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International Migration and City Growth in the Global South

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Summary

The opportunities and risks of city growth in the global South are in contrast to the scarce demographic evidence base, especially on international migration. We analyze the contribution of internal and international migration to city growth by country and global city-size class. Combining individual-level census data (IPUMS) with indirect demographic estimation techniques, we provide estimates (including confidence intervals) of the components of population change in more than 140 metropolitan areas in the global South between 1990 and 2010. Metropolitan populations are consistently defined based on geo-spatial data. Preliminary results reveal that, although natural increase dominates city growth, net international migration is positive and/or its demographic impact is larger than that of internal migration in at least one third of the metropolitan populations in the sample. The relative growth contribution of internal migration tends to decrease with rising city size, while the role played by international movements tends to increase.

Introduction

Higher population growth in urban than in rural areas and the associated process of urbanization constitute among the most important transformations in contemporary population geography. Between 1990 and 2015, the share of the world population living in urban areas increased from 43% to 54%, with a particularly fast rise in less developed countries from 35% to 49% (United Nations, 2015). On the one hand, the increase in the number of urban inhabitants constitutes a major challenge for achieving the United Nations' sustainable development goals (SDG) for 2030 in a context of growing slum populations. On the other hand, the concentration of human activity in cities is also accompanied by new opportunities related to the educational expansion and economic growth (Bloom, Canning, & Fink, 2008). These risks and opportunities of urban growth are in contrast to the scarce evidence base on the demographic components of the process. This is especially the case at the city level, where more disaggregated demographic information can effectively inform urban and development planning. As the world is about to complete its transition towards low fertility, the lack of information on migration (especially on its international component) represents a major challenge for cities to plan infrastructure and development, and to ensure social cohesion in their diversifying populations. We aim at filling this gap by studying the demographic sources of the recent population growth in more than 140 metropolitan areas in the global South.

In the next section, we stress the need for more evidence on the role of international migration in the process of city growth. We then present the data and methods used to estimate natural increase, internal and international migration at the metropolitan level, while addressing various methodological challenges. We rely on spatially consistent definitions of city boundaries and combine the use of individual-level census data with indirect demographic estimation techniques. Given the concerns regarding the quality of the available data, we apply two complementary estimation methods and quantify the uncertainty of the derived estimates. This is work in progress. In addition to the present results for 71 cities in four countries (Brazil, Mexico, Morocco and Indonesia), the final version of this communication will cover more cities, including also in five additional countries (Philippines, Malaysia, Mozambique, Ghana and Chile).

Background

Repeated international assessments of the components of urban growth have suggested a dominant role for natural increase (i.e. more births than deaths), rather than for rural-to-urban migrations (Chen, Valente, & Zlontnik, 1998; Dyson, 2011; Jedwab, Christiaensen, & Gindelsky, 2017; Jiang & O'Neill, 2018; United Nations, 1980). With the fast decline in urban fertility rates across all continents (Lerch, 2017c), one would expect a more diverse set of patterns of population growth. The intensity of migration should increase. When the number of children declines and the national populations start to age, the majority is concentrated in the working ages at which the rate of geographic mobility is the highest. In the very low urban fertility contexts of Europe, China and South-East Asia, net rural-to-urban migration recently became the main component of urban growth (Hugo, 2014; Zheng & Yang, 2016).

However, the patterns of migration in urban areas change over the process of urbanization and economic development (Geyer & Kontuly, 1993). In the initial phase, rural-to-urban migration leads to population concentration in cities. With increasing diseconomies resulting from industrial agglomeration and congestion effects in central places, cities start to extend spatially through the delocalization of jobs; a process referred to as suburbanization. Later, with the shift from an industrial to a post-industrial economy, the significance of distance to the workplace as a residential determinant decreases as a result of the development of transport and communication technologies. These changes are accompanied by a second phase of urban sprawl, referred to as peri- or counterurbanisation (Champion, 1989). Inhabitants from central areas move into formerly rural areas located on the more distant urban periphery as they are looking for environmental amenities in less congested and more natural settings.

In more developed countries, these stages of urbanization developed one after the other over a century. Contemporary developing countries experience the different patterns of migration at the same time. Rural populations still move to the cities' vicinities in order to find a livelihood, while different social strata within the cities move either into gated communities located in the periphery of the agglomerations or to other cities. As large cities growth into mega-urban regions, the social and economic congestion effects tend to motivate a redistribution of populations to lower size-class cities. Intercity-migration is on the rise in highly urbanized countries, especially in Latin America (Rodriguez 2007).

Eventually, the demographic potential for rural-to-urban migration will shrink, at the latest when the majority of residents are living in urban areas and fertility is low. In these contexts, international migration can be expected to dominate city growth. There are at least two reasons for the central position of cities in the international migration phenomenon. First, cities are the engines of economic development and, therefore, compete with one another for both highly skilled and low skilled labor on a global scale (Sassen, 1994). Therefore, cities are national gateways for international immigrants. In 2005, 20 cities across the globe counted more than one million foreign-born residents – or one fifth of the world' migrant stock (Price & Benton-Short, 2007). International migration compensates for the inner-cities' migratory losses to the peripheries of agglomerations and may sustain a new phase of population distribution back to the city (i.e. a renewed concentration of the city's inhabitants; Kabisch and Haase (2011)).

A second reason for the growing importance of international migration in city growth is the urban infrastructure. Cities are well equipped with and well connected to international transports systems and concentrate the higher education infrastructure. Therefore, cities can be expected to be major sending areas of international migrants. More educated populations face lower barriers to mobility (in terms of costs, language skills, etc.), have a more global labor market, when compared to lower skilled workers, and higher level education tends to increase the aspirations for better political and economic opportunities abroad. While positive net international migration can be expected for a given city in periods of economic development, the balance is likely to become negative in periods of crises, when individuals look for better opportunities in other countries (Skeldon, 2008).

While the global rate of international migration has remained rather stable over the last decades (at around 0.65% over 5-year periods), the phenomenon has concerned a growing number of developing countries and has increasingly been taking place within the global South (Abel, 2016; Abel & Sander, 2014; Czaika & de Haas, 2014), from less to more urbanized countries (Özden & Parsons, 2015). In a number of low-income countries with sustained levels of natural increase and intense rural-to-urban movements, a surplus of rural migrants still moved abroad (Berry & Kim, 1994). The intensity and spatial focus (domestic versus international) of migration has important implications for human development. In sending countries, international emigration that bypass or transit through domestic cities may deplete the labor force potential for development (Skeldon 2008), even though migrant remittances may compensate for the losses (DeHaas, 2010). Large-scale rural-to-urban migration and the resulting process of urbanization, however, are commonly associated with economic growth (Bloom et al., 2008; IOM, 2015; World Bank, 2009).

Despite the potentially important role of international migration in the process of city growth, it remains under-appreciated and crucially under-documented in less developed countries. Case studies in developing contexts – such as on urban areas of post-communist Albania, and the city of Zurich during its industrial revolution – reveal a major role for international migration losses or gains in the cities' demographic fortunes (Lerch, 2014, 2017a). City growth in highly developed and urbanized countries – such as Italy – is virtually dependent on international migration (Strozza, Benassi, Ferrara, & Gallo, 2015). This is confirmed in 18 capital cities around the world – not only in the US and Europe, but also in Asia (Lerch, 2017b). Yet the experience of (economic or political) capital cities may not be generalizable to lower-ranked metropolitan areas because of their central positions in the world economic geography. We question whether international migration matters for population growth also in non-capital cities and whether its importance varies systematically according to city size.

Data and methods

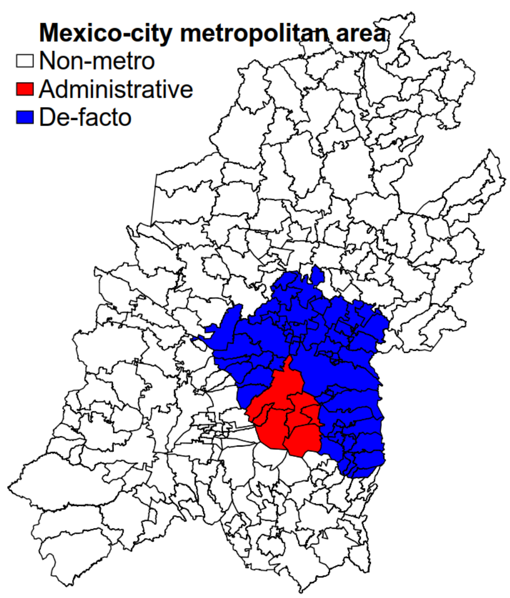
Geographic master files and individual-level demographic data for the period 1990 to 2010 were compiled in order to estimate the components of population change in more than 140 metropolitan areas, distinguishing natural increase from net internal and net international migration.

Data and definitions

Any analysis of demographic change in cities faces three main challenges. The first is related to the scarcity of official demographic statistics disaggregated by city. This concerns data on population by age and sex as well as on all components of demographic change, but the lack of data is particularly acute when it comes to (international) migration (Willekens, Massey, Raymer, & Beauchemin, 2016). To address this challenge, we assembled public use samples of individual-level records from national censuses compiled by IPUMS (Minnesota Population Center, 2017). We used information on the current residence (at the lowest available sub-national administrative level) and the individuals' responses to the question about residence at a prior date in order to estimate internal out- and in-migrations of cities. The at-risk populations were also estimated based on the IPUMS data. As these data constitute samples of the full set of census records, we have to account for possible sampling biases in our estimation method (see further down). To estimate urban deaths by age and sex, we relied on the United Nations (2017) death rates. The numbers of births and international migrations are then indirectly estimated (see further down).

The second challenge in the estimation of the components of city growth refers to the spatial delimitation of metropolitan areas. Administrative definitions of city territories often exclude the outlying areas which have been more recently urbanized. As a consequence, the internal migration balance is underestimated because it is confounded by the by out-migration from the city-core to the periphery. International migration may be over-estimated, as city-centers are major gate-ways for international migrants. Natural increase may be too low because the recent rural-to-urban migrants who were socialized to higher fertility standards at origin and settled in the city's outskirts are not included in the estimate. In order to accurately define the spatial extent of metropolitan areas, we rely on lists of their constitutive administrative units (municipalities) which have been identified using geospatial data on the continuity of the built environment. These lists, compiled by www.city-population.de, are based on elaborations by national statistical offices or by its www.city-population.de team using on available geo-spatial data. Figure 1 illustrates the discrepancy between metropolitan areas as defined according to political (legal) versus geo-spatial criteria, taking Mexico-city as an example; the resident population increases from 9 million to 21 million in 2010, respectively.

Figure 1: Official and de-facto spatial extension of the Mexico-city metropolitan area, 2010



Source: www.citypopulation.de

However, the IPUMS information on the population's current and previous place of residence is not available at the municipality level in 4 out of the 9 countries studied here. In these cases, we defined the metropolitan areas by identifying the constituent prefectures/provinces with a high population density using data available at www.city-population.de. We checked the spatial extent of the regrouped sub-national units against satellite images of the metropolitan areas (using google maps), and cross-validated the weighted IPUMS population counts against statistics published by www.city-population.de. The final sample of cities includes only those for which the discrepancy is less than 10%.

The third challenge in the estimation of the components of city growth relates to the extension of the city borders over time as the population sprawls into formerly rural areas situated in the city's vicinity (Bloom, Canning, Fink, Khanna, & Salyer, 2010; Montgomery, Stren, Cohen, & Reed, 2003). This rural-to-urban reclassification of municipalities is seldom documented and usually confounds indirect estimates of the demographic components of population change. We therefore defined metropolitan areas according to the spatial boundaries at the end of our observation periods and apply this definition to population data in earlier years. We rely on IPUMS data that include information about the subnational administrative unit of residence which has been spatially harmonized across different census rounds in a given country. This enables us to focus on demographic processes within constant spatial extents of metropolitan areas.

Our mapping of the available statistical information identified at least 9 countries with IPUMS census-samples that meet the data requirement for the estimation of the components of city growth. Up to date, we have results for 70 cities in four countries: Brazil, Mexico, Morocco and Indonesia. The work on other cities within these countries, as well as on cities in other countries (Philippines, Malaysia, Mozambique, Ghana and Chile), is in progress and will be included in the final version of this communication at the PAA 2019. Appendix-Table 1 reports the metropolitan areas covered so far, the periods of observation, as well as information about the operationalization of the spatial definition of metropolitan areas.

Method

Given the concerns about the quality of the data, we applied two complementary methods for the estimation of the components of metropolitan growth and quantified the uncertainty of the estimates.

Estimation at the aggregate level

In the first approach, we estimated the components of demographic change at the aggregate population level, using the demographic balancing equation method. Population change is measured based on counts by age and sex at two censuses (*N1* and *N2* in equation 1). The number of deaths (*D*) during the interval is estimated by multiplying the UN's annual sex- and age-specific mortality rates with the person-years lived in each age group, as approximated by the average of the population at the start and end of the period multiplied by the length of the interval. Net internal migration (*NMinternal*) is computed based on the number of in- and out-migrations: the person-years lived during the interval is multiplied with the annual average migration rates at the ages 5 and over, as estimated based on the IPUMS census samples that close the intervals. We rely on the question about place of residence five years ago and assume that the annualized rates of migration prevailed throughout the whole intercensal period.

$$NMabroad = N2 - N1 + D - B - NMinternal \qquad (1)$$

In this indirect estimation procedure, the number of births (*B*) is estimated first by reverse-survival of the numbers of children aged less than 10 years at the second census (Moultrie et al., 2013). The number of net international migrations (*NMabroad*) is obtained in a second step as the residual of the demographic balancing equation of the total population:

Based on these counts of the aggregate components of demographic change, we estimated annual crude rates (relative to the person-years lived during the interval) for the total and the sex-specific populations (after redistribution of the number of births by sex according to a standard sex-ratio of 105 boys for 100 girls).

The indirect estimates of the number of births and net international migration may be significantly affected by differential levels of enumeration completeness of the two censuses, or by differential biases introduced by the sampling of the IPUMS data from the full set of census records. We therefore provide lower and higher confidence intervals of our point estimates by replicating the procedure outlined above after adjustment of the population counts at the second census for a hypothetical rate of differential under- and over-enumeration/sampling of three percent, respectively.

Estimation by age group

As young children are more frequently undercounted in censuses, when compared to older population groups, our estimate of natural increase may be particularly under-estimated. The residual net international migration would then be over-estimated. Yet, natural increase may also be overestimated, as it is computed based on the age structure at the second census, which includes the internal and international immigrants during the interval. In this case, the residual international migration would be under-estimated. In order to cross-validate the results based on the aggregate method, we therefore applied an alternative procedure of indirect estimation, in which the number of net international migrations is obtained as the first residual and the number of births as the second residual.

To obtain estimates of international migration, we adapted Hill's (1987) method which applies the demographic balancing equation to age groups; see also Hill and Wong (2005). Hill proposed to estimate (overall) net migration at age *x* to *x+5* (${}_5NM_x$ in Equation 2) between two dates as the residual of, on the one hand, the change in the age-specific population counts (${}_5N2_x - {}_5N1_x$), and on the other hand, the sum of the numbers of deaths (${}_5D_x$) and the transitions in and out of a given age group (B_x and B_{x+5}, respectively) due to the ageing of the population:

$$ {}_5NM_x = ({}_5N2_x - {}_5N1_x) + {}_5D_x - B_x + B_{x+5} \quad (2) $$

The number of birthdays in and out of an age group can be approximated from the age-specific population numbers at the start and the end of the period[1]. The number of deaths during the interval is computed in the same way as in the aggregate method (see above). The main

[1] $B_x = (t/5)^* ({}_5N1_{x-5} * {}_5N2_x)^{1/2}$. This equation approximates the number of entries into age group *x* to *x+5* by accounting also for mortality: ${}_5N1_{x-5}$ includes individuals that will die before moving in the next age group during the period of length *t*, whereas ${}_5N2_x$ only includes the survivors of those who entered the age group in the period.

advantages of Hill's method, when compared with the conventional cohort-survival method of estimating migration by age (Siegel & Swanson, 2004), is that it directly provides estimates for age-groups (rather than age-cohorts), and that it is able to accommodate intercensal intervals that are not exactly ten years.

In order to obtain net international migration as a residual, we subtracted from the estimated number of net migrations (by age group, ${}_5NM_x$) the number of net *internal* migrations over the period. The latter numbers are estimated in multiplying the age-specific numbers of person-years lived during the interval with the annual average net migration rates, as computed based on the IPUMS data for the age groups 5 to 9 years up to the group aged 75 years and over. The numbers of internal and international migrations in the first age-group (aged 0 to 4 years) are estimated by multiplying the number of female migrants at the ages 20 to 44 with the child-women ratio observed in the population at the end of the interval.

The total number of births in the intercensal period is then obtained as a second residual, between total population change and the sum of the age-specific deaths and internal and international migrations over age:

$$B = N2 - N1 + D - NMinternal - NMabroad \quad (3)$$

As in the aggregate-level procedure, we computed lower and higher confidence intervals, assuming respectively a three percent under- and over-enumeration/sampling at the second census.

Assessment of the quality of the residual estimates of international migration

In order to better understand the quality of our residual estimates of international migration, we implemented a series of consistency tests. First, we found no systematic difference according to city-size between the aggregate-level and summed age-specific estimates in the full sample of cities. However, the distribution of the city-specific differences between the two estimates varies by country. In Brazil and Mexico, the aggregate-level method generally implies a higher international migration residual than the age-specific method (i.e. 0.03 percentage points higher on average). This tends to confirm an under-estimation of natural increase based on the age-sex structure of the enumerated population (meaning that census under-count is higher among children when compared to older populations). In Indonesia and Morocco, by contrast, the aggregate-level method generally implies lower international migration residuals than the age-specific method (i.e. 0.03 and .12 percentage points lower on average in Indonesia and Morocco, respectively). This may be explained by problems in the census enumeration of adolescents and young adults, who are hard to reach and for whom (especially among the students) the concept of usual residence is ambiguous.

As international migration is a rare phenomenon, the major uncertainty in our estimates stems from potential intercensal differentials in the levels of enumeration completeness of the total population. Assuming a 3% level of over-enumeration at the second census yields to up to twice a level of international migration, if the point estimate is below or equal to 1.5%. When presenting the results below, we therefore averaged the point estimates based on the aggregate and the age-specific methods, and plot the maximal confidence interval.

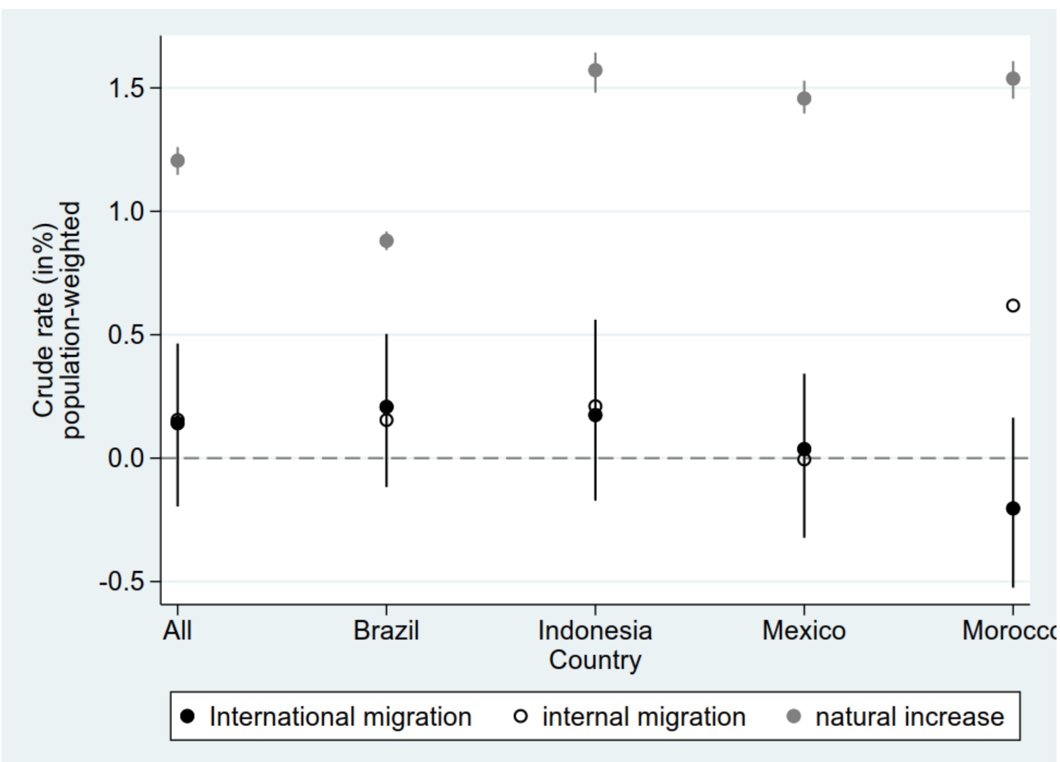
Preliminary results

The components of metropolitan population growth by country

The four countries covered by this preliminary analysis provide an interesting set of national contexts. While Mexico and Brazil are among the most urbanized countries in the world in 2000 (with 75% and 81% of their population living in cities; (United Nations, 2015)), just half of the Moroccan population lived in urban areas, and Indonesia counts 58% of its inhabitants in rural areas. The four countries also experienced contrasted international migration regimes over the last 50 years. Mexico and Morocco were among the major migrant sending countries in the world, with troughs in the annual rates of net international migration reaching -6% (in the early 2000s and 1970s, respectively; (United Nations, 2017)). Both countries recently shifted from a traditional emigration to a transit country for migrants originating from South America and sub-Saharan Africa, respectively. Mexico also experienced significant return migration from the U.S. since the financial crisis in 2008. In Brazil and Indonesia, by contrast, the level of net migration was close to zero over the last 50 years. Immigration from other Latin American countries increased in Brazil only since 2000 (with the free movement of people in the context of Mercosur treaties). The international migration balance was only slightly negative in Indonesia until 1990, but started to drop significantly to 0.8% per year in the 2000s (UN 2017). We question whether these recent country-specific rates of international migration are also observed in the different metropolitan areas.

Figure 2 shows the population-weighted average rates of natural increase, net internal and net international migration for all cities combined, as well as by country.

Figure 2: Average (population-weighted) rates of natural increase, net internal and international migration in 70 metropolitan areas by country, 1990-2010.

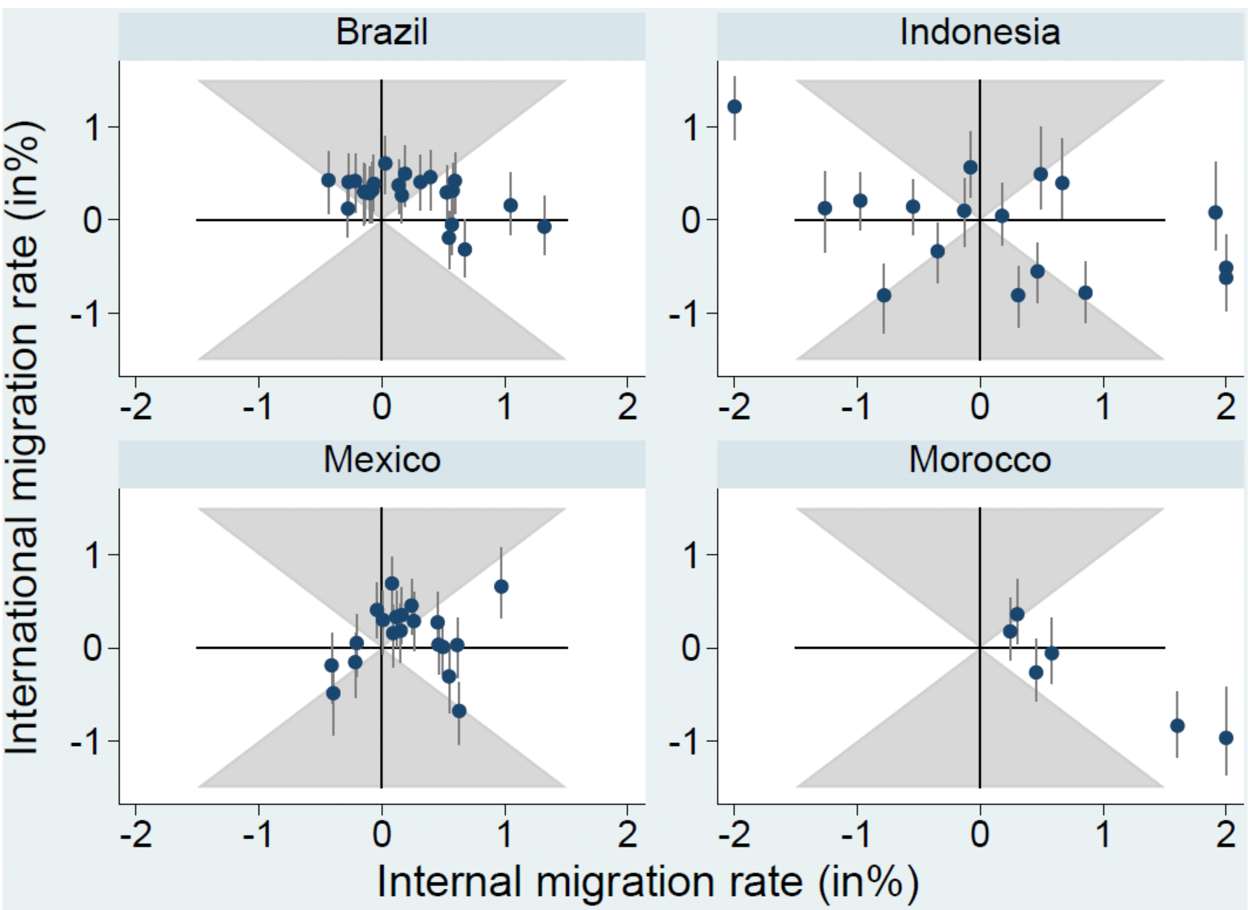


Sources: own estimates based on www.city-population.de & IPUMS-International.

The results confirm a dominant role for natural increase in urban growth, as highlighted by earlier studies. In the average city, the crude rate of natural increase was 1.2%. The rates of internal and international migration were both positive but below 0.3%. The relative contribution of total net (international and internal) migration to average metropolitan population growth was highest in the average Brazilian city (representing 41% of the level of natural increase), followed by the Indonesian (25%) and Mexican (2%). Interestingly, the level of international migration was at par with that of internal migration in Brazil, Indonesia and Mexico. Morocco was the exception as the net gains from internal migration towards cities have been partially annihilated by a net international emigration of 0.3% per year.

Natural increase dominated urban growth in 59 out of the 71 cities. Large populations indeed transform predominantly due to endogenous factors. However, there is significant diversity in the patterns of internal versus international migration across cities. We plotted in Figure 3 all cities by country according to the annual rate of net internal and international migration (on the x- and y-axis, respectively). The metropolitan populations situated inside of the two gray-shaded areas were more affected by international than internal migration. Outside of these gray-shaded areas, the internal movements had a major demographic impact.

Figure 3: Annual rates of net internal and international migration, 70 metropolitan areas in Brazil, Mexico, Indonesia and Morocco, 1990-2010.



Sources: own estimates based on www.city-population.de & IPUMS-International.

In Brazil, 13 out of 23 cities experienced larger international than internal migration. While nine cities experienced negative net internal migration, net international migration, was positive in almost all metropolitan areas. The only cities with a dominant and positive internal migration are situated close or adjacent to Sao Paulo (Campinas, Baixada-Santisata, and Grande Vitoria). They may absorb residential mobility out of the economic capital. The situation is similar in Mexico, with 12 out of 21 metropolitan populations being mainly affected by international migration. The majority of cities experienced positive internal *and* international migration balances, with only few exceptions. Juarez (a city located on the border to the U.S.) and Acapulco (a touristic city in the South) lost population due to both, internal and international migration. In greater Mexico and its satellite cities (Cuernavaca, Cuautla), net international migration losses annihilated the positive growth contribution of internal migration. These exceptions are consistent with the traditional migration routes to the US, starting from the Center/East or South of the country towards the capital region or cities at the Northern border, where people leave to the U.S.).

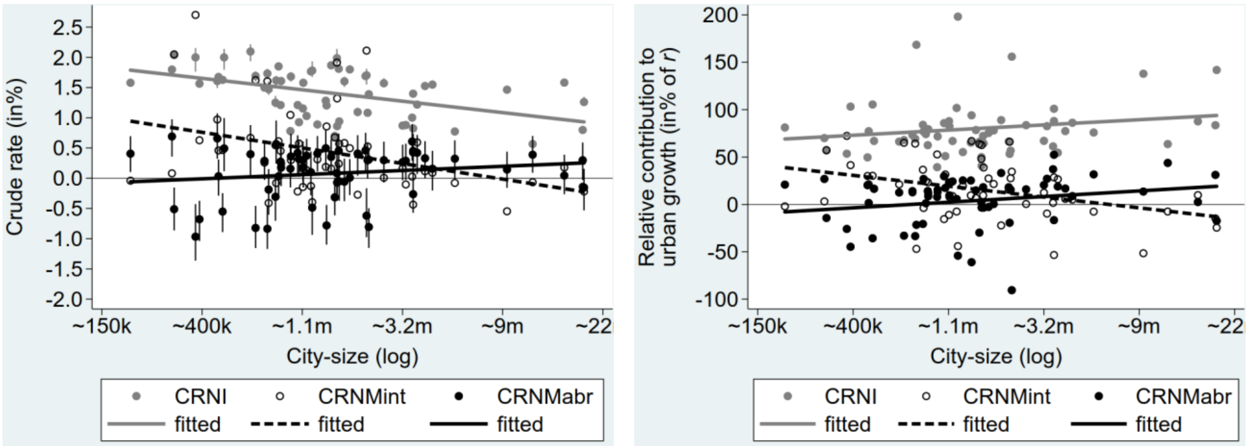
All Moroccan metropolitan agglomerations experienced net gains from internal migration – consistent with the relatively low level of urbanization. Only Marrakech experienced a positive and dominant international migration (the balance was also positive and almost equal to internal migration in Fes, too). Elsewhere, net international migration losses partially annihilated the important gains from internal migration – especially in Tanger (which is situated the closest to Europe, the main destination of international migrants) and Inezgane-Ait-Melloul.

In Indonesia, only 7 out of 19 cities were affected to a greater extent by international rather than by internal migration. Greater Jakarta (including Tangerang, Bekasi, and Depok) experienced positive but very low levels of net internal and international migration. This may be due to the counter-balancing of large in- and out-flows. Only two cities experienced positive and dominant international migration (Bogor – located South of Jakarta, Balikpapan in the South of the island Kalimatan). Several cities dispersed across the different islands of the country were predominantly and negatively affected by international migration (Bandung, Samarang and Surabaya in Java, Palembang in Sumatra, Pontianak in Kalimatan). Moreover, net internal migration was negative in a number of cities (most strongly in Yogyakarta, Surakarta, Palembang). This is surprising, given the low level of urbanization in Indonesia, and may indicate important inter-city movements.

The contribution of internal and international migration to metropolitan growth by global city-size class

Figure 4 plots the level and relative growth contribution (left- and right-hand side panel, respectively) of natural, net internal and international migration of all cities according to (logged) metropolitan population size. The demographic impact of internal migration tends to be more important in smaller than in larger cities. A similar negative association with city-size also holds for the level of natural increase. On the one hand, this can be explained by the fact that even constant increments to an expanding population must represent an ever smaller share of that population. On the other hand, large cities tend to have lower levels of fertility and to be situated in more urbanized countries, in which the rural reservoir of population (i.e. the number of potential internal migrants) has shrunk significantly.

Figure 4: Annual rates of natural increase, net internal and international migration (left-hand panel), and their respective relative contributions to metropolitan growth (right-hand panel), according to city-size, 71 cities in Brazil, Mexico, Indonesia and Morocco, 1990-2010.



Sources: www.citypopulation.de, IPUMS-international

Notes: k = thousand, m = million, CRNI = crude rate of natural increase, CRNMint = crude rate of internal migration, CRNMabr = crude rate of international migration, *r* = total growth rate.

The demographic effect of international migration, by contrast, increases with rising city-size. Large cities appear to be more attractive to potential international migrants from foreign countries than smaller cities. As this positive association is weak (with an r2 of 0.16) and non-significant, it must be confirmed in the full set of cities (for which the estimations are in progress). Nevertheless, the scatter plot clearly shows that while some cities with less than 3 million residents often experience a negative international migration balance, this is rather rare among the mega cities (with greater Mexico being the exception, due to its importance as an intermediary migration step on the route to the U.S.).

While the relative growth contribution of internal migration decreases with rising city-size (due to the reasons mentionned above), those of The international migration and natural increase increase. Large cities not only tend to grow more and more due to endogenous demographic factors, but also attract the bulk of international migrants due to their central position in national economic geographies.

First conclusions

This study provided the first comparative estimates of the components of city growth (including international migration) for a large number of metropolitan areas in the global South, by combining the use of individual-level census data with indirect demographic estimation techniques. We relied on geo-spatial definitions of the extent of metropolitan areas that are consistently applied over time in order to eliminate the bias of reclassification in the analysis.

Natural increase clearly dominated in the recent metropolitan population growth, despite a low level of fertility. Age-structure effects due to past in-flows of young migrants are probably key drivers of this phenomenon. The results also revealed a significant role for international migration. The growth contribution of international migration also tends to be larger than that of net internal migration in a number of cities, especially in highly urbanized countries. We are currently expanding the analytical sample with five additional countries (at least 70 cities) in order to confirm these conclusions.

Appendix-Table 1: Sample of metropolitan areas by country, period of observation and definition, 1990-2010

Country	**Period**	**Metropolitan area**	**Population (end period)**	**Definition of metropolitan area**
Brazil	2000-2010	Sao_Paulo_Baixada_Santisata	21,416,993	Municipalities contained in metro area, according to national statistical office
		Sao_Paulo	19,753,631	
		Rio_de_Janeiro	11,986,830	
		Belo_Horizonte	5,513,552	
		Porto_Alegre	4,112,733	
		Distrito_Federal	3,785,428	
		Salvador	3,636,883	
		Fortaleza	3,601,580	
		Recife	3,379,742	
		Curitiba	3,272,756	
		Goiania	2,307,947	
		Manaus	2,262,387	
		Belem	2,090,219	
		Grande_Vitoria	1,738,917	
		Campinas	1,703,232	
		Baixada_Santisata	1,663,362	
		Grande_Sao_Luis	1,521,001	
		Natal	1,399,033	
		Joao_Pessoa	1,255,750	
		Grande_Teresina	1,210,537	
		Norte_Catarinense	1,163,982	
		Maceio	1,148,688	
		Florianopolis	1,068,510	
Indonesia	2000-2010	Jakarta-greater2010	16,443,270	Adjacent provinces with high population density and contained in metro area, according to www.citypopulation.de and satellite images (google maps)
		Jakarta	9,281,930	
		Tangerang2010	3,002,460	
		Surabaya	2,733,660	
		Bandung	2,336,820	
		Bekasi2010	2,284,260	
		Medan	2,049,090	
		Depok2010	1,699,410	
		Semarang	1,532,470	
		Palembang	1,441,020	
		Makassar	1,311,080	
		Bogor2010	926,930	
		Malang	800,310	
		Samarinda	717,460	

		Balikpapan2010 Pontianak2010 Surakarta Yogyakarta Kupan2010	551,330 543,140 492,000 377,430 334,810	
Mexico	2000-2010	Greater Mexico Guadalajara Monterrey Puebla_Tlaxcala Toluca Tijuana Leon Juarez Laguna Merida Aguascalientes Cuernavaca Acapulco Morelia Tlaxcala_Apizaco Pachuca Cuautla Zacatecas_Guadelupe Tula Tianguistenco	20,014,450 4,410,442 4,094,796 2,715,575 1,932,724 1,730,591 1,604,170 1,328,246 1,214,931 968,815 949,251 920,408 859,676 824,863 521,314 515,075 431,057 327,553 216,553 155,690	Municipalities contained in metro area, according to national statistical office
Morocco	1994-2004	Casablanca Rabat Marrakech Fes Tanger Tanger_city2010 Rabat_city Inezgane_ait-melloul	3,636,100 1,831,240 1,073,800 973,580 848,840 754,800 623,060 414,440	Adjacent provinces with high population density and contained in metro area, according to www.citypopulation.de and satellite images (google maps)
Philippines	2000-2010	*in progress (not yet included in this draft)*		Municipalities contained in metro area, according to www.citypopulation.de definition
Ghana	1984-2000	*in progress (not yet included in this draft)*		Adjacent districts with high population density and contained in metro area, according to www.citypopulation.de and satellite images (google maps)

Malaysia	1990-2000	*in progress (not yet included in this draft)*		Adjacent districts with high population density and contained in metro area, according to www.citypopulation.de and satellite images (google maps)
Chile	1992-2002	*in progress (not yet included in this draft)*		Municipalities contained in metro area, according to www.city-population.de definition
Mozambique	1997-2007	*in progress (not yet included in this draft)*		Adjacent districts with high population density and contained in metro area, according to www.citypopulation.de and satellite images (google maps)

Notes: metropolitan areas containing a calendar year in their name have been defined based on non-consistent sub-national administrative areas across census rounds because the harmonized information refers to a territory that includes non-metropolitan areas.

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