How is internal migration reshaping metropolitan populations in Latin America? New methodologies and new evidence

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Abstract

Due to its socio-demographic selectivity, migration can modify the population structure in both origin and destination. In the case of Latin American metropolitan areas, this "qualitative" impact was relatively stylized some decades ago (although it was never measured in a rigorous way) as all large cities registered massive net in-migration due to flows originating predominantly from rural areas. Then, the stylized fact/effect consisted in the "ruralization of cities". The current migration scenario in Latin American metropolitan areas is different since in-migration no longer comes mainly from rural areas but from other cities; moreover, out-migration from large cities is growing (in many cases, out-migrants outnumber in-migrants). Consequently, the stylized effect of the past probably no longer exists. In order to shed some light on this issue, a new procedure based on the so-called "matrix of flow indicators" is used. The "qualitative" impact of internal migration on population composition will be estimated for eight cities of 1 million or more residents in three Latin American countries with micro-data from the 2000 and 2010 census rounds (Ecuador, Mexico and Panama). The impact of internal migration is measured for sex ratio, percentage of children, percentage of older people and average education. The results indicate that migration still contributes to the reshaping of population composition in metropolitan areas, but its impact is decreasing and out-migration has become as important as in-migration.

I. Introduction

There is wide debate about the migration dynamics in large cities and its perspectives. Part of this debate is related to the effects of migration on population characteristics. These effects derive from the well-known migration selectivity. For example, if the immigrant population is younger than the resident population, immigration will tend to rejuvenate the city. But if the out-migrating population is younger than the resident population, migration will tend to intensify the aging process of the city. The final effect of migration on the age structure depends on the numerical balances between in-migrants, out-migrants and non-migrants as well as the age differences between these three groups.

It is possible to quantify the effect of migration on population composition through the procedure used in this study. However, it should be noted that the results obtained through this procedure are far from perfect and are based on certain assumptions. Besides, they are subject to the limitations of the data source on migration available in Latin America[1]. Nevertheless, the results

[1] Which is the population census, and in particular the item on "the place of residence at a specified date in the past" (normally five years ago).

obtained by means of this procedure might represent a significant methodological advance and are highly useful for academic debate and for the formulation of public policy on internal migration in Latin America.

II. Background

Until the mid 1980s, there was extensive research on the effect of internal migration on the population composition of large cities. This literature was framed by the rapid process of urbanization and metropolization in the region which in turn was closely related to the development model based on import substitution adopted in several Latin American countries between the 1930s and 1970s. The conceptual contributions of these studies were more sociological. In contrast to the classical narrative of migrant assimilation , the emphasis was placed on the socio-cultural change that the massive arrival of immigrants from the countryside meant for the city, the relations of solidarity and conflict in the areas where the immigrants settled, and the probabilities of social integration or marginalization that they had in economically dynamic cities but with high levels of social inequality, increasing informality of the labor market and low investment and poor public regulation (Elizaga, 1972 and 1970; Alberts, 1977). Strictly in demographics terms the emphasis was placed on the effects caused by the selectivity of these migrants (at least by sex and age)[2], but the available data and the existing methodological tools to quantify these effects were very limited (see box 1).

Box 1
Internal migration and changes in the population sex and age structure: the case of Latin America until the 1980s

The analysis reveals a high concentration of young adults of both sexes, and particularly, a more intensive migration of women. This behavior is not identical in all areas given that some regions are affected by international migrants, whose characteristics are different from those of internal migrants. This is the case of Greater Buenos Aires, where in 1960 half of the population was migrant, 57 percent of them were Argentineans from other parts of the country and 43 percent were international migrants. The uneven distribution by sex and age between internal and international immigrants is not enough to even the sex ratio of the total migration, which is 98 men per 100 women, in comparison with the sex ratio of 100 for the non-migrant population.

Source: Camisa, 1972, summary s/p.

Nowadays, this subject requires new conceptual approaches and an update of the evidence for two reasons. First, the attractiveness of cities to migrants is no longer guaranteed, and thus the relevant effects may also be caused by out-migration. This involves methodological challenges, which are impossible to address with the data sources used in the past, typically city surveys (i.e., in the destination) in which out-migration was not considered. And second, the prevailing migratory pattern is the movement between cities, and therefore, the migrant profile no longer

[2] "*Migration in Latin America is selective by age (15-35), by sex (feminine)…*" CELADE, 1979, p.93.

corresponds to the "typical" in-migrant from the countryside with low levels of education, among other characteristics.

Additionally, the gradual decline of immigrant waves into large cities, the slow consolidation of net out-migration in few cities (almost all of them megalopolis or metropolis) and the (growing) importance of the quality of human resources to the economic growth in cities, have shifted the attention of the authorities and specialists from the quantitative effects of internal migration to its qualitative effects (CEPAL, 2012)[3]. Hence, to present an updated panorama of the socio-demographic implications of migration to large cities is of great interest to academics, politicians, policy makers and the public in general.

III. Theoretical framework

There is consensus that internal migration, due to its selectivity, modifies population composition in both areas of origin and areas of destination (Box 2).

Box 2
Internal migration and population composition change

It is commonly recognized that internal migration, defined as a change of residence from one county to another, is the most important component of small area population change (Long & Wetrogan 1986; Rives & Serow 1984; Wetrogan 1983; Lycan & Weiss 1979). Migration also is the principal determinant of differences in population change and structure among such areas (Goldstein 1976: 425).[1] For this reason, among others, migration is generally a major preoccupation for county and municipal planners responding to changing land use, housing, and transportation patterns; for labor market analysts examining the changing human-resource base of a local economy; for businesses confronting changing demand for goods and services; for school administrators anticipating facility construction and instructional needs due to the changing number and composition of students; and for social service providers responding to changing client and community needs. In the mid-1990s,

Source: Voss et al., 2001, p. 587.[4]

However, there is no hegemonic theory that predicts the magnitude and sign of these effects in large cities. In part, this is because the ultimate impact is due to two components with distinct determinants. On the one hand, there is a difference between the characteristics of in-migrants and the characteristics of urban non-migrants during the analysis period. On the other hand, there is a difference between the characteristics of out-migrants and those of urban non-migrants. Moreover, the magnitudes of the flows and, especially, the amount of net migration have a key influence on the final effect.

In the case of Latin America in the past, when in-migration flows to large cities predominantly came from rural areas, the qualitative effect of migration could be described in a relatively

[3] ECLAC, 2012. Población, territorio y desarrollo sostenible [WWW Document]. ECLAC. www.cepal.org/celade/noticias/paginas/0/46070/2012-96-Poblacion-WEB.pdf
[4] Voss, P., R. Hammer y A.M. Meier (2001), "Migration Analysis: A Case Study for Local Public Policy", Population Research and Policy Review, vol. 2, núm. 6, pp. 587-603.

stylized manner, both demographically[5]: increasing the proportions of young people ("rejuvenating") and women ("feminizing") in large cities (see box 1) and at the same time, reducing the average level of education in the city, as well as sociologically: "ruralizing" the city[6].

Why do these effects occur? On the one hand, there are generic causes related to migration determinants and to the migration-development relationship. On the other hand, there are specific elements of Latin American society and economy. In the case of the "rejuvenating"[7] effect, generic factors are predominant given that, as is well documented, globally the intensity of migration is higher among youth. The push factors in the countryside (access to land and resources, inheritance practices distribution of power within the community and families, possibilities of emancipation, work opportunities, recreation options and matchmaking, etc.) are particularly strong for rural youth. Also the pull factors in the city (including a dynamic labor market, educational opportunities, spaces for amusement, recreation and access to culture, ad-hoc housing supply) are particularly relevant to them[8]. The region-specific reasons that encourage the out-migration of rural youth are the marked concentration of opportunities and resources in the cities, especially the location of secondary and tertiary educational institutions. In fact, studies based on traditional procedures and data from the 1980s and 1990s showed that in all the cities analyzed net migration was positive for young people (15-29 years old), even in cities where overall net migration was negative.[9]

In the case of women, the reasons are more region-specific – in fact, in other world regions there is no evidence of female predominance in internal migration (Bell, 2009) or female majority of in-migrants to large cities. The reasons are a mix of cultural and socio-economic peculiarities of the region. The most relevant cultural characteristic in this case is the contrast between a strong and traditional male chauvinism in the countryside that holds women back and a growing influence of modern Western culture on women's aspirations in general. This mismatch encourages women to move to urban areas, where it is more likely that they will achieve such aspirations. The socio-economic characteristics relevant here are several. In the first place, there are persistent socio-economic gaps between countryside and city that encourage rural-urban migration. Second, there are enormous socio-economic inequalities within cities that generate an affluent class which demands services typically offered by women such as domestic work. And third, there is a weaker link between urbanization and industrial development, and therefore the urban economy of Latin America has a larger than expected service sector and this sector has higher demand for female labor (CEPAL, 2012).

[5] Alberts, J. (1977), Migración hacia áreas metropolitanas de América Latina. Un estudio comparativo, CELADE, E. 24; Elizaga, J. C. (1972), Migraciones interiores, el proceso de urbanización, movilidad social. Serie A, CELADE, Santiago de Chile, Nº 117.

[6] Quijano, A. (1980), Dominación y cultura. Lo cholo y el conflicto cultural en el Perú, Mosca Azul editores; y 1977, Dependencia, urbanización y cambio social en América Latina, Mosca Azul editores; Lewis, O. (1961), Antropología de la pobreza: cinco familias, Bogotá, Fondo de Cultura Económica.

[7] "Rejuvenating" in the social sense of the term, i.e. an increase in the percentage of young people.

[8] Bell, M. y S. Muhidin, (2009), Cross-National Comparisons of Internal Migration, Human Development, UNDP, Research Paper 2009/30; Rodríguez. J. (2008), Migración interna de la población joven: el caso de América Latina, Revista Latinoamericana de Población, Año 2, Número 3, julio-diciembre 2008, pp 9-26; http://relap.cucea.udg.mx/articulos/3/articulo%201.pdf; Greenwood, M. (1997), Internal migration in developed countries, Handbook of Families and Population Economics, Amsterdam, Elsevier, pp….; Tobler, W. (1995), "Migration: Ravenstein, Thornthwaite, and Beyond", Urban Geography, vol. 16, núm. 4, pp. 327-343.

[9] Rodríguez, 2008, op.cit

Finally, with regard to the effect on education, the massive immigration from countryside to the city implied the arrival of people with lower levels of education compared with the resident population. Hence, in the context of the ruralization hypothesis, the predicted impact of migration on the educational composition of the population was the reduction of educational levels in cities.

During this stage, out-migration from large cities was quite small and there were no empirical sources for studying its selectivity. As a consequence, no relevant theory or hypothesis on the qualitative effects of out-migration existed.

The current scenario is different. First, out-migration from large cities is growing (in many cases, out-migrants outnumber in-migrants). Second, immigration no longer comes mainly from rural areas but from other cities. As a result, the differences between in-migration flows and urban non-migrants –as far as the composition by sex and education is concerned – have probably been narrowed.[10]

Since the direction and magnitude of the effect of migration are determined by the quantity and, above all, by the selectivity of migration flows, it is easier to make theoretical projections of the impact when the exchange occurs between two notably different areas and with a systematic balance (typically positive for the one and negative for the other).This was the case in the past, when most of the effect was due to the immigration from the countryside to cities. However, this is no longer so.

With this scenario in mind, two theoretical frameworks are useful. The first one describes migration to large cities based on the classical determinants of migration, i.e. the search for opportunities, especially opportunities for work and education. For this reason, it is expected that these flows will continue to be characterized by a high proportion of young people (age selectivity), but its composition by sex and education will not be as different from those of urban non-migrants as it had been in the past. So, the only firm hypothesis offered by this theory is the permanence of the "rejuvenating effect" of migration to large cities. The second theoretical framework refers to the out-migration from the cities. In this case, non-traditional determinants (quality of life, residential life cycle) have a more influential role. In particular, the hypothesis of the affluent de-concentration/ suburbanization implies a massive out-migration of young families with high income, which could increase the proportion of older persons in large cities (ageing effect) and could reduce skilled human resources at the same time.

In summary, the empirical estimation of the effect of migration on the demographic composition of the population of large cities will help to resolve the ongoing theoretical debate. Additionally, distinguishing between the effect of immigration and the effect of out-migration is relevant because their determinants are different and appropriate policies for each flow are different as well.

IV. Methodological framework

[10] ECLAC, 2012, Population, territory and sustainable Development, ECLAC, Santiago, Chile, June LC/L.3474(CEP.2/3); Matos, Ralfo (2009), "Fatores de fixação em cidades intermediárias e percepçao dos habitantes", paper presented in VI Encuentro nacional sobre migraciones, Belo Horizonte, 12-14 of August [online] www.abep.nepo.unicamp.br/docs/anais/outros/6EncNacSobreMigracoes/ST2/RalfoMatos.pdf.

Methodological procedures and tools

Up until a few years ago the effect of migration on socio-demographic composition used to be estimated through comparisons between migrants and non-migrants, as is shown in Table 1. The problems of this approximation are evident since, being an unrepresentative sample of the population, migrants often stray significantly from the averages of non-migrants (whether for genuine reasons or due to compositional effects derived from selectivity). The weaknesses of this approach are not overcome by introducing the emigrants to the comparison, since behind each group average are the absolute numbers and the combination of both parameters is the one that defines the magnitude of the effect of migration on a determined attribute in origin and destination.

Table 1
Bolivia, 2001: Average years of study, head of household, according to recent migratory condition (last 5 years), by department

Region (Department)	Inmigrant	Emigrant	No migrant	Absolute difference between Inmigrants and No migrants	Absolute difference between Inmigrants and Emigrants
Chuquisaca	5.32	5.23	4.99	0.33	0.09
La Paz	7.21	7.24	7.14	0.07	-0.03
Cochabamba	6.57	6.52	6.38	0.19	0.05
Oruro	7.3	7.47	7.19	0.11	-0.17
Potosí	4.75	4.86	4.57	0.18	-0.11
Tarija	6.54	6.58	6.34	0.2	-0.04
Santa Cruz	7.73	7.73	7.67	0.06	0
Beni	7.18	7.32	7.02	0.16	-0.14
Pando	7.18	6.94	6.33	0.85	0.23
Total	6.84	6.84	6.75	0.09	0.09

In fact, Table 2 displays a procedure published more than 15 years ago but never implemented according to a literature search carried out by the authors of the present work. The procedure consists of a theoretical calculation of the impact of migration on the educational composition of a population (% of population with high school diploma) in two areas with migratory exchange. Despite the intuitive condition of the procedure, its application has at least two important limitations: a) it only considers two territorial divisions but in reality countries have far more; b) it requires population data from before and after migration, which is unusual, and actually inexistent in the case of censuses.

Table 2
Theoretical procedure to quantify the impact of migration in origin and destination

	Region A		Region B		Migrants
	Number	%	Number	%	B → A
Before migration					
Population	1 000		500		100
Population with high school or over	800	80	250	50	70
Population without high school	200	20	250	50	30
% with high school or over in A / % with high school or over in B	**(80/50=1,60)**				
After migration					
Population	1 100		400		
Population with high school or over	870	79	180	45	
Population without high school	230	21	220	55	
% with high school or over in A / % with high school or over in B	**(79/45) = 1,75**				

Source: Mario Polese, Economía urbana y regional. Introducción a la relación entre territorio y desarrollo, Cartago, Libro Universitario Regional, 1998, p. 198.

Due to these problems and limitations, the Latin American and Caribbean Demographic Centre (CELADE) – the Population Division of ECLAC - developed an *ad hoc* procedure disseminated through various means since 2004 (Rodríguez, 2001, Rodríguez and Busso, 2009, Rodríguez, 2007a; Rodríguez, 2004a y 2004b).[11] This procedure, used for estimating internal migration´s "effect on sociodemographic composition", is based on the matrix of flow indicators (ECLAC, 2012). The procedure consists of comparing factual (observed at census date, this is considered observed migration flows) and counterfactual (values that would have been registered in the absence of migration) indicators. Operationally, the factual value is taken from the marginal of current residence in the matrix and the counterfactual from the marginal of place of residence at a specified date in the past (usually five years). This effect will be measured for sex ratio, percentage of children, percentage of older persons and average education (years of schooling) of

[11] For more details see: Rodríguez, 2012, "Migración interna y ciudades de América Latina: efectos sobre la composición de la población", Estudios Demográficos y Urbanos, vol. 27, núm. 2 (80), pp. 375-408; and Rodríguez, J. (2009), "Dinámica demográfica y asuntos urbanos y metropolitanos prioritarios en América Latina: ¿qué aporta el procesamiento de microdatos censales?", Notas de Población, nr. 86, Santiago de Chile, ECLAC / Celade, pp. 63-100 <http://www.cepal.org/publicaciones/xml/6/35866/lcg2349-P_4.pdf>.Rodríguez, 2007a, 2004a y 2004b. It is worth mentioning that a key assumption of the procedure is the invariability or identical variability of the attribute in the entire population in the five years before the census. This assumption is achieved almost entirely for various relevant attributes, such as sex, age, ethnicity and education after a certain age threshold. Precisely for this reason, the procedure is not suggested to be used for attributes that vary over five years (unemployment, poverty, marital status), especially if such variation may be due to migration (endogeneity). If the procedure is applied to total migration, meaningless results will be produced.

the 30-49 year old group. The procedure has been applied in several previous studies with satisfactory results (ECLAC, 2012).

Calculation of the flow indicators matrix changes according to variable type. Roughly speaking, two modalities exist. On the one hand, there are indicators that correspond to relations or percentages that derive from the division of two population matrices. In the case of a ratio, these matrices correspond to the numerator and the denominator of the ratio which, as is well known, belong to different populations. In the case of a percentage, the matrices correspond to the numerator and the denominator of the ratio which are a subset and a whole, respectively. On the other hand, there are the indicators that correspond to averages. These are obtained as a division of two matrices, the first one being of people and the second one a sum of the attribute whose average is being calculated.

Diagrams 1A, 1B and 1C display the generic calculation of sex ratio of migration flows[12]. Diagrams 1A and 1B present the generic migration matrices for men and women, respectively. Diagram 1C exposes the flow indicator matrix (which in this case corresponds to the sex ratio of each flow, obtained as a ratio of the matrix of men to the matrix of women) and the derived calculations that permit the estimation of the impact of internal migration on the sex ratio of the areas under consideration. Diagrams 2A, 2B and 2C display the calculation of average years of schooling for the population aged 25 and over. Diagram 2A presents the migration matrix of the population aged 25 and over. Diagram 2B displays an innovative matrix -for calculation purposes only, (it may not be interpreted) which corresponds to the sum of the years of education of each flow. Diagram 2C shows the flow indicator matrix[13], which in this case is the average schooling of the population aged 25 and older, obtained as a ratio between the matrix that sums up the years of education of the population aged 25 and above (numerator), and the migration matrix of the population aged 25 and above (denominator).

The derived calculations are found in the two innovative columns - highlighted in italics and in bold - and correspond to the absolute effect and the relative effect that internal migration has on the sex ratio of the selected area (Major Administrative Division, Minor Administrative Division, cities, urban and rural areas, etc.). The absolute value corresponds to the difference between the marginal column - the factual value of sex ratio and average schooling of the population aged 25 years and older of each area, i.e. the observed and influenced by migration during the reference period - and the marginal row[14] - which is the counterfactual value, i.e. the sex ratio and average schooling of the population aged 25 years and older of each area that would exist if there had been no migration in the reference period. The relative value corresponds to the absolute value divided by the counterfactual and captures the quantity of the effect with respect to the initial value (another interpretation of counterfactual value).

A negative value for a given location indicates that migration tends to reduce the analyzed indicator (sex ratio or average schooling of the population aged 25 years and older). Inversely, a positive value means that migration tends to increase the indicator under analysis. The sign is not

[12] Includes the diagonal which, technically, is not a flow.
[13] Includes the diagonal which, technically, is not a flow.
[14] Copied and transposed in order to facilitate the completion of the calculations in Excel as well as the presentation of the calculation process and the results.

necessarily repeated in the tendency of the indicator of a given place due to its dependence on other factors. For example, in the case of the sex ratio of a given area, the tendency also depends on the levels and tendencies of the sex and age structure of international migration, sex ratio at birth and mortality by sex.

It is important to point out that this effect can be decomposed into the impact of in-migration and the impact of out-migration. The first one is obtained as a difference, for each area, between the factual value and the value for non-migrants. The second is obtained as the difference, for each area, between the value for non-migrants and the counterfactual value.

Diagram 1A
Generic migration matrix of men

Current place of residence	Place of residence 5 years ago					TOTAL
	1	2	3	[…]	i	
1	H11	H21	H31	[…]	Hi1	H.1
2	H12	H22	H32	[…]	Hi2	H.2
3	H13	H23	H33	[…]	Hi3	H.3
[…]						
i	H1i	H2i	H3i	[…]	Hii	H.i
TOTAL	H1.	H2.	H3.	[…]	Hi.	H..

Source: Auhor's own elaboration.

Diagram 1B
Generic migration matrix of women

Current place of residence	Place of residence 5 years ago					TOTAL
	1	2	3	[…]	i	
1	M11	M21	M31	[…]	Mi1	M.1
2	M12	M22	M32	[…]	Mi2	M.2
3	M13	M23	M33	[…]	Mi3	M.3
[…]						
i	M1i	M2i	M3i	[…]	Mii	M.i
TOTAL	M1.	M2.	M3.	[…]	Mi.	M..

Source: Auhor's own elaboration.

Diagram 1C
Generic matrix of flow indicator sex ratio

Current place of residence	Place of residence 5 years ago					TOTAL (FACTUAL)	COUNTER-FACTUAL	ABSOLUTE effect	RELATIVE effect
	1	2	3	[...]	i				
1	(H11/M11) = RM11	(H21/M21) = RM21	(H31/M31) = RM31	[...]	(Hi1/Mi1) = RMi1	(H.1/M.1) = RM.1	(H1./M1.) = RM1.	***RM.1 - RM1.***	***(RM.1 - RM1.)/RM1.*100***
2	(H12/M12) = RM12	(H22/M22) = RM22	(H32/M32) = RM32	[...]	(Hi2/Mi2) = RMi2	(H.2/M.2) = RM.2	(H2./M2.) = RM2.	***RM.2 - RM2.***	***(RM.2 - RM2.)/RM2.*100***
3	(H13/M13) = RM13	(H23/M23) = RM23	(H33/M33) = RM33	[...]	(Hi3/Mi3) = RMi3	(H.3/M.3) = RM.3	(H3./M3.) = RM3.	***RM.3 - RM3.***	***(RM.3 - RM3.)/RM3.*100***
[...]	[...]	[...]	[...]	[...]	[...]	[...]	[...]	***[...]***	***[...]***
i	(H1i/M1i) = RM1i	(H2i/M2i) = RM2i	(H3i/M3i) = RM3i	[...]	(Hii/Mii) = RMii	(H.i/M.i) = RM.i	(Hi./Mi.) = RMi.	***RM.i - RMi.***	***(RM.i - RM.i)/RM.i*100***
TOTAL	(H1./M1.) = RM1.	(H2./M2.) = RM2.	(H3./M3.) = RM3.	[...]	(Hi./Mi.) = RMi.				

Source: Author's own elaboration.

Diagram 2A
Generic migration matrix of population 25 years and older

Current place of residence	Place of residence 5 years ago				
	1	2	3	[...]	i
1	N11	N21	N31	[...]	Ni1
2	N12	N22	N32	[...]	Ni2
3	N13	N23	N33	[...]	Ni3
[...]					
i	N1i	N2i	N3i	[...]	Nii
TOTAL	N1.	N2.	N3.	[...]	Ni.

Source: Author's own elaboration

Diagram 2B
Accumulated years of schooling by each flow, population 25 years and older

Current place of residence	Place of residence 5 years ago				
	1	2	3	[...]	i
1	ΣYoS11	ΣYoS21	ΣYoS31	[...]	ΣYoSi1
2	ΣYoS12	ΣYoS22	ΣYoS32	[...]	ΣYoSi2
3	ΣYoS13	ΣYoS23	ΣYoS33	[...]	ΣYoSi3
[...]					
i	ΣYoS1i	ΣYoS2i	ΣYoS3i	[...]	ΣYoSii
TOTAL	ΣYoS1.	ΣYoS2.	ΣYoS3.	[...]	ΣYoSi.

Source: Author's own elaboration.

Diagram 2C
Generic flow indicator matrix, average years of schooling, population 25 years and older

Current place of residence	Place of residence 5 years ago					MARGINAL TOTAL (FACTUAL)	COUNTER-FACTUAL	ABSO-LUTE effect	RELATIVE effect
	1	2	3	[...]	i				
1	(ΣYoS11/N11) = AYoS11	(ΣYoS21/N21) = AYoS21	(ΣYoS31/N31) = AYoS31	[...]	(ΣYoSi1/Ni1) = AYoSi1	(ΣYoS.1/N.1) = AYoS.1	(ΣYoS1./N1.) = AYoS1.	AYoS.1 - AYoS1.	(AYoS.1 - AYoS1.)/ AYoS1.*100
2	(ΣYoS12/N12) = AYoS12	(ΣYoS22/N22) = AYoS22	(ΣYoS32/N32) = AYoS32	[...]	(ΣYoSi2/Ni2) = AYoSi2	(ΣYoS.2/N.2) = AYoS.2	(ΣYoS2./N2.) = AYoS2.	AYoS.2 - AYoS2.	(AYoS.2 - AYoS2.)/ AYoS2.*100
3	(ΣYoS13/N13) = AYoS13	(ΣYoS23/N23) = AYoS23	(ΣYoS33/N33) = AYoS33	[...]	(ΣYoSi3/Ni3) = AYoSi3	(ΣYoS.3/N.3) = AYoS.3	(ΣYoS3./N3.) = AYoS3.	AYoS.3 - AYoS3.	(AYoS.3 - AYoS3.)/ AYoS3.*100
[...]							[...]	[...]	[...]
i	(ΣYoS1i/N1i) = AYoS1i	(ΣYoS2i/N2i) = AYoS2i	(ΣYoS3i/N3i) = AYoS3i	[...]	(ΣYoSii/Nii) = AYoSii	((ΣYoS.i/N.i) = AYoS.i	(ΣYoSi./Ni.) = AYoSi.	AYoS.i - AYoSi.	(AYoS.i - AYoSi.)/AYoS i.*100
MARGINAL TOTAL (COUNTER-FACTUAL)	(ΣYoS1./N1.) = AYoS1.	(ΣYoS2./N2.) = AYoS2.	(ΣYoS3./N3.) = AYoS3.	[...]	(ΣYoSi./Ni.) = AYoSi.	(ΣYoS../N..) = AYoS..	(ΣYoS../N..) = AYoS..		

Source: Author's own elaboration.

In short, the key formulas of the document are presented in Diagram 3. The letter "K" is the variable or indicator of interest (mean age, sex ratio, percentage of children, average years of schooling), the letter "i" the city and the points indicate the corresponding point of time -current or 5 years before- according to the standard migration nomenclature.

Diagram 3
Impact of migration on the sociodemographic composition of cities

IMPACT OF MIGRATION ON ATTRIBUTE K OF PLACE I			
ABSOLUTE	RELATIVE	IMMIGRATION	EMIGRATION
K.i-Ki.	((K.i-Ki.)/Ki.)*100	K.i-Kii	Kii-Ki.

Source: Author's own elaboration.

Data and countries

The sample consists of eight cities of one million or more residents in three Latin American countries with micro-datasets from the 2000 and 2010 census rounds: Quito, Guayaquil and Cuenca in Ecuador, Mexico City, Guadalajara, Monterrey and Tijuana in Mexico and Panama City in Panama. The variety of countries and cities allows disposing of a rather diverse cast of cases and thus avoiding drawing conclusions on the basis of circumstantial evidence.

The REDATAM software program is used to process the micro-data. Subsequent calculations and statistical analysis is carried out with the help of other programs, mainly Excel worksheets and SPSS.

Variables

The variable migration used in this study corresponds to the one captured at a specified date in the past – also called recent migration since the reference period is five years – at a disaggregated scale (municipality, commune or district). This measurement of migration is preferred since it is the only one that permits to situating the entire population at a specified date and place in the past and thus allows the calculation of rates and the identification of real flows, although multiple migrations within the period are not captured (Rodríguez, 2009a). The disaggregated scale is essential for examining migration (or residential mobility) within cities. The impact of migration is captured both at the city scale and at the scale of smaller administrative divisions (municipality, commune, district, canton, etc.); however, these latter results that would permit one to estimate the impact of migration on socio-demographic differences and residential segregation between minor administrative divisions are not analyzed in this document.

The magnitude of the impact of population composition is quantified for the following variables: a) sex ratio; b) population distribution by large age groups (0-14; 15-59 and 60 years and more), and c) average years of schooling. It is calculated as the percentage change that migration causes in the selected indicators according to the methodology previously described.

Hypothesis

Consistent with the conceptual framework, the hypotheses to be contrasted with the evidence presented in this text are:

- Internal migration can still be considered as a "rejuvenating force" for large Latin American cities.
- Internal migration still tends to "feminize" large Latin American cities.
- Migration still reduces the average level of schooling in cities, but with less intensity than in the past.
- Today, the impact of migration is derived from a balance between the impact of in-migration and the impact of out-migration which is more symmetrical than in the past when the effect of in-migration was decisive.

V. Results

Tables 3 and 4 display the coefficients that capture the relative effect of migration on the population composition of cities in terms of education -average schooling of two age groups- and age and sex structure. Along with this, the breakdown of the effect of in-migration and out-migration, whose sum is the absolute impact of migration on the above mentioned indicators, is displayed.

In general, non-zero effects are seen – these are census results, i.e. parameters of the universe and therefore the values have no confidence interval – which suggests that the selectivity according to the above mentioned characteristics (sex, age and education) is still a feature of internal migration linked with these cities. However, the effects are low, since few exceed 2 percent in the period of five years.

Next, each of the three variables affected by migration and the evolution in time of this effect will be examined.

Effect on sex composition

As explained in the background section the historical female bias of internal migration in most Latin American countries was based on the predominance of women in the rural-urban migration flow. In fact, the patterns of authority and the chauvinistic and patriarchal distribution of resources that prevailed in the countryside discriminated against women, a situation that produced a strong incentive for them to migrate. At the same time, economic and social modernization made the traditional patterns weaker and generated expectations of a better life in the city. Moreover, only in cities was there room for the non-traditional development of women, in particular through school enrollment and inclusion within the workforce, whose segmentation generated specific opportunities for women in several areas of the service sector. Due to the high metropolitan concentration of the rural-urban flow during a great part of the 20th century, migration seems to have had a "feminizing" impact on the populations of large cities.

This description is fully supported by the figures displayed in Table 3, which shows that during the second half of the 1990s, migration to large cities tended to reduce the sex ratio, with the exception of Cuenca in Ecuador. All in all, the decomposition of this effect to the one that derives from in-migration and the other that is produced by out-migration brings a surprise: in at least three cities (Tijuana, Quito, and Cuenca), in-migration tends to increase the sex ratio, while in all cities, out-migration tends to decrease it. This is an unexpected finding that makes it necessary to review the discourse and general proposals made until recently on the subject.

Table 4 – that shows what happened in the second half of the 2000s, i.e. nearly the current situation – reveals a significant change regarding what was presented in the previous paragraph: half of the cities register a positive impact of migration on the sex ratio and this is because, in almost all of them, in-migration enhances its masculinizing effect, a situation that counterbalances the reducing impact of out-migration on sex ratio. Thus, it can be concluded that a historical inflection due to a change in the immigrant profiles in large cities is taking place; women are no longer overrepresented as they were in the past. This is probably related to the fact that the main migration flow is no longer rural-urban (as it was for most of the 20th century) but urban-urban. The latter flow, unlike the former, has no female bias. In fact, the pull factors in large cities (except for some cities that are highly dependent on primary and extractive productive processes, for example) tend to coincide between sexes.

Effects on age composition

As anticipated in the theoretical framework and suggested by previous research, large cities are still highly selective in terms of the age of migrants. They still concentrate the creation of jobs and count with a set of attractions for young people, such as educational institutions, especially for higher education, ad-hoc housing supply, entertainment options and culture (ECLAC, 2012).

The above mentioned situation is probably the cause of the results presented in Tables 3 and 4. The results verify, almost without exception, that migration tends to reduce the percentages of children (5 to 14 years old) and older people (60 years and older) and thus increase the percentage of the working age population. The most evident effect is produced in Tijuana between 1995 and 2000, when migration, due to its age selectivity of youth and young adults,

causes a decrease of 7 percent in the percentage represented by older people between 1999 and 2000 and of 3 percent in the percentage represented by people aged under 15 during the same time period.[15] In several other cities, the effects exceed 2 percent in both groups in the 2000 census round. This situation implies a significant effect of internal migration on the age structure of the cities. Furthermore, the effect is unidirectional: expanding the working-age population, i.e., the demographic dividend.

Evidence from censuses of the 2010 round show that the effect remains, but it is reduced in intensity when compared to the 2000 censuses. The direct cause of this attenuation may be related to selectivity as well as numbers – a decomposition that was not formally carried out in this study and that will be presented in future studies.

In the case of Tijuana, the effect of migration on the percentage of older people and on the percentage of people under 15 years is -0.9% and -0.7% respectively. The key factor for this decrease is the fall of immigration flows resulting from the economic, social, and security crisis experienced by the city during the reference period. Because of this, immigration went from reducing the percentage of people under 15 by 0.62 percentage points between 1995 and 2000 to reducing it by 0.07 percentage points between 2000 and 2005. In the case of the absolute effect on the percentage of people over 60, the change is less obvious, falling from 0.55 in 2000 to 0.25 in 2010. In Guayaquil, a city that also experienced a substantial drop of its migration attractiveness, reaching the point of becoming a city of high out-migration the effect of migration on the percentage of people under 15 was not especially significant in the 2000 census (-0.9%). However this percentage experienced an important fall reaching -0.34% because the absolute effect of migration fell by half (from -0.308 to –0.152), although the absolute effect of emigration (that, in this case, tends to increase the proportion of children) also fell by half.

An important difference between the effect on children and on older people are the pattern of out-migration. In the case of the effect of migration on the proportion of older people almost no exceptions exist: out-migration tends to increase the percentage of older people, a situation that arithmetically can only be explained by the fact that this age group is underrepresented in the outflow in contrast to non-migrants. Since the propensity to migrate is lower among older people, this underrepresentation seems logical. However, as we are referring to out-migration from a specific area (large cities) the finding is interesting for two main reasons. Firstly, since the studies of Rogers and Castro in the 1980s[16], in the world literature there is a deep rooted hypothesis concerning the "double bulge" age distribution of migration. This is due to a rise in migration when reaching retirement age and can be explained by the migration of the newly retired. The phenomenon has been observed in several developed countries but in Latin America the double bulge is not yet present among migrants (CEPAL, 2012). Nevertheless, due to higher levels of formal employment and income of retirees living in large cities, a hypothesis of a massive outflow of these people in search of more pleasant locations to live could be made. Secondly, in Latin America, there is another factor that could favor the rise of migration around

[15] It's worth repeating these are relative effects with respect the initial value and not percentage points. The 7.1 % results from the comparison between 5.9 % of older people (observed) including migration (5.9 % of people aged 60 years and over to the population aged 5 years and over), and the 6.4 % counterfactual, which is the percentage that would have existed in case there had been no migration (these values are not shown in the table).

[16] Rogers, A. and L. Castro (1982), "Patrones modelo de migración", Demografía y Economía, vol. 16, nº 3, pp. 267-327.

retirement age. In fact, the massive movement of workers towards large cities produces a great number of people who have the expectation of returning to their place of origin (not necessarily to their location but region) because they either have accumulated resources for a comfortable return, or have not, and their dependence on support networks, particularly family, make them return. Although both hypotheses are attractive and have a reasonable argumentative basis, the evidence provided by censuses and presented in a special way in this document suggest that neither is valid at the moment for the large cities examined here.

On the other hand, in the case of the effect of emigration on the percentage of children, according to the 2000 censuses, in at least four cities there is a tendency for this percentage to rise. In 2010 the number of cities dropped to two. This means that in these cities there is an overrepresentation of children in the out-migrant flows in contrast to non-migrants. This could be due to the suburbanization processes based on the movement of families with small children to areas nearby cities, with better conditions for raising and taking care of children and with more affordable housing. Although this hypothesis is attractive, the fact that this effect has decreased (at least in number) between the last two censuses makes it weaker. In the light of these findings, there is a need to continue studying in more detail the migration flows from cities in order to identify possible causes of the overrepresentation of children.

Effects on education

In contrast to the favorable age effect that migration has for large cities - the increase in the proportion of the working age population strengthens the demographic dividend, an opportunity which requires a dynamic labor market in order to take advantage of it - migration has a negative effect for large cities in terms of education as it tends to reduce their average schooling. The impact is low – no greater than 1% in any of the cities according to the 2010 census and in 2000 in a couple of cities the impact is slightly higher – but systematic, except for a few exceptions (Tijuana and Cuenca for the 25 to 39 age group in 2010, for example). This situation is not due to migrants' age structure. The effects are calculated for two age groups, controlling in this way for the age factor, which is relevant because of the age selectivity already explained.

Nevertheless, the most original finding provided by the application of the methodology derives from the analysis of the effect of immigration and emigration. Almost intuitively the "depressant" effects of migration on educational levels could be attributed to immigration when taking into account the previous evidence on the massive inflow of low skilled rural populations to cities. As stated in the conceptual discussion, this image deeply penetrated the imagination and even the political and ideological visions concerning Latin American urbanization (the thesis on the "ruralization of cities", for example). However, the results shown in Tables 3 and 4 suggest a much more diverse situation. According to the 2010 census, in most of the cities examined (5 of 8), immigration tended to increase the average level of schooling of the 25-39 age group. The same occurred in three of the eight cities for the 35-49 age group. This positive effect of immigration may be due to the movement of young people with high levels of education to cities (at least, higher with respect to the educational level of non-migrants of the same age) in search for further education. This hypothesis is consistent with the fact that the number of cities whose level of education for the 35 to 49 age group increased as a result of migration is lower -it is less probable that people of this age group would migrate in search of further

education opportunities. Out-migration tends to have a reducing effect on educational levels, although with several exceptions. The outflow of the population from large cities does not correspond to a stampede of the poor but rather to an emigration of the skilled (at least more skilled than non-migrants).

The available data do not permit the identification of systematic effects of migration on the educational level of the population of cities. Possibly this effect, at least within the sample of cities used in this study, arises from a complex combination of factors that vary between each city and therefore regularities are not perceived. This calls for case studies to identify the set of factors and the way in which they act in each case. Certainly, the lack of a stylized effect can be due to the sample used that only contains few cities and therefore a similar study but with a larger sample of cities might be necessary. Whatever the case might be, to better specify the factors that are behind this non-systematic effect of migration on the educational level of cities is a challenge for future research.

Table 3
Relative effect of total migration and absolute effects of immigration and emigration on average schooling, age structure and sex ratio, eight selected cities, 2000 censuses.

2000 Census															
Cities	Effects of migration on average schooling, population aged 25 to 39 years			Effects of migration on average schooling, population aged 35 to 49 years			Effects of migration on percentage of children (5-14 to total population above 5 years)			Effects of migration on percentage of older people (60 and above to total population above 5)			Effects of migration on sex ratio (by hundred)		
	Total (%)	Immigration (abs)	Emigration (abs)	Total (%)	Immigration (abs)	Emigration (abs)	Total (%)	Immigration (abs)	Emigration (abs)	Total (%)	Immigration (abs)	Emigration (abs)	Total (%)	Immigration (abs)	Emigration (abs)
Panama (districts of Panamá, Arraiján, Balbo, La Chorrera and San Miguelito)	-1.100	-0.132	0.010	-0.720	-0.079	0.002	-4.957	-0.999	-0.072	-2.805	-0.321	0.069	-0.288	-0.002	-0.001
Mexico city (new definition with 75 municipalities or delagtions)	-0.284	-0.013	-0.015	-0.218	0.002	-0.021	-0.747	-0.098	-0.067	-0.277	-0.104	0.082	-0.578	-0.004	-0.001
Monterrey (Monterrey, Guadalupe, Apodaca, San Nicolás de los Garza, Gral. Escobedo, Santa Catarina, Juárez, García, San Pedro Garza García, Cadereyta Jiménez, Zuazua, Santiago, Salinas Victoria, Ciénega de Flores)	-0.310	0.018	-0.050	-0.159	0.016	-0.031	-0.967	-0.224	0.013	-1.182	-0.180	0.088	-0.261	-0.001	-0.001
Guadalaja nueva (Guadalajara, Ixtlahuacán de los Membrillos, Juanacatlán, El Salto, Tlajomulco de Zúñiga, Tlaquepaque, Tonalá and Zapopan)	-0.029	0.055	-0.058	0.013	0.044	-0.043	-0.750	-0.142	-0.043	0.344	-0.107	0.133	-0.122	-0.072	-0.042
Tijuana nueva (Tecate, Tijuana, Playas De Rosarito)	-0.460	-0.025	-0.017	-1.408	-0.078	-0.036	-2.955	-0.623	-0.111	-7.066	-0.547	0.098	-0.299	0.001	-0.004
Quito (parroquias Quito, Alangasi, Amaguaña, Atahualpa (Habaspamba), Calacali, Calderón (Carapungo), Conocoto, Cumbayá	-0.949	-0.113	0.007	-0.756	-0.053	-0.026	-2.486	-0.578	0.029	-2.066	-0.413	0.220	-0.750	0.068	-0.769
Guayaquil (parishes of Guayaquil, Juan Gómez Rendon, Morro, Posorja, Puna, Tenguel and Eloy Alfaro (Durán))	-1.071	-0.098	-0.008	-0.885	-0.069	-0.014	-0.884	-0.308	0.114	0.084	-0.127	0.135	-0.740	-0.348	-0.357
Cuenca	-1.339	-0.187	0.038	-0.656	-0.11	0.039	-2.406	-0.569	0.019	-3.15	-0.57	0.25217	1.102	1.42	-0.462

Source: Author's own calculations based on special processing of micro-data from 2000 census.

Table 4
Relative effect of total migration and absolute effects of immigration and emigration on average schooling, age structure and sex ratio, eight selected cities, 2010 censuses

2010 census															
Cities	Effects of migration on average schooling, population aged 25 to 39 years			Effects of migration on average schooling, population aged 35 to 49 years			Effects of migration on percentage of children (5-14 to total population above 5 years)			Effects of migration on percentage of older people (60 and above to total population above 5)			Effects of migration on sex ratio (by hundred)		
	Total (%)	Immigra-tion (abs)	Emigra-tion (abs)	Total (%)	Immi-gration (abs)	Emigra-tion (abs)	Total (%)	Immi-gration (abs)	Emigra-tion (abs)	Total (%)	Immigra-tion (abs)	Emigra-tion (abs)	Total (%)	Immigra-tion (abs)	Emigra-tion (abs)
Panama (districts of Panamá, Arraiján, Balbo, La Chorrera and	-0.620	-0.090	0.016	-0.534	-0.072	0.010	-4.448	-0.816	-0.093	-2.363	-0.333	0.073	0.028	0.002	-0.002
Mexico city (new definition with 75 municipalities or delagtions)	-0.129	0.011	-0.026	-0.081	0.021	-0.030	-0.704	-0.057	-0.073	-0.669	-0.158	0.086	0.049	0.003	-0.002
Monterrey (Monterrey, Guadalupe, Apodaca, San Nicolás de los Garza, Gral. Escobedo, Santa Catarina, Juárez, García, San Pedro Garza García, Cadereyta Jiménez, Zuazua, Santiago, Salinas Victoria, Ciénega de Flores)	-0.224	0.024	-0.048	-0.113	0.002	-0.014	-0.622	-0.130	0.006	-1.175	-0.247	0.130	-0.588	-0.002	-0.004
Guadalaja nueva (Guadalajara, Ixtlahuacán de los Membrillos, Juanacatlán, El Salto, Tlajomulco de Zúñiga, Tlaquepaque, Tonalá	-0.180	0.061	-0.080	-0.168	0.040	-0.057	-1.169	-0.219	-0.034	0.178	-0.152	0.169	0.244	0.400	-0.177
Tijuana nueva (Tecate, Tijuana, Playas De Rosarito)	0.195	0.014	0.005	-0.222	-0.013	-0.008	-0.671	-0.074	-0.074	-0.855	-0.248	0.189	-0.533	0.001	-0.006
Quito (parroquias Quito, Alangasi, Amaguaña, Atahualpa (Habaspamba), Calacali, Calderón (Carapungo), Conocoto, Cumbayá	-0.310	-0.046	0.011	-0.360	-0.036	-0.003	-1.699	-0.293	-0.048	-1.024	-0.433	0.330	-0.713	0.256	-0.921
Guayaquil (parishes of Guayaquil, Juan Gómez Rendon, Morro, Posorja, Puna, Tenguel and Eloy	-0.384	-0.057	0.013	-0.262	-0.031	0.002	-0.339	-0.152	0.078	-0.017	-0.125	0.123	-0.233	0.120	-0.345
Cuenca	0.239	0.033	-0.007	-0.019	-0.008	0.006	-2.190	-0.422	-0.023	-1.380	-0.558	0.412	0.378	1.468	-1.133

Source: Author's own calculations based on special processing of microdata from 2010 census.

Conclusions

The findings from this study tend to show a certain ambivalence of the qualitative effects of migration in large Latin American cities. On the one hand, migration tends to increase the demographic dividend but, on the other hand, it tends to slightly reduce the level of education. Unlike in the past, migration is no longer a feminizing force for large cities. The results emphasize the importance of considering both in-migration and out-migration in order to estimate the effect of internal migration. In fact, a remarkable finding that differs from what has been observed in the past and that contradicts deep-rooted assumptions present in public opinion and academic circles, is that the reducing effect of migration on education in large cities is no longer due to in-migration but rather to out-migration.

The results speak for themselves when it comes to the potential of the census to estimate the impact of migration on population composition. In fact, the procedures can be applied en masse to all cities identifiable in a census and thereby obtain detailed information on the effects of migration for cities in general (and not just a selected group of large cities, as in the present study). The results also expose some theoretical gaps, particularly concerning migration analysis and distinctions between the causes and effects of in-migration and out-migration. In fact, the results of the study indicate that both in-migration and out-migration affect the population composition of cities and therefore both –inmigration and out-migration should be analyzed. Analyzing only one of them may lead to erroneous conclusions on the impact of migration.

A line of research not addressed in this study but which is feasible to carry out with the available data and procedures here used refers to the analysis of the effects experienced by each minor administrative division of the metropolitan areas. Such analysis would permit the estimation of the impact of migration on social disparities within cities and consequently on the trends in socioeconomic residential segregation (Rodriguez, 2011b; Fosset, 2004).

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