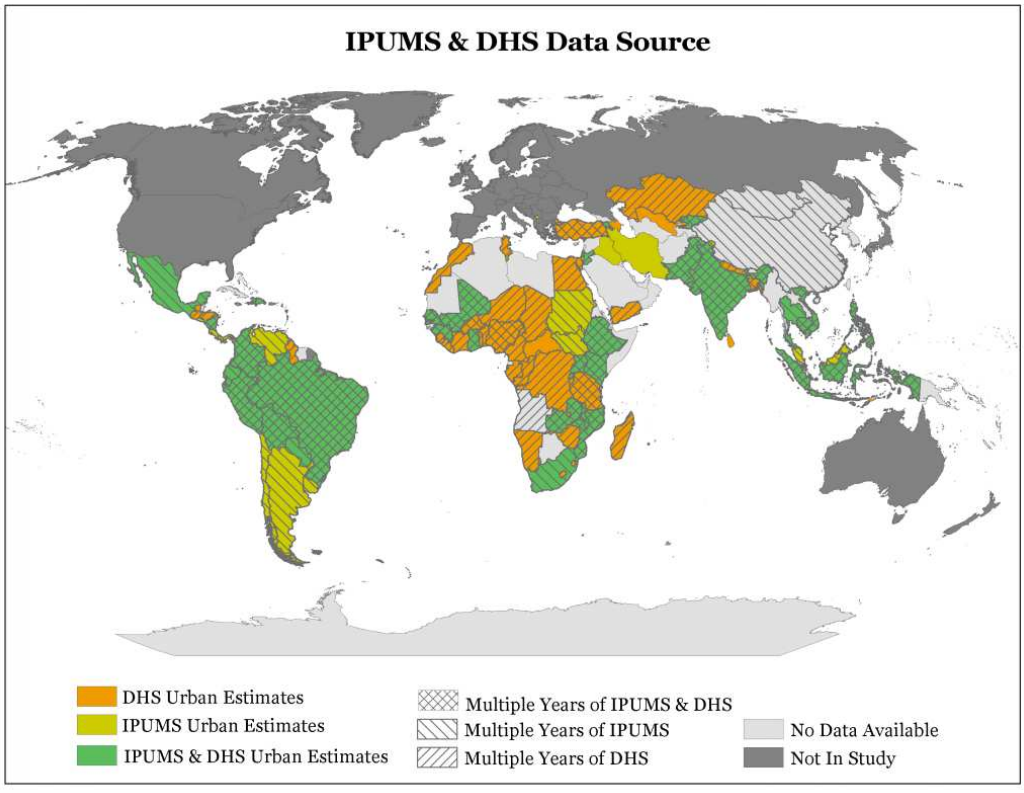
Regional development inequalities, population density of destination and geographical distance are main factors that influence migration (Guo & Qiao, 2020; Zhang & Song, 2003). In line with the classic "pull and push" model on urbanization (Todaro, 1969; Williamson, 1988), internal migration ratio is higher in more developed areas, regardless of greater geographical distance to homeland (Deng et al., 2020; Guo & Qiao, 2020). Additionally, in the post-immigrate era, employment opportunities, family and social networks in cities could protect rural outflows from returning home (Deng et al., 2020). However, the selectivity bias about the poorer often unable to search for resources lead to debate on the association of migration and urbanization.

Data and Method

Data

Unlike the majority of papers based on the IMAGE Project, we focus here only on urban in-migration in Africa, Asia, and Latin America where the bulk of future population will take place in its cities and towns. Figure 1 shows the collection of data used in this study. Micro-census data is available from the International Public Use Microdata Series (IPUMS-I) collection housed that the Minnesota Population Center (URL here); for a handful of countries, the IPUMS collection uses survey micro-data rather than census microdata (add a note). IPUMS-I data include more than 500 million individual records and contain harmonized migration and geography variables that offers great potential for studying internal and international migration patterns that are otherwise not possible with other data sources (Sobek 2016). In this study, we used more than xx million records from 51 countries representing 134 census micro-data. The other major collection of data we rely on here is the Demographic Health Survey (DHS). DHS has been a widely used nationally-reprehensively data source for studies on health and fertility, and offers opportunities

Figure 1: IPUMS and DHS Collections: Countries for which URBAN in-migration estimation is possible



NB: Updated based on IPUMS collection as of [REVISE: July 2014] and DHS collection through 2009 (the last wave before migration question is dropped).

to study migration in many low-income countries where censuses are not available, though there are concerns about its *sampling* precision for studying migration (Bocquier 2016).
In both of these data sources, it is usually but not always possible to identify whether the individual is considered urban. Countries that may have survey or census data are shown as not having data for our study if no urban strata were present (greyed out here). Overall, 197 micro census samples for 61 developing countries in Asia, Africa and Latin America are available from the IPUMS collection. Among the 61 countries, we can generate migration estimates for 51 of them based on 134 censuses. Urban/rural status of current residence is available for 45 countries, for which we can further generate urban in-migration estimates, which are shown as yellow and green in the map. At the same time, 273 DHS surveys from 76 developing countries are available. Among them, we can generate urban in-migration estimates for 70 of them using 185 surveys (shown as brown). For 32 developing countries in Asia, Africa and Latin America, we can generate estimates from both data sources (shown as green). Urban in-migration estimates are generated for 83 countries in total, including 38 countries from Africa, 24 from Asia, 21 from Latin America.

Method

Key measures

Urban in-Migration

Urban in-migration percentage/rate in this paper is measured as the proportion of the population currently living in urban areas that have moved to their current residence within a five-year period from the point of observation (i.e., the census or survey date). Five-year migration durations are the most commonly asked interval in censuses; and we show evidence later in this paper that it is likely to be a sensitive and sensible measure of migratory trends.

Table 1 below identifies the two main collections we use in this analysis, and highlights the main questions and migration defining properties. Although the same time interval is used across countries and across data sources, the specific migration questions asked in censuses and DHS differ. The "migration defining" boundaries differ not only across data sources, but also between countries, as shown in Appendix 2. For some censuses, any move between localities is defined as migration (e.g., Rwanda 2002); for others only migration between major administrative units (first-order administrative units such as states) are counted as migration (e.g, Ghana 2000). For countries with more than one migration measure available, urban in-migration rates are generated using different measures.

Table 1: Differences in Questions relating to Migration in Census and DHS.

Dimension of Migration Question	**Data Collection (type)**			
	IPUMS		**DHS**	
	Question	Variable	Question	Variable

Question wording	*Where was your place of habitual residency in 2000 (specific time, often 5 year prior to current census)*	migrate5	*How long have you been living in [this place]? [where place is specified as the respondent's city, town or village]*	ADD
	1. *What was the location (country, province, state, municipality etc) of your former residence?* 2. *In what state/province/municipality did you live before moving to current residence(state/province/municipality)*	migratep		
Time interval associated with migration event	*How long/ Since which year have you lived in this residence (state/province/municipality etc)*	migyrs1	Any Year	ADD
	Mostly 5 year, 1 year, 10 year or any-year for some			
Administrative unit associated with migration event	Major admin units (state/province for most countries), minor admin units (municipality, district for most countries), locality (town, country) for some.		City, town, village (respondent-classified)	ADD
Place of origin	No harmonized variable, but for some countries the name of the former administrative area, and urban/rural status is given		City (capital city, other urban areas), town, countryside	

In order to compare migration measurements used in different countries, as well as censuses and surveys, we evaluate four types of migration measures:

1. urban in-migration between major administrative units, based on direct measure MGRATE5—the variable based on census respondents being asked directly about where they lived 5 years prior—a harmonized variable from the IPUMS collection;
2. total urban in-migration, which is migration between major administrative units plus migration between minor administrative units, also based on direct measures from censuses;
3. total urban in-migration, based on indirect migration questions about years having lived at the current location (MGYRS1) and previous residence (MGRATEP) from IPUMS;
4. total urban in-migration, based on indirect migration questions about years having lived at the current location in DHS.

Urbanization Indicators

We use two main indicators to measure urbanization levels: percent of total population that are urban (as defined by censuses and DHS data), and percent built-up in any geographic unit (based on GHSL data). The first one is a more traditional way of measuring urbanization and urban growth, but it has certain limitations since the definition of urban strata varies by country. Therefore, we also use the newly-developed built-up measure which has been increasing used as a proxy to measure urban land and change in urbanization and is comparable across time and place.

Analytical Strategy

In the following parts of this paper, we first compare migration estimates generated based on varied migration data sources/measures used, followed by migration estimates comparison as well as descriptive discussion of age and gender profiles of urban in-migrants across countries. Lastly, we attempt to offer some insights on the relationship between urban in-migration and urbanization levels based on 84 developing countries covered in this study. To examine the complex relationship between urbanization levels and urban in-migration percentages by gender, as well as whether females and males differ in terms of internal migration destinations, we ran mixed-effects regression analysis using both demographic and socioeconomic characteristics at the regional (subnational-level at which urban in-migration estimates are derived) and also the country level to predict subnational-level urban in-migration percentages for all persons and also by gender.

Results

Descrptive Analysis

Cross-Country Comparison of Urban in-Migration Patterns in Developing Countries

Migration patterns by age across countries

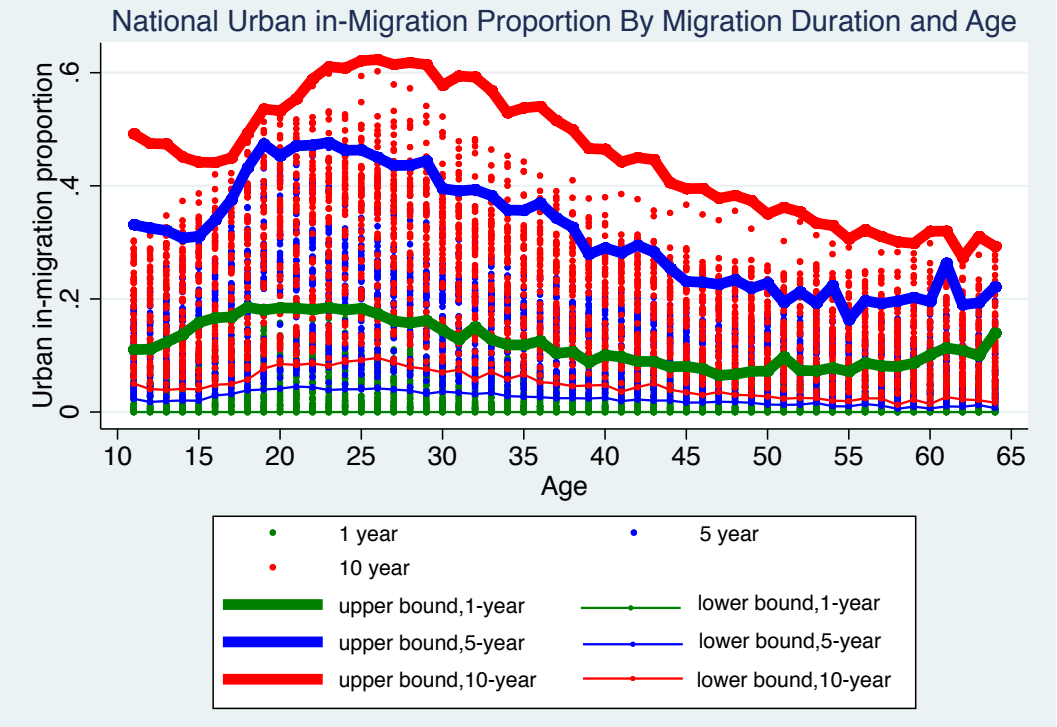
By all accounts, the urban in-migration pattern by age is very consistent among all countries. Rates of migration are highest among young adults. Teens and 30–40 year olds also have much higher rates than the very young or persons older than 50. However, as shown in Figure 10 (blue or red dots), there is significant variation in urban in-migration percentages (measured as migration between major administrative units) at the national level among countries for any age. As mentioned above, the migration-defining time interval varies considerably from country-to-country (and sometimes within countries for different years). Figure 5 shows the national-level age-pattern of urban in-migration for all countries (census-data only) for which we can measure internal migration across 1, 5, and 10-year intervals. Each dot in the figure represents a census-year. The minimum and maximum of in-migration percentages of each interval is shown in bold. While there is a good deal of heterogeneity among countries as to level, it is unambiguous that migration rates are nearly flat when measured at one-year and peak substantially among 15-29 year olds when measure migration within a 10-year interval.[1] Individual-country figures (not shown due to space constraints) confirm the same pattern, irrespective of the total level of

[1] This figure is restricted to 10-65 year olds because the 10-year migration question was not asked of persons aged 10 and younger. The samples of persons over age 65 are very small in many of these micro-samples and therefore estimates for older ages is less robust, and thus omitted here.

migration.

We also find confirmation of the well-known age pattern. Rates of migration are highest among

Figure 5. Cross-country comparison of urban in-migration percentages, based on censuses

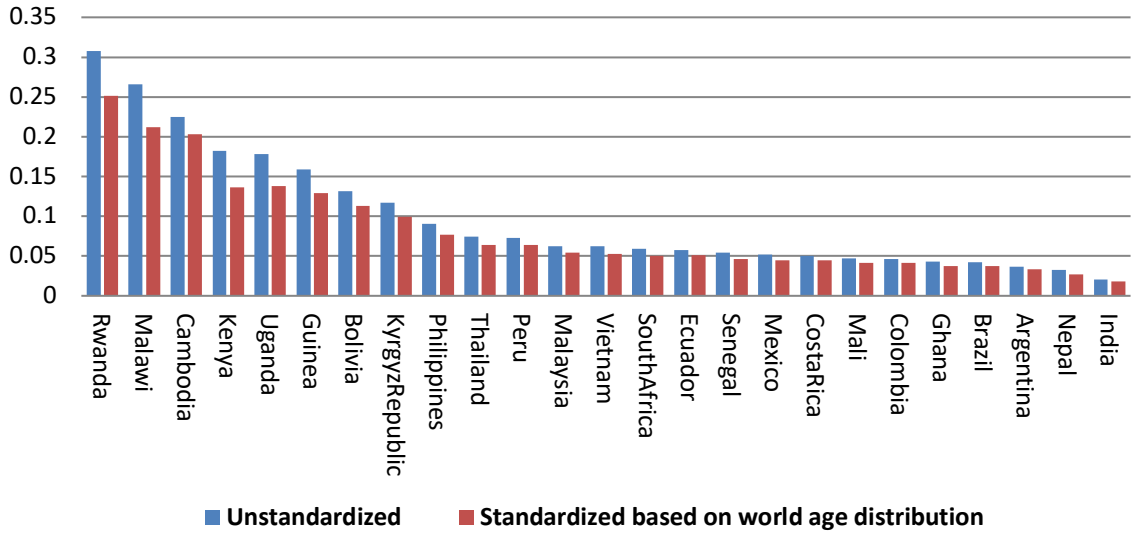


young adults—those in their twenties— regardless of the overall level of migration. Often the rates of migration at the peak age groups far exceed those found at much younger and older ages. Teens and 30–40 year olds also have much higher rates than the very young or persons older than 50, though at lower rates than young adults. This age-pattern is essentially universal in all study countries, though in some countries urban in-migration rates are more flat across age groups (Figures by country not shown due to space constraints). In Brazil, Iraq, and Mexico, the rates of migration are remarkably flat throughout all ages, though this may have more to do with the way migration is measured (i.e., the major administrative areas may be too large to capture most internal migration) than with actual population movements within countries.

Because many of the countries in this analysis have very young-age distributions, and because migration tends to be highest among the young adults, it is necessary to consider whether the higher rates of migration are simply due to age-composition of the population. Figure 6 uses an age-standardization method by applying the age-specific urban in-migration rates to the world age distribution (REF). Small reductions in the total urban in-migration rates can be seen after standardizing to the world age distribution. The change is particularly noticeable in African countries such as Kenya, Malawi and Uganda that have a particular large proportion of young

adults who are also most likely to migrate. After the effect of age-structure is taken out, the difference in urban in-migration rates at the national level decreases, but the variation still exists to a great extent. Unlike fertility rates for which age-standardization is a necessity, these results suggest that age structure only contribute slightly to the variation in urban in-migration rates among developing countries, which further indicates that the variation in migration estimates cross countries might be due to the varied migration-defining spatial resolution, as well other factors such as economic factors that we have not considered, among countries.

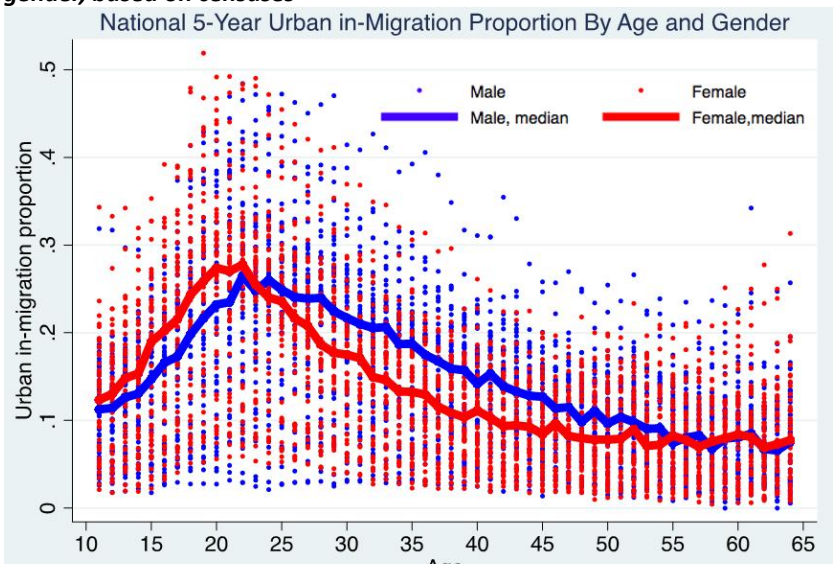
Figure 6. Five-year Total Urban in-Migration Rate
(migration between major admin units, based on censuses around 2000)



Varied Migration Patterns by Gender

Less well-known is that the rates of urban-in migration are higher for young women then young men. As we see in Figure 7, the most common gender pattern is one where migration rates for females is higher through young adulthood, but in the prime working ages (about 25-49), men tend to migrate at higher rates. In some countries, despite larger differences through young adulthood, in these prime working ages, the differences are not so large (e.g., the Philippines). The one exception is in Nepal, where male migration is reported to be higher at all ages. While the sample sizes are smaller for the oldest ages, we find that rates of female urban in-migration are also higher than, or at least equal to, male migration at older ages (roughly from 60+). It is unclear what might be the causes of the different age pattern of migration by gender. Many reasons could contribute to it, such as the total urban age-sex pattern or differential sex-specific mortality or simply changes in cohort-specific behavior (e.g., young women are migrating more now than they used to in the past).

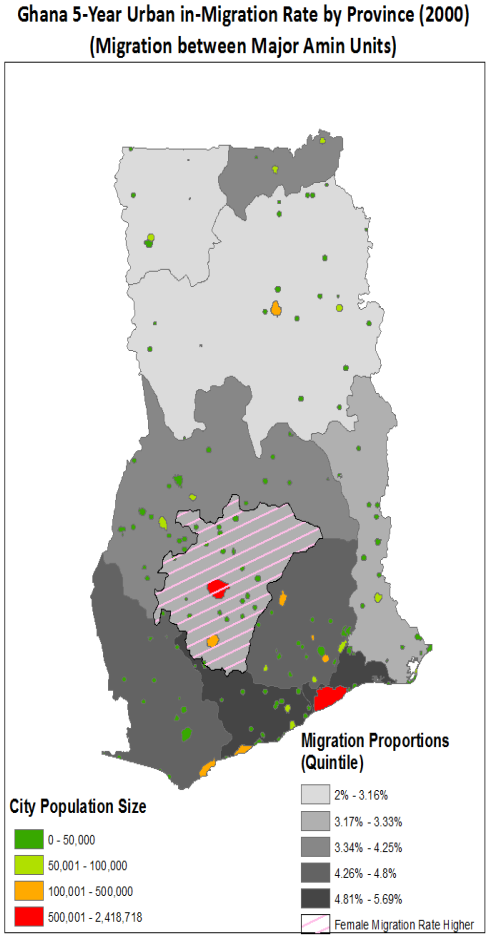
Figure 7. ***Cross-country comparison of urban in-migration percentages by age and gender, based on censuses***

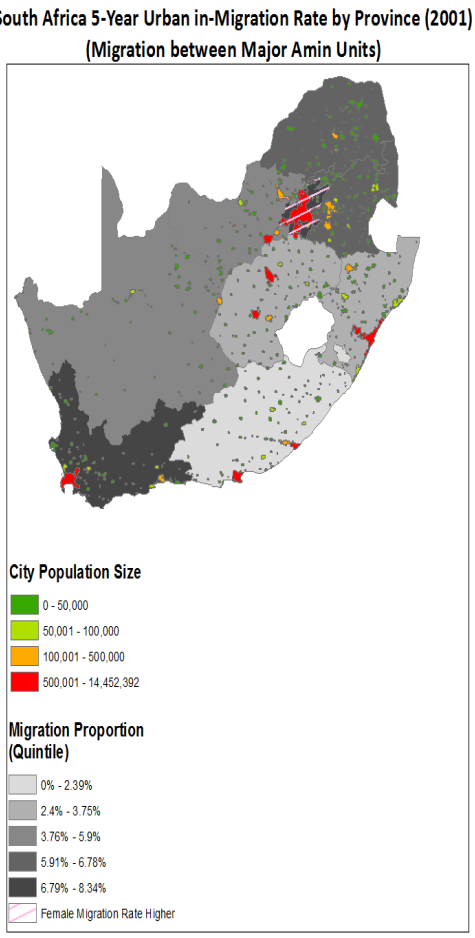


Not only females are more likely to migrate a younger age, they are also more likely to migrate to more urban destinations if they migrate. The percentage of in-migration is much higher for males, on average, than females except in the region that contains the largest cities. This perhaps surprising finding is found in most strongly in the African countries studied. This is very evident for Nairobi, Accra, Johannesburg (located in Guateng region, South Africa), Conakry, Dakar, Dar es Salaam, and Kampala (Figure 8, left panel). In some countries—Ghana, for example—the proportions of female migrants is not greater than males but in the Greater Accra region is close to equal whereas in all other regions, it is clear that male migration is more commonly found (Figure 8, right panel). In Mali(figure not shown), the proportions of males and females who have migrated are close to equal, except for Toumbouktu region (home to the city Timbuktu) where there a larger share of females who have migrated. This suggests that larger cities maybe

relatively attractive migration destinations for females. Our regression analysis (shown in the next section) below also confirms this pattern.

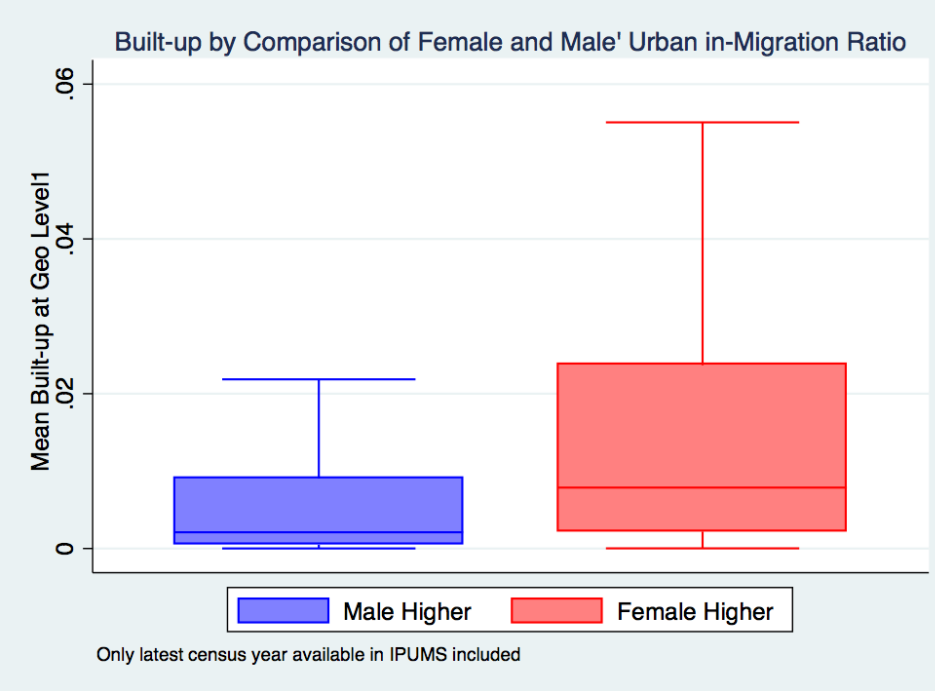
Figure 8:





To further understand whether females are more likely to migrate into subnational administrative areas with higher levels of urbanization, we plotted the range of mean built-up level by whether the place has higher proportion of female urban in-migration or male urban in-migration. As shown in Figure 9, we observe that overall subnational units with higher levels of built-up are more likely to be homes of female in-migrants.

Figure 9



Regression Results

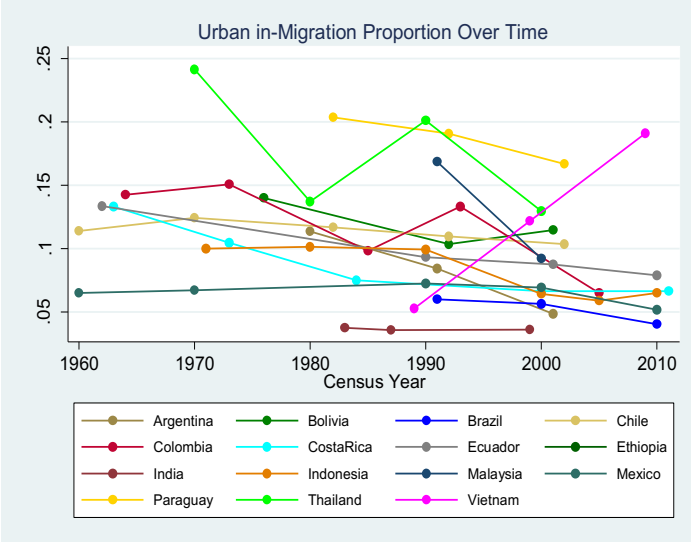
Complex Relationship between Urban in-migration and Urbanization in Developing Countries

Another important issue we try to understand is the correlation between internal migration to urban areas and rates of urbanization. So here we used urban population share as an indicator of urbanization, but that's not true in all countries. Censuses data provide good historical

information for understanding historical change in migration and urbanization levels. We observe much different urban in-migration rates in different survey years (Figure 10). Even within countries, the trends in urban in-migration rates over time are very mixed. For some countries such as Vietnam and Bolivia, the highest urban in-migration rate is reported in the most recent census; while for other countries such as Brazil and Argentina, higher urban in-migration is seen in earlier census years. We find that higher urban in-migration rates are found in poorest countries (which also happen to be those with the lowest share of urban population), such as Kenya, Malawi, Rwanda in Africa, as well as Cambodia in Asia, while generally lower urban in-migration is reported for most Latin American countries where the share of urban population is much higher. What accounts for these differences? Has economic opportunity changed-either development or economic zones that encourage migration in certain years? Have policy changes, implicitly or indirectly, allowed for more internal movement? Or might these changes be caused by changes in the level of urbanization (irrespective of changes in economic development)? We cannot undertake a causal analysis here, but we can examine the associate of national-level urbanization levels in urban in-migration, in simple scatter plots using all of the possible censuses from the IPUMS collection.

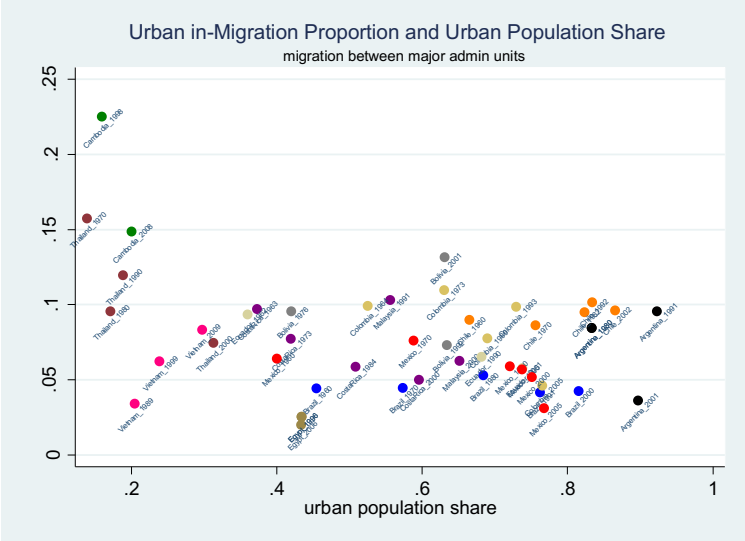
As shown in Figure 11, urban in-migration seems to be negatively associated with urbanization – the share of the population living in urban areas – though the correlation is weak: Internal urban migration rates fall as urbanization levels rise. But this pattern is clearly seen in Asia, but much less so in Latin America. Developing countries in Asia, Africa and Latin America are becoming more urban overtime. Urban in-migration rates are higher in Asian countries with

Figure 10. Urban In-migration Percentages over time



lower urban population share, and the prevalence of urban in-migration is still increasing in those countries. Urban in-migration proportions are lower in LAC countries with high levels of urban population and proportion of in-migration to urban areas is decreasing over time.

Figure 11. Urban In-migration vs. Urban Population Shares



NB: Census sources only. *Each color represents one country; Graph based on censuses from IPUMS*

Earlier work of Zelinsky (1971) argues that the type of migration flows varies over stages of demographic transition: higher levels of rural-to-urban migration is to be seen at earlier transitional stages and decreases as societies enter late transitional stage (see more recent interpretation in Skeldon 2012). In our attempt to understand urban in-migration and urbanization, we found some evidence that rural-to-urban migration is more prominent in countries at earlier stages of urbanization. As shown in Figure 12, we found that migrant population is a more important component in urban areas than in rural areas, particularly in more recent censuses for most developing countries in this study. Contradictory to the popular thinking that most of the migrants to urban areas come from rural areas, we observe that a large proportion of urban in-migrants come from cities or towns, as shown in Figure 13. Both panels shows measure of any migration. The left-side panel are estimated derived from the DHS, among 15-49 men and women, in 17 African countries. In only two countries, Kenya and Zimbabwe, are the proportions from rural area greater than from towns and cities, and in Rwanda (a country who's DHS did not use town as a possible place of origin) the proportion is about 50:50 coming from rural and other urban areas alike. However, all the others most urban in-migrants are not coming from rural areas. In many countries, it is notable that the fractions coming from towns rather than other cities, is quite high. This might suggest a step-wise type of migration (REF) where rural residents first migrate to towns, and from there to larger urban areas. Similarly, on the right-side panel, which is based on circa year 2000 census data for the handful of countries that ask individuals information about the urban-rural classification of the place of origin, the same pattern emerges. Fewer than half of the 13 countries – Ethiopia, India, Iraq, Kyrgyz Republic and Thailand – had rates of urban in-migration is greater from rural than other urban areas.

Figure 12. In-migration Percentages by Rural/Urban Status, Changes Over Time

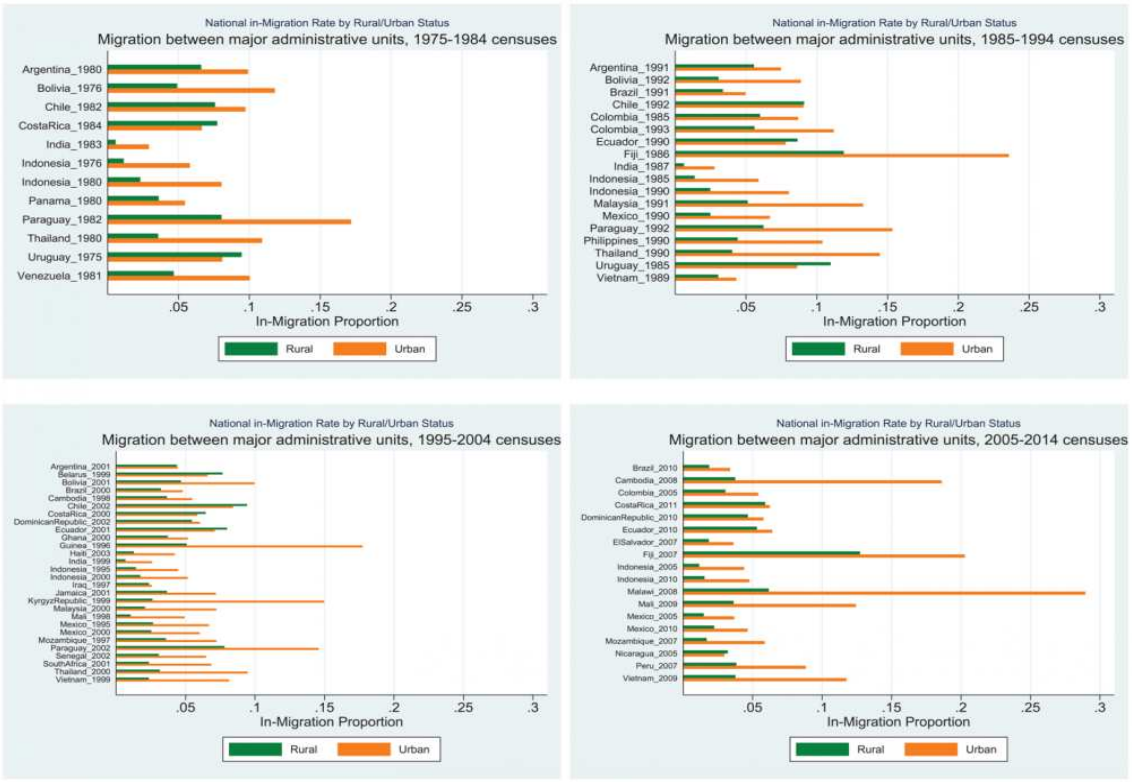
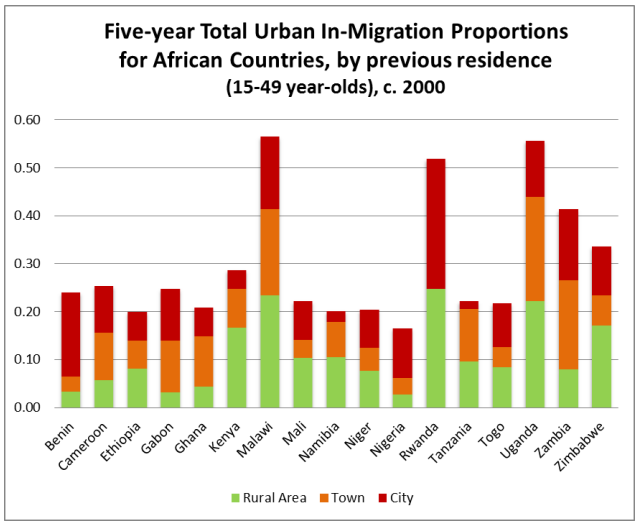
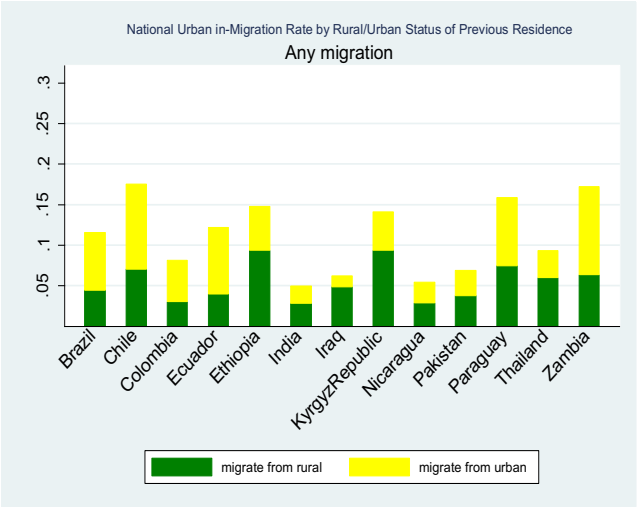


Figure 13. Total Urban In-Migration c. 2000, by migrants' place of origin, survey (left-panel) and census (right-panel)





To examine the complex relationship between urbanization levels and urban in-migration percentages by gender, as well as whether females and males differ in terms of internal migration destinations, we further ran mixed-effects regression analysis using both demographic and socioeconomic characteristics at the regional (subnational-level at which urban in-migration estimates are derived) and also the country level to predict subnational-level urban in-migration percentages for all persons and also by gender. Results are shown in Table 2 and 3 u. As shown in Model 1, urban in-migration percentages at the subnational level are positively associated with urbanization levels (measured by percent of total population that are urban) in the region, but the positive impact of urbanization level on urban in-migration percentages decreases as places become fully urbanized. Of course, this is also due to the way urban in-migration percentages are calculated in this study. Higher percentages of urban in-migrants are also found in places with higher levels of educated population (indicated by the percent of local population with secondary and above education) and more urban (indicated by percent of built-up). Meanwhile, although the admin size of the subnational unit itself does not seem to have a significant impact on urban in-migration percentages within the region, average admin size and number of major admin units (migration-defining boundaries) seem to be significantly related to the subnational level urban in-migration percentages. As expected, as migration-defining boundaries become relatively smaller (higher number of major admin units), higher urban in-migration percentages are observed. Literature also suggests that prevalence of migration to urban areas might vary by demographic transition stages and economic development at the country level, so in our analysis, we also include country-level characteristics such as country-level GDP and percent population of working age. We find that overall migration to urban areas is less prevalent (indicated by percent of urban population that are migrants) in developing countries with higher GDP, but we did not

find a significant effect of percent of working age population on subnational urban in-migration percentages.

To understand whether gender affects the destination choices of urban in-migrants, we ran a mixed-effects logit regression predicting the likelihood of having higher proportions of in-migrants of females compared to males among urban population at the subnational-level, using demographic and socioeconomic predictors at both the subnational level and country level. As shown in Table 3, we found that regions(subnational units) with higher rban population and higher levels of built-up are more likely to be homes of female in-migrants rather than male migrants.

Table 2: Mixed-effects Model Predicting Subnational-level Urban in-Migration Percentages

VARIABLES	Model1: Total	Model2: Male	Model3:Female
Subnational-level admin characteristics			
Percent Population Urban	0.146***	0.180***	0.174***
	(0.0193)	(0.0253)	(0.0236)
Percent Population Urban, Squared	-0.000832***	-0.000963***	-0.000958***
	(0.000172)	(0.000226)	(0.000211)
Urban Population(in thousands), Logged	-1.031***	-1.556***	-1.168***
	(0.0873)	(0.115)	(0.107)
Percent built-up (GHSL)	0.0299**	0.0476***	0.0499***
	(0.0132)	(0.0174)	(0.0163)
Admin Area (Sqkm), Logged	0.0542	0.197*	0.0693
	(0.0878)	(0.116)	(0.108)
Percent Population with Secondary and Above Education	0.105***	0.108***	0.138***
	(0.0143)	(0.0186)	(0.0174)
Country-level characteristics			
Mean Major Admin Area (Sqkm), Logged	0.747**	1.194***	0.948**
	(0.355)	(0.442)	(0.420)
Total Number of Major Admin Units	0.121***	0.151***	0.153***
	(0.0353)	(0.0439)	(0.0417)
Country-level GDP Per Capita	-0.000434*	-0.000653**	-0.000572*
	(0.000253)	(0.000314)	(0.000298)
Percent Population of Working Age (15-65)	-0.172	-0.129	-0.189
	(0.115)	(0.143)	(0.136)
Constant	5.979	0.565	4.825
	(8.557)	(10.64)	(10.12)
Observations(subnational units)	1,933	1,933	1,933
Number of groups(census-years)	97	97	97

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Mixed-effects Logit Regression Predicting Probability of Female Urban in-Migration Percentages Higher than of Male at Subnational-level

VARIABLES	
Subnational-level admin characteristics	
Percent Population Urban	-0.00678
	(0.0126)
Percent Population Urban, Squared	-3.36e-05
	(0.000113)
Urban Population(in thousands), Logged	0.402***
	(0.0586)
Percent built-up (GHSL)	0.0366***
	(0.0120)
Admin Area (Sqkm), Logged	-0.212***
	(0.0593)
Percent Population with Secondary and Above Education	0.0109
	(0.00810)
Country-level characteristics	
Mean Major Admin Area (Sqkm), Logged	-0.386***
	(0.143)
Total Number of Major Admin Units	0.00516
	(0.0133)
Country-level GDP Per Capita	-3.36e-05
	(9.53e-05)
Percent Population of Working Age (15-65)	0.0448
	(0.0456)
Constant	-0.118
	(3.280)
Observations(subnational units)	1,933
Number of groups(census-years)	97

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Conclusion

The literature on internal migration to cities and towns is marked by inconsistent measures of migration, and limited studies have focused on migration to urban areas specifically, though most in-migration occur in urban areas, particularly in developing countries. Although migration is becoming more important for demographic change, existing data collection approaches for internal migration has many deficiencies (Bilsborrow 2016). Systematic comparison of migration measures has started to draw scholars' attention in recent literature. Censuses and surveys take different approach to asking migration questions and also often have different sampling universe, and therefore provide inconsistent migration estimates. Migration might be defined fundamentally different depending on the measurements (eg duration, geographic reference) used in censuses and surveys. While we use urban in-migration estimates for city growth and urbanization projections, we should always be aware of how migration is measured in a specific country and local context. The preliminary results show that census and surveys produce much different levels of migration. More research needs to be done to evaluate the accuracy of these estimates and determine the cause of the differences between them, as well as corrections can be made through indirect or other methods. This study also shows that there is significant variation in urban in-migration rates among developing countries, and that age structure accounts for some of the difference in urban in-migration rates at the national level, but most of the variation is still unexplained. The varied migration measures might also contribute to some of the differences. Research that aim to understand economic and policy factors driving different levels of urban in-migration in specific developing countries should also be cautious about how the observed difference might be attributable to the varied ways internal migration is measured across countries.

Also, though censuses and surveys often measure migration in different ways, they also complement each other. Censuses generally provide more detailed information on geographic origin of migrants so that we have a clear idea about "migration-defining" boundaries, but they do not report geographic unit in urban/rural terms. Meanwhile, DHS data provide on urban/rural origin of migrants, which is valuable to understand flows of migration, but they are less clear about the specific location/distance of migration. By comparing urban in-migration estimates as well as educational selectivity of urban in-migrants based on censuses and surveys from a large number of developing countries, this paper provides strong empirical evidence that although censuses and surveys report similar patterns of urban in-migration by demographic composition such as age and gender, different data sources might lead to varied understandings of migrant characteristics. While many studies rely on different singular sources to understand urban migration and thus reach different conclusions, a large-scale study utilizing multiple censuses and DHS surveys like this one can contribute to clarify some controversies by providing a fuller picture with evidences from multiple countries and multiple measures.

Our regression analyses that aim to understand the complex relationship between migration and urbanization controlling for subnational, national-level population and economic characteristics,

as well as varied migration-migration defining spatial units suggest that urban in-migration percentages at the subnational level are positively associated with urbanization levels (measured by percent of total population that are urban) in the region, but the positive impact of urbanization level on urban in-migration percentages decreases as places become fully urbanized. Higher percentages of urban in-migrants are also found in places with higher levels of educated population (indicated by the percent of local population with secondary and above education) and more urban (indicated by percent of built-up). We also find that overall migration to urban areas is less prevalent (indicated by percent of urban population that are migrants) in developing countries with higher GDP, but we did not find a significant effect of percent of working age population on subnational urban in-migration percentages. Interestingly, we also find that regions(subnational units) with higher urban population and higher levels of built-up are more likely to be homes of female in-migrants rather than male migrants.

Internal migration is not only important for projection of urbanization and city growth, it also has significant policy implications. Since migration is an important factor in the population change of urban areas in developing countries, reliable estimates and projections of migration to the urban areas are considered essential for appropriate planning of infrastructure and services (Bell et al 2015; Montgomery et al 2016). Furthermore, internal migration has been shown to have profound economic and social consequences both at the individual and macro levels. A better understanding of internal migration and sensible comparison of migration patterns across countries, particularly migration to urban areas, in developing countries, therefore, would help formulate effective policies targeting the large population of urban in-migrants in those countries.

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Appendices

Appendix 1: List of Countries in the Study by Data Source

Appendix 1: List of countries in the study by data source

NAME	ISO	Continent	Years of IPUMS data	Years of IPUMS data with migration information	Year of IPUMS with urban/rural status of current residence	Year of IPUMS with urban/rural status of previous residence	Years of DHS data	Years of DHS data with migration information	Year of DHS with urban/rural status of current residence	Year of DHS with urban/rural status of previous residence	Urban migration estimates possible with IPUMS data	Urban migration estimates possible with DHS data	Urban migration estimates possible with IPUMS AND DHS data
Benin	BEN	Africa	0	0	0	0	4	3	4	1		x	
Burkina Faso	BFA	Africa	3	0	1	0	5	3	5	2		x	
Burundi	BDI	Africa	0	0	0	0	3	1	3	0		x	
Cote d'Ivoire	CIV	Africa	0	0	0	0	4	2	4	0		x	
Cameroon	CMR	Africa	1	1	0	0	4	3	4	1		x	
Central African Rep	CAF	Africa	0	0	0	0	1	1	1	0		x	
Chad	TCD	Africa	0	0	0	0	3	1	3	0		x	
Comoros	COM	Africa	0	0	0	0	2	1	2	1		x	
Congo (Brazzaville)	COG	Africa	0	0	0	0	3	1	3	0		x	
Congo, Democratic	COD	Africa	0	0	0	0	2	1	2	0		x	
Egypt	EGY	Africa	0	0	0	0	8	7	8	5		x	
Ethiopia	ETH	Africa	3	3	3	2	3	2	3	1	x	x	x
Gabon	GAB	Africa	0	0	0	0	2	1	2	0		x	
Ghana	GHA	Africa	3	2	2	0	6	5	6	5	x	x	x
Guinea	GIN	Africa	2	1	2	0	3	1	3	1	x	x	x
Kenya	KEN	Africa	5	2	4	0	7	5	7	5	x	x	x
Lesotho	LSO	Africa	0	0	0	0	3	2	3	1		x	
Liberia	LBR	Africa	2	0	2	0	5	2	5	1		x	
Madagascar	MDG	Africa	0	0	0	0	6	4	6	0		x	
Malawi	MWI	Africa	3	1	3	0	6	4	6	2	x	x	x
Mali	MLI	Africa	3	3	2	0	6	4	6	1	x	x	x
Morocco	MAR	Africa	1	1	0	0	3	3	3	2		x	
Mozambique	MOZ	Africa	2	2	2	0	5	3	5	2	x	x	x
Namibia	NAM	Africa	0	0	0	0	4	3	4	3		x	
Niger	NER	Africa	0	0	0	0	4	3	4	1		x	
Nigeria	NGA	Africa	5	0	5	0	5	3	5	2		x	
Rwanda	RWA	Africa	2	2	1	0	7	3	7	3	x	x	x
Sao Tome and Princ	STP	Africa	0	0	0	0	1	1	1	1		x	
Senegal	SEN	Africa	2	2	1	0	8	5	8	1	x	x	x
Sierra Leone	SLE	Africa	1	0	1	0	2	1	2	1		x	
South Africa	ZAF	Africa	4	1	4	0	1	1	1	0	x	x	x
Swaziland	SWZ	Africa	0	0	0	0	1	1	1	1		x	
Tanzania *, United I	TZA	Africa	2	0	1	0	8	6	8	2		x	
Togo	TGO	Africa	0	0	0	0	3	2	3	0		x	
Tunisia	TUN	Africa	0	0	0	0	2	2	2	2		x	
Uganda	UGA	Africa	2	2	2	0	8	5	8	4	x	x	x
Zambia	ZMB	Africa	3	3	2	2	5	5	5	4	x	x	x
Zimbabwe	ZWE	Africa	0	0	0	0	5	3	5	1		x	
Armenia	ARM	Asia	2	2	2	1	3	2	3	1	x	x	x
Azerbaijan	AZE	Asia	0	0	0	0	1	1	1	0		x	
Bangladesh	BGD	Asia	3	0	3	0	7	5	7	4		x	
Cambodia	KHM	Asia	2	2	2	0	4	2	4	1	x	x	x
Fiji	FJI	Asia	5	4	2	1	0	0	0	0	x		
India	IND	Asia	5	3	5	2	3	3	3	2	x	x	x
Indonesia	IDN	Asia	9	9	9	0	7	1	7	0	x	x	x
Iran, Islamic Republ	IRN	Asia	1	1	1	0	0	0	0	0	x		
Iraq	IRQ	Asia	1	1	1	1	0	0	0	0	x		
Israel	ISR	Asia	3	2	2	2	0	0	0	0	x		
Jordan	JOR	Asia	1	1	1	0	6	4	6	1	x	x	x
Kazakhstan	KAZ	Asia	0	0	0	0	2	2	2	0		x	
Kyrgyzstan	KGZ	Asia	2	2	2	1	2	1	2	0	x	x	x
Malaysia	MYS	Asia	4	4	4	0	0	0	0	0	x		
Nepal	NPL	Asia	0	0	0	0	4	3	4	3		x	
Pakistan	PAK	Asia	3	1	3	1	3	1	3	1	x	x	x
Philippines	PHL	Asia	3	2	1	0	5	4	5	4	x	x	x
Sri Lanka	LKA	Asia	0	0	0	0	1	1	1	1		x	
Thailand	THA	Asia	4	4	4	3	1	1	1	1	x	x	x
Timor-Leste	TLS	Asia	0	0	0	0	1	1	1	0		x	
Turkey	TUR	Asia	3	0	0	0	4	4	4	2		x	
Uzbekistan	UZB	Asia	0	0	0	0	1	1	1	1		x	
Viet Nam	VNM	Asia	3	3	3	0	3	3	3	1	x	x	x
Yemen	YEM	Asia	0	0	0	0	2	1	2	1		x	
Costa Rica	CRI	North Amer	5	5	5	0	0	0	0	0	x		
Dominican Republi	DOM	North Amer	3	2	3	1	9	7	9	3	x	x	x
El Salvador	SLV	North Amer	2	2	1	0	1	0	1	0	x		
Guatemala	GTM	North Amer	0	0	0	0	3	1	3	1		x	
Haiti	HTI	North Amer	2	2	1	0	4	3	4	0	x	x	x
Honduras	HND	North Amer	0	0	0	0	2	1	2	1		x	
Jamaica	JAM	North Amer	3	3	1	0	0	0	0	0	x		
Mexico	MEX	North Amer	7	7	7	0	1	1	1	0	x	x	x
Nicaragua	NIC	North Amer	3	3	1	1	2	2	2	1	x	x	x
Panama	PAN	North Amer	6	2	5	0	0	0	0	0	x		
Argentina	ARG	South Amer	5	4	3	0	0	0	0	0	x		
Bolivia	BOL	South Amer	3	3	3	0	5	3	5	1	x	x	x
Brazil	BRA	South Amer	6	3	6	1	3	3	3	1	x	x	x
Chile	CHL	South Amer	5	5	5	1	0	0	0	0	x		
Colombia	COL	South Amer	5	5	5	2	6	6	6	0	x	x	x
Ecuador	ECU	South Amer	6	6	4	1	1	1	1	0	x	x	x
Guyana	GUY	South Amer	0	0	0	0	2	2	2	1		x	
Paraguay	PRY	South Amer	4	3	4	2	1	1	1	0	x	x	x
Peru	PER	South Amer	2	1	2	0	9	9	9	7	x	x	x
Uruguay	URY	South Amer	6	5	3	0	0	0	0	0	x		
Venezuela (Bolivar	VEN	South Amer	4	1	3	0	0	0	0	0	x		

Appendix 2: Comparison of spatial resolution used to define migration between major admin units in censuses (sqkm)