The Changing Impacts of Internal Migration on Residential Socio-Economic Segregation in the Greater Santiago

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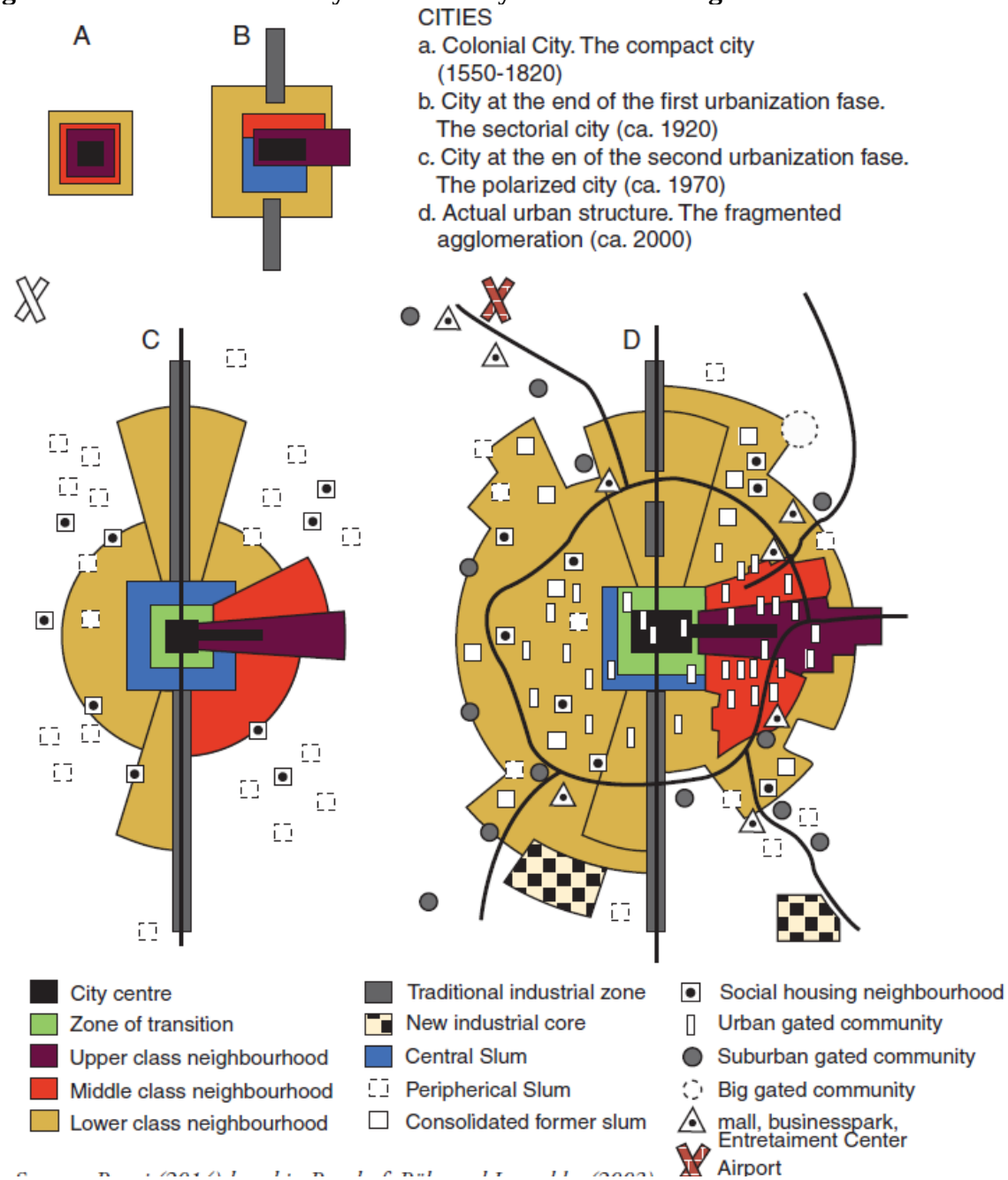
1. INTRODUCTION

Socio-economic residential segregation is widely recognized to have adverse impacts on national socio-economic progress and is a key component of urban planning policies. Socio-economic residential segregation can perpetuate socio-economic differences by deterring human capital development and information through limited social interaction between low- and high-income groups (Marpsat 1999; Roberts and Wilson 2009; Sampson, 2012). Patterns of socio-economic residential segregation has also been associated with concentration of employment opportunities in high-income communities – which is argued to reproduce socio-economic differences by increasing the geographical separation of poor individuals from jobs (Lazear 1995; Culter and Glaeser 1995; Collins and Margo 2000). Spatial socio-economic separation may also involve isolation from mainstream society for low-income individuals, leading to a greater reliance on peers for information and an increased risk of unemployment, drug use, crime, alcohol abuse and higher mortality rates (Case and Katz 1992; Glaeser, Sacerdote and Scheinkman 1994; Acevedo-Garcia, Osypuk, and Subramanian 2003).

Latin America is often identified as the region with the highest level of income inequality in the world, with Chile topping the rank as the most unequal OECD country (Kanbur, Lopez-Calva and Venables 2005; OECD, 2016, p.6, Table 1). Mirrored in space, income inequalities give rise to distinctive patterns of socio-economic residential segregation. Over the last four decades, the demographic structure and socio-economic composition of Latin American cities have experienced major structural shifts changing the patterns of residential segregation (Sabatini, 2006, Roberts and Wilson 2009; De Mattos 2010; ECLAC 2012 and 2014; Rodríguez 2013a and 2013b). By the end of the twentieth century, metropolitan areas in Latin America were characterized by a well-defined pattern of socio-economic residential segregation encapsulated in four distinctive features: (1) central areas (Central Business District (CBD) and surrounding areas) undergoing population decline and a mixed socio-economic composition; (2) a Peri-centre with an over-representation of low- and middle-class population, as well as both population decline and ageing; (3) a periphery reporting fast population growth, high poverty levels and informal settlement; and (4) a geographical area of affluent families, virtually free of poor or informal settlements, and well connected to the local CDB (Bahr and Mertins 1993; Janoschka 2002; Borsdorf 2003).

During the first decade of the 21st century, key demographic and socio-economic changes seem to have altered this pattern. Two shifts have received particular attention (Sabatini et al. 2009; ECLAC 2014; Duhau 2016): (1) net migration gains of young and university educated people in central areas; and, (2) net migration gains of high-income families in the metropolitan periphery from traditional wealthy areas in the metropolitan region. Several urban scholars have pointed towards increasing socioeconomic fragmentation across Latin American metropolitan areas in the view of these changes in migration patterns. For example, the historically poor periphery is believed to have become more socioeconomically diverse with an increasing educated population, some parts of the periphery have totally changed due to a massive construction of gated communities and the centre has lifted its educational level due to a fresh in-migration of young people with high education[] . These changes would have led to a reduction in socio-economic residential segregation, primarily through intra-metropolitan mobility (Roberts and Wilson 2009; De Mattos 2010; ECLAC, 2014). Figure 1 summarizes these changes and shows how Latin American cities have transitioned from colonial cities into fragmented urban agglomerations. Figure 1 illustrates the increasing fragmentation or higher socio-economic diversity in the metropolitan periphery through different symbols. These symbols represent new forms of settlements, including social housing neighborhoods, urban gated communities, suburban gated communities and big gated communities.

Figure 1: Latin American City Evolutionary Model according to several scholars



Source: Adapted from Buzai, 2016, p. 281.

Thus, while prior work has examined changes in the patterns of socio-economic residential segregation in Latin America metropolitan cities, the influence of internal migration, in the form of intra- and extra-metropolitan moves, on shaping these patterns has remained unexplored. This paper aims to determine and assess the impacts of internal migration on residential educational segregation in the Greater Santiago Metropolitan Area (GSMA). We focus on educational segregation as education is a major determinant for income, particularly in Latin America and enables to leverage on the comprehensive geographical coverage of the Chilean census, which does not collect income information.

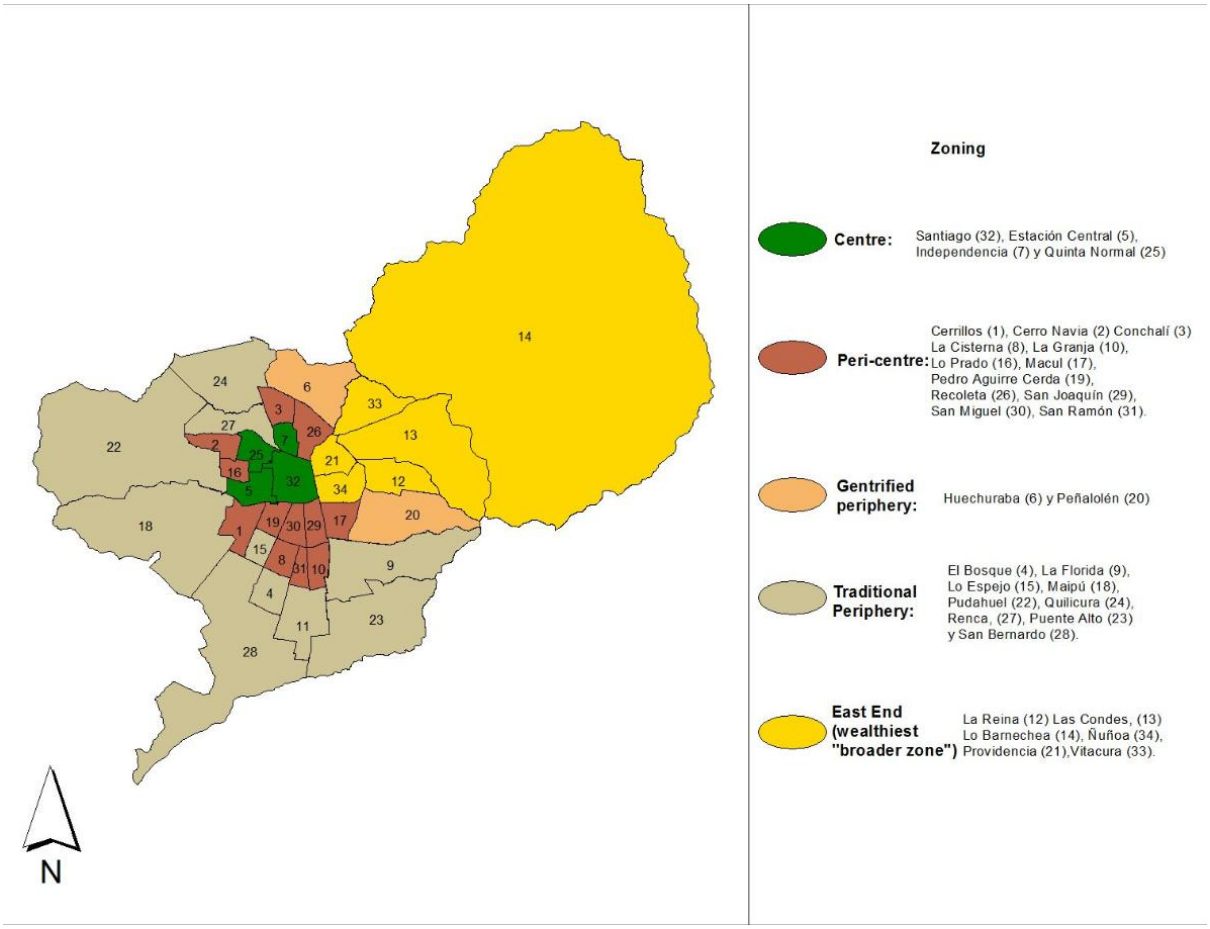
Drawing on data from three consecutive censuses conducted in 1982, 1992 and 2002, we extend and apply a novel counterfactual approach to estimate the impacts of internal migration on residential segregation by education. This counterfactual approach was formally proposed by Rodriguez and Rowe (forthcoming), and previously used by Rodriguez (2007) and ECLAC (2012), to quantify the impacts of internal migration on the age and educational composition of metropolitan areas in various Latin American countries. By using Duncan's Index of dissimilarity (Duncan and Duncan 1955), we extend this method to measure temporal changes in residential segregation in places. We estimate the impacts of internal migration at two geographical levels: (a) broad areas which capture the socio-economic structure of the GSMA: Centre, Peri-centre, Traditional Periphery, Gentrified Periphery and Affluent Eastern Areas; and, (b) administrative municipalities in order to examine the spatial variability in the impact of internal migration on residential educational segregation within macro regions. Additionally, we decompose the internal migration impacts into the effects of intra-metropolitan mobility, one the one hand, and extra-metropolitan migration (this is interchange between the GSAM broad areas or municipalities and the rest of the country), on the other hand, in order to determine the main type of mobility underpinning changes in educational residential segregation.

2. BACKGROUND

The GSMA is part of the Metropolitan Region, one of the fifteen major administrative regions of Chile. The GSMA comprises 34 municipalities, contains the capital of the country and is home to the main government institutions and business corporations. According to the 2002 census, the GSMA had 5.3 million inhabitants and housed over 40% of national population.

Until the 1970s, the territorial socio-demographic structure of the GSMA was characterized by the traditional Latin American urban city model (Bahr and Mertins, 1993; Janoschka, 2002, Borsdof, 2003, Romero 1976, Ratinoff, 1975; Herrera, Pecht and Olivares, 1976, Schteingart and Torres, 1973, Hardoy and Schaedel, 1975). Four features typified the structure of the GSMA (see Figure 2): i) central areas in process of de-population and with a mixed socio-economic composition; ii) a consolidated Peri-centre which has undergone downward socioeconomic process: a rapid population aging and accommodating a large low socio-economic population; iii) a periphery where population growth was faster than the rest of the city -mostly due to migration and high concentration of poverty and informality regarding housing tenure and access to basic services; and, (iv) a well-established high-income area (often cone-shaped) which was the upper class habitat in the metropolitan areas and well connected to the CBD. Figure 2 shows the structure of the GMSA and the constitutient municipalities. As explained below, we made key distinction within the periphery. We identified the old traditional periphery of disadvantaged groups and the new emerging gentrified periphery of more affluent groups.

Figure 2. GSMA: Socio-spatial structure by broad areas and municipalities



Source: Authors' elaboration

Since 1980's, the GSMA has undergone profound spatio-social transformations. These transformations are often summarized with the notions of urban fragmentation (Borsdorf, 2003) or, urban insularity. Four key changes have driven these changes (Contreras, 2016, Dureau et. al, 2014, Rodríguez and Espinoza, 2012, De Mattos, 2010 and Sabatini et al, 2009). A first process is the socio-economic diversification of the historically poor periphery where a more mixed socioeconomic composition emerges. This increasing socio-economic diversification has been the result of: i) neighborhood improvements thank to upward social mobility of old inhabitants as well housing upgrades made by themselves and local and national governments; ii) urban policies addressed at housing and neighborhood improvement; iii) housing policies aimed at development of social dwelling complexes for middle class families. However, emerging slums and informal settlements also concentrated in the periphery and thus the periphery mainly remained a living habitat for the poor.

The second is the development of luxury and high standard housing projects, largely in the form of gated communities concentrated in a small number of municipalities in the periphery of the GSMA, such as Huechueraba and Peñalolén. This region is known as Gentrified Periphery. Residents of new housing complexes in this area are assumed to have relocated from affluent northern-eastern areas of the GSMA. However, systematic empirical evidence is lacking.

The third process is housing renewal in the CBD. Although this redevelopment process did not revert the existing pattern of population losses in Santiago's CBD, it curbed mobility to other municipalities within the GMSA (Rodríguez, 2007) and is expected to have enticed an influx of young and middle- and upper-middle class families. Housing renewal projects in the CBD started in the early 1990s and have been based on public subsidies for high-rise construction and small departments targeted to young families and middle- and high-income households (Contreras, 2016). Yet, empirical evidence on the impact of these housing projects is fragmented and inconclusive.

The fourth process is the relocation of high-income families from traditional affluent areas in the northern-eastern cone of the GSMA as a result of new housing developments in the Gentrified Periphery and CBD (Sabatini et al 2009; Jordan and Galetovic 2006). It is described as a counter-urbanization process and argued to resemble the relocation process of families to suburbs beyond the metropolitan periphery following the US model of location of the upper-income strata (Pacione 2009; Roberts and William 2009). However, scholars argue that the relocation of wealthy families from affluent northern-eastern areas of the GSMA have been modest and would not have transformed the socio-economic composition of the Northern-Eastern Area, the historical habitat for wealthy population (Ortiz and Escolano, 2013; Rodríguez, 2007).

And a final phenomenon regards to the "Peri-centre". While redevelopment and renewal projects have taken place in most of the broad areas of the GSMA, the broad zone called "Peri-centre" has remained forgotten and almost abandoned. Deficient infrastructure, impoverished neighborhoods, stigmatization, and weak housing and infrastructure programmes and investments drive a continuos huge out-migration and a scarce in-migration (Contreras 2016; Dureau et a 2014; Rodriguez and Espinoza, 20012; Sabatini et al, 2009; Rodriguez 2007).

Figure 3 shows a clear contrast between the Northern-Eastern Areas and the rest of the GSMA in terms of share of population with high education. Similar gaps are apparent in other metropolitan areas of Latin America. Three distinctive features differentiate the GMSA in term of the importance of this zone: (i) its large geographical surface (almost all the East of the city, Figure 1 and 2, ECLAC 2014) (and population (Table 1, ECLAC 2014; ii) its concentration of high-income population (Table 1, ECLAC 2014; iii) its marginal levels of poverty (Table 1, ECLAC 2014).

The above-described first two features were driven by four set of factors. The first set comprises morphological conditions. A natural barrier (the Andes Mountains) isolates the Northern-Eastern End of the GMSA, separating it from low-income municipalities. The second involves historical factors, in particular the mobility of the elite from the central areas to the affluent Northern-Eastern areas at the beginning of the 20th century escaping from increasing social conflict and insecurity (DE Ramón 1978, Romero 1976, Ratinoff 1982, Herrera, Pecht and Olivares 1976, Galetovic and Jordan, 2006). This mobility pattern gave this space a socio-cultural identity and homogeneity as well as much more formal city and an overconcentration of all kinds of resources (Ortiz and Escolano, 2013; Sabatini et al 2009; Galetovic and Jordan, 2006). And third, liberalization of the housing market led to rises in land and housing prices in Northern-Eastern areas (Rodriguez and Espinoza 2012; Galetovic and Jordan 2006; Sabatini et al 2001); these high prices are major barriers to potential in-migrants of lower economic strata

The third feature ―which is rather exceptional in the region, where the existence of poor settlements in the middle of upper-class habitats has been well-documented (Duhau 2016; ECLAC, 2014; Roberts and Wilson, 2009, Sabatini 2006, Bahr and Mertins 1993, Janoschka 2002, Borsdorf 2003)― is mainly an political outcome. During the dictatorship, most of poor settlements in the Northern-Eastern Northern-Eastern End were eradicated towards the periphery, except for a few that are still in the higher parts of Lo Barnechea, Las Condes and La Reina, mostly already consolidated but still rather poor.

In parallel to these changes and processes, there have been shifts in the patterns of educational inequalities between GSMA' areas (Figure 3). In all areas, schooling has increased, as does the percentage of heads of household with high education. The Gentrified Periphery and Traditional Periphery registered a large increase in the share of population with university education growing at a faster rate than the Affluent Northern-Eastern End. Educational inequalities in the GSMA at the broad five area level seem to have decreased which should be concomitant with a reduction of socio-educational segregation between them. Internal migration is believed to have played a major role in shaping these changes. Yet, the impacts of internal migration reshaping the spatial distribution of educational residential segregation remained unexplored. [3]

[3] It must be recognized that these changes could be driven by other determinants, like faster educational improvements among poor people and poor zones, for instance. However, this research focuses only in the effect of internal migration.

While the above described processes are specific to the GSMA, similar processes have been documented for many metropolitan areas in Latin America. A distinctive feature of these processes is the socio-economic fragmentation of the large Latin American cities which contrasts with the traditional centre-periphery city model. In Latin America this model refers to the high concentration of affluent families in one or a few number of areas usually well connected to central areas, while poor population cluster in the metropolitan peripheryThe changes identified above and presented in the mainstream literaturecarry an increasing socio-economic diversification in the periphery. According several scholars these changes, specifically the spreas out of affluent families accros the periphery, have fostered a reduction of socio-economic residential segregation (Rasse, 2016; Sabatini et al. 2009; Sabatini, 2006; Sabatini, Cáceres and Cerda, 2001).

However, this conclusion clashes with recent evidence pointing to an increase in socio-economic residential segregation in the GSMA (Agostini et al., 2016, p.178). This disagreement may have arisen from differences in the way residential segregation was measured, but also as Rodríguez (2009) indicated, due to differences in: (i) the use of different segregation indicators[4]; (ii) geographical scales; (iii) socio-economic segmentation variables (income, housing conditions, education, etc.); and iv) reference groups for the calculation of the dissimilarity index (ECLAC, 2014).

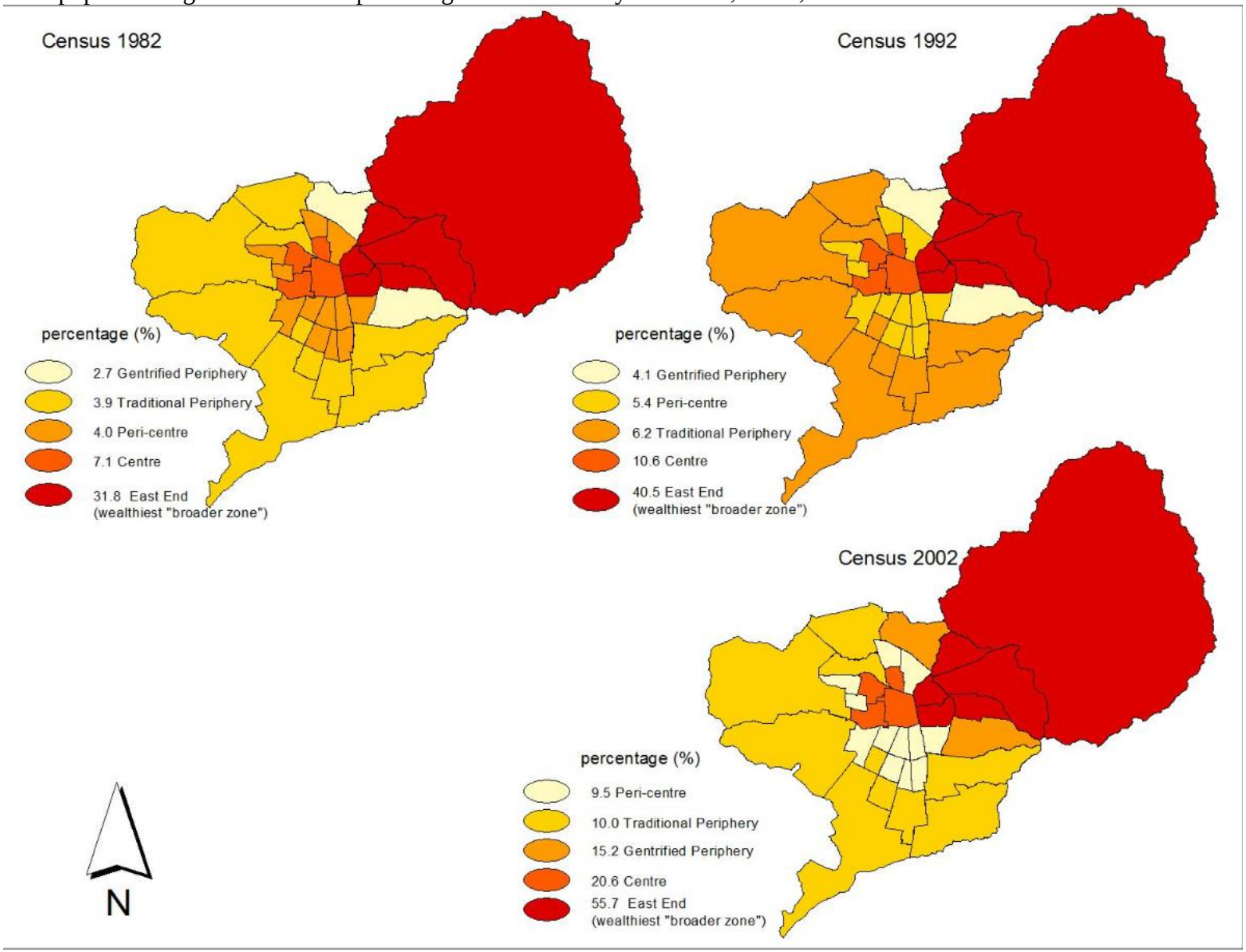
Despite this, there is consensus on the key role that internal migration may have played in shaping the patterns of socioeconomic residential segregation in the Latin American cities, particularly that of intra-metropolitan migration. Naturally, intra-metropolitan migration is often described as residential mobility and closely linked to real estate activity and housing developments and thereby having direct influence on the patterns of residential segregation (Roberts and Wilson 2009; ECLAC, 20120; ECLAC, 2014; Agostini et al. 2016; Duhau 2016). Yet, it is recognized that residential segregation can evolve in absence of migration as a result of social mobility (Roberts and Wilson, 2009, pp. 209-210).

A key residential mobility process shaping the patterns of socio-economic residential segregation has been the dispersion of the elite across the GSMA (Sabatini et al., 2009). This process is believed to have reduced the level of socio-economic residential segregation in the GSMA. Yet, the impact of internal migration on socio-economic residential segregation have not been quantified. Prior work is fragmented and has focused exclusively on out-migration from traditional affluent areas but counter-flows to these areas have been neglected. Moreover, the residential location and mobility patterns of less advantaged socio-economic groups have not been examined. Analyzing these patterns is key to a comprehensive understanding of the migration role in the socio-demographic changes within large metropolitan areas.

Thus, building on previous research, we formulate **and test six hypotheses.** First, internal migration is expected to contribute to increasing educational levels in the Gentrified Periphery, particularly through intra-metropolitan mobility. Second, internal migration is anticipated to have raised educational levels in the Traditional Periphery, especially during the 1997-2002 period when this recorded a large influx of middle-class families (Rodríguez 2009; Sabatini et al. 2009). Third, internal migration is hypothesized to have increased educational levels in Affluent Northern-Eastern Areas in 1977-1982 and 1987-1992 through outflows of poor families during the 1970s and 1980s (Rodriguez, 2007; Lombardi and Veiga, 1989) but it is expected to have decreased educational levels there in 1997-2002 through outflows of wealthy families (Sabatini et al 2009). Fourth, internal migration is expected to have eroded the educational base of the Pericentre via the out-migration of young educated individuals. Fifth internal migration is expected to have increased the proportion of population with high education in 1997-2002 in the Centre due to the inflows of population with high education.
And Sixth, overall, internal migration is expected to have contributed to a reduction in spatial differentials in educational levels in the GSMA.

[4] There are many indicators. The most well known and used is the dissimilarity index by Duncan (1955). It is one of the simplest indicators in terms of calculation, understanding and interpretation. However it has some well documented weaknesses and shortcomings. Other indicators make part of the "dissimilarity family" (Massey and Denton, 1988), and others have been developed recently with the help of GIS (Apparicio et al, 2014).

Figure 3
GSMA by broad areas: population aged 25 and over: percentage with University education, 1982, 1992 and 2002



Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).
Table 1

GSMA, by broad areas: selected demographic and social indicators, 1982, 1992, y 2002

GSMA broader zones	Population															Population 0-14 (per hundred)		
	1982					1992					2002							
	0-14	15-29	30-59	60+	Total	0-14	15-29	30-59	60+	Total	0-14	15-29	30-59	60+	Total	1982	1992	2002
Centre	147,571	181,221	192,713	74,793	596,298	129,084	152,517	200,497	83,918	566,016	94,954	128,556	197,360	79,807	500,677	24.7	22.8	19.0
Peri-centre	432,256	443,778	424,513	105,410	1,405,957	398,158	401,312	487,278	147,104	1,433,852	310,669	322,055	510,438	178,984	1,322,146	30.7	27.8	23.5
Gentrified periphery	71,167	56,492	56,922	9,030	193,611	74,502	73,239	78,993	14,831	241,565	79,654	71,020	114,428	25,028	290,130	36.8	30.8	27.5
Traditional periphery	377,017	339,761	324,982	62,800	1,104,560	579,027	487,759	618,185	116,592	1,801,563	689,764	623,404	997,384	197,357	2,507,909	34.1	32.1	27.5
East End	153,169	195,571	215,185	72,926	636,851	162,301	188,249	260,303	102,814	713,667	152,152	194,709	314,150	126,277	787,288	24.1	22.7	19.3
Total MAGS	1,181,180	1,216,823	1,214,315	324,959	3,937,277	1,343,072	1,303,076	1,645,256	465,259	4,756,663	1,327,193	1,339,744	2,133,760	607,453	5,408,150	30.0	28.2	24.5

GSMA broader zones	Population 60+ (per hundred)			Population growth (percentage)		Average years of schooling, head of hosuiholds, aged 30-59			Universitary education, head of hosehols aged 25 and over (per hundred)			Overcrowding households (per hundred)			Dweling without running water		
	1982	1992	2002	1982-1992	1992-2002	1982	1992	2002	1982	1992	2002	1982	1992	2002	1982	1992	2002
Centre	12.5	14.8	15.9	-5.1	-11.5	8.5	10.0	11.7	7.1	10.6	20.6	29.2	23.5	12.0	2.3	0.4	0.7
Peri-centre	7.5	10.3	13.5	2.0	-7.8	7.3	8.7	10.1	4.0	5.4	9.5	36.7	26.4	15.6	2.4	0.4	0.5
Gentrified periphery	4.7	6.1	8.6	24.8	20.1	6.1	7.8	10.2	2.7	4.1	15.2	44.4	31.0	16.2	3.5	5.9	1.2
Traditional periphery	5.7	6.5	7.9	63.1	39.2	7.0	8.8	10.3	3.9	6.2	10.0	37.6	23.2	12.1	3.9	1.4	0.6
East End	11.5	14.4	16.0	12.1	10.3	12.0	13.6	14.5	31.8	40.5	55.7	9.8	5.7	2.9	1.1	0.4	0.4
Total MAGS	8.3	9.8	11.2	20.8	13.7	8.1	9.6	11.0	9.3	11.9	18.6	31.5	21.9	11.6	2.6	1.0	0.6

Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).

3. METHODOLOGICAL FRAMEWORK

3.1 Sources and items used for migration measurement

The main source of data is the last three official Chilean censuses, conducted in 1982, 1992 and 2002. Five-year transition migration data were derived by comparing the municipality of residence at the census day and five year ago, covering the 1977-82, 1987-92 and 1997-2002 periods.

This question was used because it is the only one that allows estimating rates and the effects of migration on growth, educational composition of the population and residential segregation by educational groups in a given period of time (Bilsborrow 2016; Rodriguez 2016; Rodriguez and Rowe 2017, forthcoming).

The weaknesses of this question to capture migration are well documented and can very tightly synthesize in: i) it only captures a migratory movement during the reference quinquennium; ii) assumes that this movement is direct between the place of residence 5 years earlier and the current one; iii) loses return migration within the period: iv) loses to the population under 5 years of age (Bilsborrow, 2016, Rodriguez, 2016, Rees y otros, 2000). These weaknesses affect the procedure applied in this work, although in terms of the amount of migration (which will be underestimated) and not necessarily in terms of the specific effects of migration that will be measured in this work. In fact there is no evidence this underestimation bias in some way the characteristics of the migrants.

Anyway, there are no alternative sources for the analysis of internal migration in Latin America (except Cuba where there is a sort residence register and any change of residence is recorded). Some household surveys include a module of internal migration that uses the same questions as censuses and a few additional, but their size and sample design does not allow representative capture of migration flows at disaggregated scale (municipalities), and the latter is essential for the analysis carried out in this study.

Exceptionally, some CASEN surveys (www.mideplan.cl/casen) were used to characterize the "broad areas" and counties socioeconomically and to examine their evolution. But its use for the estimation of the migration was discarded,[5] due to the sample limitations, as it is recognized by the same Ministry in charge of the CASEN,[6] as for the bias over standard migration indicators, usually associated to both the sample size and the sample design (White, 2016, Bilsborrow, 2016, Gutiérrez and Rivero, 2011; Rodríguez, 2009, Long, 2009).

3.1. Processing and analytical tools

Using census microdata at municipality level, 36-by-36 origin-destination matrices were created comprising the 34 GSMA' municipalities and two additional categories for: i) moves to and from municipalities outside the GSMA but inside the Metropolitan Region of Santiago, the Major Administrative Division where GSMA lies; ii) moves to and from municipalities located in other Major Administrative Division of the country[7]

These long matrices were used few times, because the analysis at the municipality scale is not easy to follow for those who do not know the city. Additionally, and even more important, the theoretical arguments presented in the previous section regards to areas within the city ("broad areas" that make up the city, specifically: city center, periphery, "peri-centre", renewal or gentrified areas, high-income cone, suburbs, etc), more than each municipality of the GSMA.

Accordingly, the municipality of current residence (Chilean censuses haven been "*de facto*") as well as the municipality of residence 5 years before the census, were re-grouped to generate two new variables, which

[5] Since 2006, these surveys include a specific module on migration, very similar to census module.

[6] "…*la Encuesta Casen considera como dominios de estudio las regiones, y sus ámbitos urbano y rural*": The CASEN survey has the rural and urban area of the regions as its sample domain. (free translation). (http://observatorio.ministeriodesarrollosocial.gob.cl/casen_obj.php.

[7] In 2002 there were 13 Major Administrative Division (labelled "Regions") in Chile.

were used to generate the standard migration matrices compatible with the theoretical discussion. These are the variables "GSMA broad area of current residence" and "GSMA broad area of residence 5 years before the census", being these areas fully compatible with the hypotheses. In both variables the rest of the municipalities of the country were pooled in an additional category. Therefore the final matrices are 7 x 7, being their components the following broad areas: i) Center; ii) "Peri-centre"; iii) Traditional Periphery; iv) Gentrified periphery; and, v) the High Income Cone (or "Northern-Eastern End", see Figure 2); vi) rest of the municipalities of the Metropolitan Region of Santiago; vii) municipalities located in other Major Administrative Division of the country.

Figures 2 and 3 in the backgrounds section show the 5 "broad areas", the municipalities that make up every broad area and a selected indicator of educational composition of each zone (percentage of heads of household with higher education) in 1982, 1992 and 2002. Figure 2 shows that the "broad areas" fit some spatial pattern regarding the distance to the center (CBD located in the northeast of the municipality of Santiago). Figure 3 ratifies the socio-economic differences between these broad areas. For the latter, the educational indicator mentioned above is used since the census does not capture income and the analysis of this study focus on the educational composition of the population. The better-off status of the Northern-Eastern End is apparent because 55 per cent of heads of households aged 25 and over had an university (college degree, in fact) degree there in 2002, a persistent well-off condition according to data from 1982 and 1992 (Figure 3). Table 1 (in the background section too) offers additional indicators showing huge socio-demographic gaps between the five broad areas; this table confirms that the Northern-Eastern is far ahead in all the selected indicators of living conditions except in the basic services coverage due these services are almost universal in GSMA.

The broad area called "gentrified periphery" is exceptional because it is the only one whose municipalities (only 2: Peñalolen and Huechuraba) are very distant. But they are grouped because they share: i) peripheral location; (ii) a historical poverty condition significantly modified by the massive building of gated communities. Figure 3 and Table 1 show up the change of the educational composition in this "broad area". The percentage of population with college/university level among the population aged 25 and over skyrocketed, turning this the area from the lowest percentage in 1982 to the third in 2002 and rapidly approaching the second[8]; iii) relative physical proximity and direct connection by new avenues and highways, bike lanes, and metro lines with the Northern-Eastern End.

Of course, in each "broad area" there are some bordering counties that at a first glance seems to have an ambiguous condition. This is the case, for example, of the counties of Providencia and Nuñoa, because both could be belong to the Peri-centreor even to the centre, since both limit with the central municipality of Santiago. However, they classify in the Northern-Eastern End because they share geographical position there as well as both have a mainly affluent population.

Regarding the definition of the "peri-centre", it has some debatable aspects. Some of the counties included there (such as Cerro Navia and Lo Prado in the West and La Granja and San Ramón in the South) could be classified as peripheral, both by location and by socioeconomic level. However, it was chosen to include them in the Peri-centrebecause several decades ago their space for expansion was exhausted and they have not undergone process of urban renewal (except the eastern limits of Lo Prado recently), and for that reason they have been basically expulsive of population. The debate could also be with regard to the Peri-centrecondition (and not central condition, as many researchers could suggest) of counties such as San Miguel, which border with the central municipality of Santiago and which have undergone processes of urban renewal and repopulation due to a construction of massive and tall buildings blocks for middle and middle-high socioeconomic strata. In this case we chose the location and include San Miguel in the first ring of the Peri-centreand with that to limit the central broad area only to the 4 oldest municipalities of the city.

[8] The use of a different educational indicator from table 1, the average education of the heads of household aged30-59, yields a different ordering, with the gentrified periphery in fourth place, slightly surpassing the "Peri-centre". This is because in the gentrified periphery there still is a large chunk of original inhabitants who have low education. Therefore this average hides a huge heterogeneity.

The peripheral municipalities, on the other hand, have in common that in addition to being located in the outer ring of the city, in general they still have surface for the urban expansion. The exceptions would be Lo Espejo and El Bosque, which in general are almost completely covered by the urban spot. But by location they are closer to the periphery. Perhaps there could be a distinction within the Peri-centrewith an inner ring (Cerrillos, San Miguel, San Joaquín, Macul) and another outside (La Granja, San Ramón, Lo Prado, Cerro Navia) in which case Lo Espejo and El Bosque could join this extended peri-center. Recoleta and Independencia counties, as well as Conchali municipality in a less degree, are difficult to classify because some parts of them are located and behave like different "broad areas". The extreme case is Recoleta (26), whose south area would clearly classify as central "broad area", its intermediate area as "peri-centre broad area" and its northern area as traditional periphery "broad area" (though without territory for expansion).

Anyway, different definitions of these broad areas could be used in future research in order to assess the robustness of the results presented in this paper.

Thus, with these 7 x 7 migration matrices, migration flows, in-migration, out-migration, net migration and their respective rates were estimated for every GSMA broad area for the five–years migration periods of 1977-1982, 1987-1992 and 1997-2002. The same rates were calculated, but for subgroups of the population by educational level: i) without education; ii) low education (elementary or primary, partial or full); (iii) secondary (high-school) education (partial or completed secondary, medium education); iv) technical education (post secondary but vocational, medium-high education); and v) higher education (college/university or higher). This allowed a first approach to the pull or push condition of every broad area (or municipality) for each selected educational level. Moreover, the compositional effect of migration can be anticipated (although not precisely estimated) by comparing migration rates (in particular the comparison between the rate of each group and the total); every group with a net migration rate higher than the total migration rate will increase its participation in the total population due to migration.[9]

The procedure developed to estimate the net and exclusive effect of migration (net migration, in-migration and out-migration) on the educational composition of the areas in the periods 1977-1982; 1987-1992; 1997-2002) was then applied. Age-disaggregated estimations were obtained in order to control the distorting effect of the age bias of migrants (as it is well known, in-migrants as well as out-migrants are concentrated at young ages). This procedure, developed by CELADE, has been used during the last 10 years (ECLAC, 2014; Rodríguez 2013a, 2013b and 2011, ECLAC, 2012, Rodríguez and Busso, 2009). Recently it was formalized and expanded by Rodriguez and Rowe (forthcoming).

This methodology allows the estimation of the impacts of internal migration on the composition of the population of invariant variables over time[10] or variables that change for the whole population in the same way and pace (as the age). The proposed approach provides a summary statistical index, **the Compositional Impact of Migration (CIM)**, which quantifies the impact of migration on the socio-demographic composition of places. The CIM is a counterfactual approach that involves a comparison between a Factual Value (FV) and a Counterfactual Value (CFV). These values are derived from the row and column marginals of a migration matrix based on a statistical indicator and labeled **Migration Impact Indicator (MII) matrix**. It is not a matrix of migration flows. Each element in this matrix represents a statistical indicator that provides a representation of the socio-demographic composition of the local population, such as the local sex population ratio or the mean years of schooling. Like any standard migration matrix, the diagonal elements of the MII matrix relate to the staying population in an area i; off-diagonal elements relate to the migration flow from a region i to a region j; and the column and row marginals relate to the total population in region I at a time t, and in region i at an earlier time t-x

[9] This does not mean that the population of a group with net in-migration rate during the intercensal period grew during this period, because population growth of an educational group depends on migration, natural increase and educational mobility.

[10] Such as sex, education once reached certain age (25 and over, for instance, when educational course ends for most of the people), ethnicity measured through spoken language in childhood, race measured by color of the skin, country or place of birth, social class "inherited" by the occupation or education of the parents, among many others.

FVs correspond to the row marginals of the MII migration matrix which are based on the population distribution at the census date. Thus, they provide a representation of the sociodemographic structure of regions/broad areas"/areas/counties at the census i.e. after migration. CFVs correspond to the elements in the column marginals of the MII migration matrix which are based on the population distribution at an earlier year – one, five or ten years as recorded by censuses. Hypothetically, CFVs could be thought of as the expected population composition if there was no internal migration i.e. if migration had not happened, what would have been the local socio-demographic structure. Subtracting CFVs from FVs provides a measure of change between the start and end of a census interval and represents our proposed summary statistic, the CMI. The CIM measures the estimated percentage change in the local population structure, as captured by a MII, resulting from net migration redistribution. A positive CIM indicates that internal migration contributed to increase a given MII e.g. the local sex population ratio. A negative value denotes that internal migration reduced the MII. A more detailed and analytical description of this procedure, including formulas, can be found in Rodriguez and Rowe, forthcoming, ECLAC, 2014; and Rodriguez 2013a and 2013b)

In this paper the procedure is extended in order to estimate the effect of migration over educational residential segregation. In this case, by using the factual and the counterfactual of "majority" and "minority" populations by broad area as well as municipalities, the factual and the counterfactual Duncan index of dissimilarity[11] are calculated. The difference between both allows estimating the effect of migration on residential segregation (measured by D of course).

Tables A to C of the **Annex** illustrate in the most direct and basic way the migration matrices used and the calculations made in order to estimate the three migration effects described above.

Table A shows the migration (transition) matrix for the population aged 25 years old and over. This matrix was obtained by processing the microdata from the 2002 census. Accordingly it covers the period April 1997 to April 2002. The indicators that allow the estimation of the "growth effect" of migration, in particular the average annual rate of net migration are described and their calculation is presented following the specialized literature (White, 2016, Rees y otros, 2000; CELADE-PROLAP, 1997). This matrix was reproduced for each of the 5 educational groups, for each of the three age groups and for the three censuses used in this study. All of the above mentioned had to be multiplied by 2, because matrices were calculated between counties and between GSMA "broad areas", although finally the bulk of the analysis was made only on the basis of matrices between GSMA "broad areas". In order to estimate intra-metropolitan migration (and its effects), the columns and rows corresponding to "remaining municipalities of the Metropolitan Region" and "counties of other regions of the country" (category 36) were eliminated and their totals recalculated, generating an intra-metropolitan migration matrix. The effects from this migration were estimated in the same way used to estimate effects of the total migration.

Table B shows the inputs for generating the Migration Impact Indicator (MII) matrix between GSMA "broad areas" and the Migration Impact Indicator (MII) matrix between GSMA "broad areas" itself, together with the calculations necessary to estimate the effect of migration on the educational composition of the population, in this case using the percentage of the population with high education (college/university or over). The first matrix in Table B is known because it is the same as in Table A (without calculations to estimate the growth effect) and it was already described. The second matrix of

[11] $$D = \frac{1}{2}\sum\left|\frac{N_{1i}}{N_1} - \frac{N_{2i}}{N_2}\right|$$

where N1 is the population of the subject group ("the minority" in this case one educational group), N2 is the population of the remainder of cases (all the rest educational groups) and i the territorial divisions of the city (broad areas o municipalities in this paper). The range of this measurement is from zero to one. A score of zero means the absence of segregation, because the compared groups have an identical territorial distribution. A score of one denotes maximum segregation, because the two groups are so dissimilar in their distribution that there are no territorial divisions in which both populations are represented. The value of the index is interpreted as the proportion of the minority group that would have to be redistributed among the territorial divisions of the city in order to achieve zero segregation, which occurs when both groups (the .minority and the rest) are equally distributed (adapted from ECLAC, 2014, p. 213-214).

Table B corresponds to the same matrix in Table 1 but only for population with high education. And the third matrix of Table B —namely Migration Impact Indicator (MII) matrix between GSMA "broad areas", being the percentage of the population with high education the indicator— corresponds to the division (cell-to-cell ratio, including the row and the column marginals) between matrix 1 (numerator) and matrix 2 (denominator). The diagonal cells indicate the percentage of the population with high education among non-migrants, each cell outside the diagonal indicates the percentage of the population with high education of each migratory flows, and the marginals indicate the factual (row marginal) and the counterfactual (column marginal) value of the indicator (percentage of the population with high education indicator). The calculations next to this matrix correspond to the estimation of the effect of migration on the proportion of university students, as it was shown in the formulas above. To illustrate the results and their understanding, the inspection of the Northern-Eastern End figures seems useful and communicative.

In line with the description of the socioeconomic geography of GSMA, the third matrix in Table B shows, firstly, that the Northern-Eastern End has a very marked over-representation of highly educated people in its population of 25 years and over: 47% against 12% national and 18% in the "broad area" that trails (center). A more relevant and groundbreaker finding derived from the calculations is that migration tended to increase the percentage of high educated population in the Northern-Eastern End, and not to diminish it as suggested by most of the specialized but scarcely empirical literature on the subject. Although this is an effect that may seem modest (0.7 percentage points, equivalent to 1.4% of the counterfactual percentage, i.e, there would have been no migration), it is not for an attribute that tends to have a lot of inertia and neither is it for an area that already registered the highest percentages of highly educated population by far.

Finally, focusing in specific cell (or indicators of flows) also yields valuable information. First, it is verified that there is an outflow from the Northern-Eastern End to the gentrified periphery as well as this outflow has a very high education profile, even higher than the non-migrant population of the Northern-Eastern End (by far the more educated of GSMA). In this case, the application of the procedure support an expected phenomenon according the literature and additionally it contributes with precise numbers in order to quantify and describe this phenomenon in a detailed manner. Second, the flow towards the traditional periphery differs sharply from the previous one and has a much lower educational profile in comparison to Northern-Eastern no migrant. However, its percentage of highly educated population is higher than the same percentage among non-migrant population in the traditional periphery, meaning this in-flow to the periphery tends to increase the percentage of highly educated population there, although the out migration out number this effect and at the end of the day, migration drives a decrease on the percentage of highly educated population in the traditional periphery. And thirdly, the flows towards the Northern-Eastern End are very selective according educational levels, meaning they have a much higher proportion of people highly educated than the non-migrants in the origin. Therefore, these flows from the other "broad areas" to the Northern Eastern End entail a sort of brain drain in these areas. There is no doubt about this finding contradicts the mainstream narrative about the dissemination of the well-off population across all the AMGS. In fact, it shows that the opposite is still happening, since the Northern-Eastern End has a persistent appeal for well-off population. A more detailed review shows up additional interesting findings because in-migration to End East hardly would raise the percentage of highly educated population there, since only one out six flows registers a higher percentage than the non-migrant population (Northern-Eastern End non-migrant population). In the same vein, and at the odds of the mainstream literature, out-migration hardly decrease the percentage of high educated population, since only one of the 6 possible out-flows registers a higher percentage than the non-migrant population (Northern-Eastern End non-migrant population). In fact, as already mentioned, the final effect of migration is to increase the percentage of the highly educated population in the Northern-Eastern End.

Finally, table C shows the matrices, calculations and results of the effect of migration on residential segregation (segregation index to be more precise) of the educational groups by selected age group. The latter in order to control the influence of age structure over the results, since the specificities of the migrants age structure (much more concentrated in the 15-29 age group.

Only two matrices were used, although a third one is also required to obtain the second matrix: i) the matrix of highly educated population (minority) of 25 years and older, which was already used in Table B; (ii) the matrix of the rest of the population (or majority), which corresponds to all population aged 25 and older without high education, obtained by cell-to-cell subtraction between the matrix for the total

population (25 years and older) and the matrix of highly educated population (minority) of 25 years and older. The marginals of both matrices provide the factual and the counterfactual population distribution of the minority and the majority by areas ("broad areas" and municipalities in this paper). With the factual distributions, the factual segregation index is obtained by applying the formula presented in footnote 11 (Duncan's dissimilarity index) and with the counterfactual distributions the counterfactual segregation index is calculated. The difference between the two corresponds to the absolute effect of migration on segregation and this result on the counterfactual index corresponds to the relative effect. The example shows that migration contributed to increase the rate of dissimilarity between large areas of population with university education, since there had been no migration had been 34.7%, but with the recorded migration was 36.7% in fact, i.e, 2.1 points more, which means a 5.6% increase in exclusive and direct effect due to internal migration.

4. CHANGING PATTERNS OF INTERNAL MIGRATION GAINS AND LOSSES

Tables 2 and 3 show the net migration and the net migration rate of each educational group and broad area.[12] We summarise the key points for each of the five broad area:

a) The Centre. This area has lost an increasingly large number of population across all educational groups and over all three census periods.[13] Two important trends are noted. First is the reduction in net intra-metropolitan out-migration, reflecting the impact of urban renewal projects on retaining population particularly during the 1997-2002 period. The second trend is persistent huge net out-migration rates among technical and university educated people during the 1977-82 and 1987-92 periods. (negative migration rates of 69.6 per thousand for the total migration and 55 per thousand for the intra-metropolitan in 1977-1982, i.e. a depopulation). A decline in these rates however was recorded in the 1997-2002 period, another sign of change due to the renewal programmes.

b) Gentrified Periphery. This area consistently enticed highly educated people, resulting in huge net migration gains during the three census periods. This gain has however been erratic during the observation period, generating doubts about de timing of the gentrification process.

c) Traditional Periphery. This area has consistently been the main attraction center for people from three educational groups during the observation period, except for universities educated individuals. The main destination centre for these individuals has been the Gentrified Periphery. Our analysis reveals a surprising finding which contradicts a prevailing narrative in existing studies (Sabatini et al 2009). The prevailing narrative, as discussed in Section 2, indicates that social diversification in the periphery of the GSMA is a relatively recent process which began in the late 1990s. However, our analysis reveals population with higher education had the highest net in-migration rates in the "traditional periphery" during 1977-19982 and 1987-1992, while the most recent census (1997-2002) showed an inversion, because the population with high education registered the lowest in-migration rate. This decrease was parallel with the boom of in-migration of population with high education towards the "gentrified periphery". However the huge jump of in-migration of educated population to gentrified periphery allows discarding a single or exclusive substitution effect, although is almost sure that some substitution effect happened indeed.

d) Peri-centre. This area reported total net in-migration through both inter- and intra-metropolitan mobility during the 1977-82 census period. But, in the 1987-92 period, this situation changed with this area experiencing net migration losses for all educational groups, and the largest net out-migration rate for university educated people in the 1997-2002 period. In this case the standard narrative about a progressive decay of the Peri-centrematch with the evidence, since there has

[12] Results refer to the population of 25 years and older who answer items of internal migration and education in the census

[13] The magnitude of these losses is however an over-estimation resulting from the similarity in names for CBD Santiago municipality and Santiago city or GSMA. In fact, it is the only "broad area" where the magnitudes and rates of total and intra-metropolitan net migration are very different.

been a loss of population due to migration (not necessarily total growth because the still positive natural growth) as well as a relatively larger loss of population who have high education, due to higher net out-migration rate. Of course, the latter it is not sculpted in stone and it could change if there are land and housing policies or changes in land/housing market conditions.

e) The Northern-Eastern End shows both a trend and social pattern that clash openly with the hypothesis of a major spread of the economic and educational elite. Regardless of the low and irregular migratory attractiveness of this "broad area", which, as already indicated, has geographical and economic barriers to entry, what stands out in this case is that has always registered positive net migration (total and intra-metropolitan) of population with high education while most of the other educational groups registered net-outmigration rates. Relatively high in-migration rates of university educated people during the three census periods indicate that internal migration has consistently contributed to augment the existing large university population in these areas. This finding is consistent with Rodríguez (2007) suggestions based 2002 census data and does not align with the hypotheses of the loss of appeal of these areas for the most affluent and educated population in the country. This finding is also valid in the case of intra-metropolitan migration, which is the base scenario in which the exit of population and educated families to other areas of the city should have totally operated (spreading out the high educated population across the AMGS) according to the mainstream narrative (Sabatini et al, 2009, De Mattos, 2010; and Galetovic and Jordán 2006, for instance).[14]

[14] It should be mentioned that the above calculations were replicated for two age groups (25-34 and 35-59) to control the distorting effect that could be derived from the juvenile bias of the migrant population. And the results did not show significant changes compared to the ones shown in Tables 2 and 3. Data disaggregated by age available at request.

Table 2

GSMA, broad areas: net internal migration and net internal migration rate (per thousand) by educational groups, population 25+, 1977-1982, 1987-1992, 1997-2002.

Census and migration five-year period	GSMA broader zone	TOTAL INTERNAL MIGRATION (INTRA AND EXTRAMETROPOLITAN), POPULATIONA AGED 25+											
		Net migration						Net migration rate (per thousand)					
		NE	LE	ME	TE	UE	Total	NE	LE	ME	TE	UE	Total
1982 (1977-1982)	Centre	-2,014	-19,260	-25,293	-1,964	-9,377	-57,908	-25.8	-29.1	-30.1	-39.9	-69.6	-32.8
	Peri-centre	2,240	10,124	10,949	550	2,184	26,047	12.0	6.4	9.0	8.4	17.5	8.2
	Gentrified periphery	817	7,194	5,174	323	905	14,413	28.5	31.3	54.5	68.3	131.2	39.5
	Traditional periphery	2,593	22,025	21,371	1,187	3,634	50,810	16.4	18.4	26.8	27.1	47.5	22.3
	East End	-772	-2,905	2,326	717	5,234	4,600	-15.6	-8.3	2.9	10.6	13.7	2.8
1992 (1987-1992)	Centre	-1,739	-23,024	-38,779	-6,712	-10,172	-80,426	-39.7	-41.7	-44.0	-59.1	-58.4	-45.5
	Peri-centre	-1,027	-22,318	-28,157	-3,886	-2,282	-57,670	-7.3	-13.9	-16.1	-19.9	-11.3	-14.8
	Gentrified periphery	341	3,988	3,995	869	1,122	10,315	12.6	14.7	19.8	41.9	62.8	19.1
	Traditional periphery	3,110	48,720	71,862	9,688	8,731	142,111	21.2	29.3	40.6	47.0	41.5	35.6
	East End	-317	-5,355	-8,271	-1,244	3,933	-11,254	-10.2	-16.9	-10.1	-6.8	6.3	-5.7
2002 (1997-2002)	Centre	-2,897	-24,245	-40,047	-12,051	-11,404	-90,644	-59.5	-62.6	-50.1	-48.9	-36.3	-50.5
	Peri-centre	-1,042	-12,309	-27,240	-9,899	-8,264	-58,754	-6.3	-10.5	-15.0	-23.0	-21.7	-14.8
	Gentrified periphery	-124	-1,144	-1,718	903	5,680	3,597	-3.5	-4.5	-5.6	11.6	66.3	4.7
	Traditional periphery	3,050	23,806	43,528	12,851	4,008	87,243	13.4	13.1	14.4	16.0	6.7	13.5
	East End	-298	-668	541	686	6,119	6,380	-10.1	-3.0	0.8	2.0	5.6	2.7

Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).

Note: NE: No education; LE: Low education (elementary or primary); ME: Medium Education (secondary-high school); T: Technical education (post secondary but vocational) and UE: University or higher education).

Table 3

GSMA, broad areas: net intra-metropolitan migration and net intra-metropolitan migration rate (per thousand) by educational groups, population 25+, 1977-1982, 1987-1992, 1997-2002.

Census and migration five-year period	GSMA broader zone	INTRAMETROPOLITAN MIGRATION, POPULATIONA AGED 25+											
		Net migration						Net migration rate (per thousand)					
		NE	LE	ME	TE	UE	Total	NE	LE	ME	TE	UE	Total
1982 (1977-1982)	Centre	-1,533	-14,041	-19,715	-1,503	-6,289	-43,081	-21.0	-22.7	-25.5	-33.5	-55.3	-26.5
	Peri-centre	944	1,426	2,927	198	811	6,306	5.2	0.9	2.5	3.1	7.0	2.1
	Gentrified periphery	464	4,830	3,879	257	667	10,097	16.8	21.6	42.4	56.3	106.2	28.5
	Traditional periphery	1,423	14,678	15,954	906	2,685	35,646	9.3	12.7	21.0	21.8	38.4	16.4
	East End	-1,298	-6,893	-3,045	142	2,126	-8,968	-27.6	-21.0	-4.0	2.2	5.9	-5.8
1992 (1987-1992)	Centre	-905	-12,061	-23,382	-3,771	-5,806	-45,925	-22.6	-24.1	-29.3	-38.1	-39.4	-29.0
	Peri-centre	-1,294	-24,708	-31,871	-4,112	-3,266	-65,251	-9.4	-15.8	-18.8	-21.9	-17.0	-17.2
	Gentrified periphery	209	2,773	2,958	741	936	7,617	7.9	10.5	15.1	37.0	55.6	14.5
	Traditional periphery	2,441	42,058	63,911	8,841	7,205	124,456	17.2	26.1	37.6	44.9	36.6	32.3
	East End	-451	-8,062	-11,616	-1,699	931	-20,897	-15.2	-27.4	-14.9	-9.9	1.6	-11.2
2002 (1997-2002)	Centre	-659	-5,091	-10,449	-3,155	-1,978	-21,332	-16.1	-15.8	-15.2	-15.2	-7.7	-14.1
	Peri-centre	-1,162	-11,942	-26,883	-9,681	-8,478	-58,146	-7.1	-10.5	-15.2	-23.2	-23.2	-15.1
	Gentrified periphery	-190	-1,443	-2,063	701	5,134	2,139	-5.5	-5.8	-6.9	9.4	62.8	2.9
	Traditional periphery	2,423	21,669	42,250	12,600	3,397	82,339	11.0	12.3	14.4	16.2	5.9	13.1
	East End	-412	-3,193	-2,855	-465	1,925	-5,000	-14.7	-15.6	-4.6	-1.5	1.9	-2.3

Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002)

Note: NE: No education; LE: Low education (elementary or primary); ME: Medium Education (secondary-high school); T: Technical education (post secondary but vocational) and UE: University or higher education).

5. THE IMPACT OF INTERNAL MIGRATION ON LOCAL EDUCATIONAL COMPOSITION

Charts 1 and 2 report CIM for each educational group for the five broad areas of the GSMA. These indices provide an estimation of the impact of internal migration on the educational composition of these zones. Figure 1 reports indices of the overall internal migration levels, and Figures 2 and 3 disaggregate these into the effect of inter- and intra-metropolitan migration. The analysis of these indices reveals six key findings. Firstly, the results reveal a decreasing trend in the overall impact of internal migration on the educational composition of the broad areas of the GSMA. In the 1977-1982 period, significant effects (of the order of 5% or more) in several "broad areas" of GSMA (like gentrified periphery and Northern-Eastern End) and for several educational groups, whereas in 1997-2002 it only has an effect of this magnitude in the gentrified periphery. This trend is even deeper in the case of intra-metropolitan migration.

The second key finding is the relatively large impact that internal migration has on augmenting the share of vocational and university educated population in the Gentrified Periphery area. This confirms, with acute numbers this time, the role played by internal migration in the socioeconomic transformation of this periphery: due to migration this group increase its share on the total population (25 years and older) by 60% during 1977-1982, by 25% in 1987-1992 and by 38% in 1997-2002.

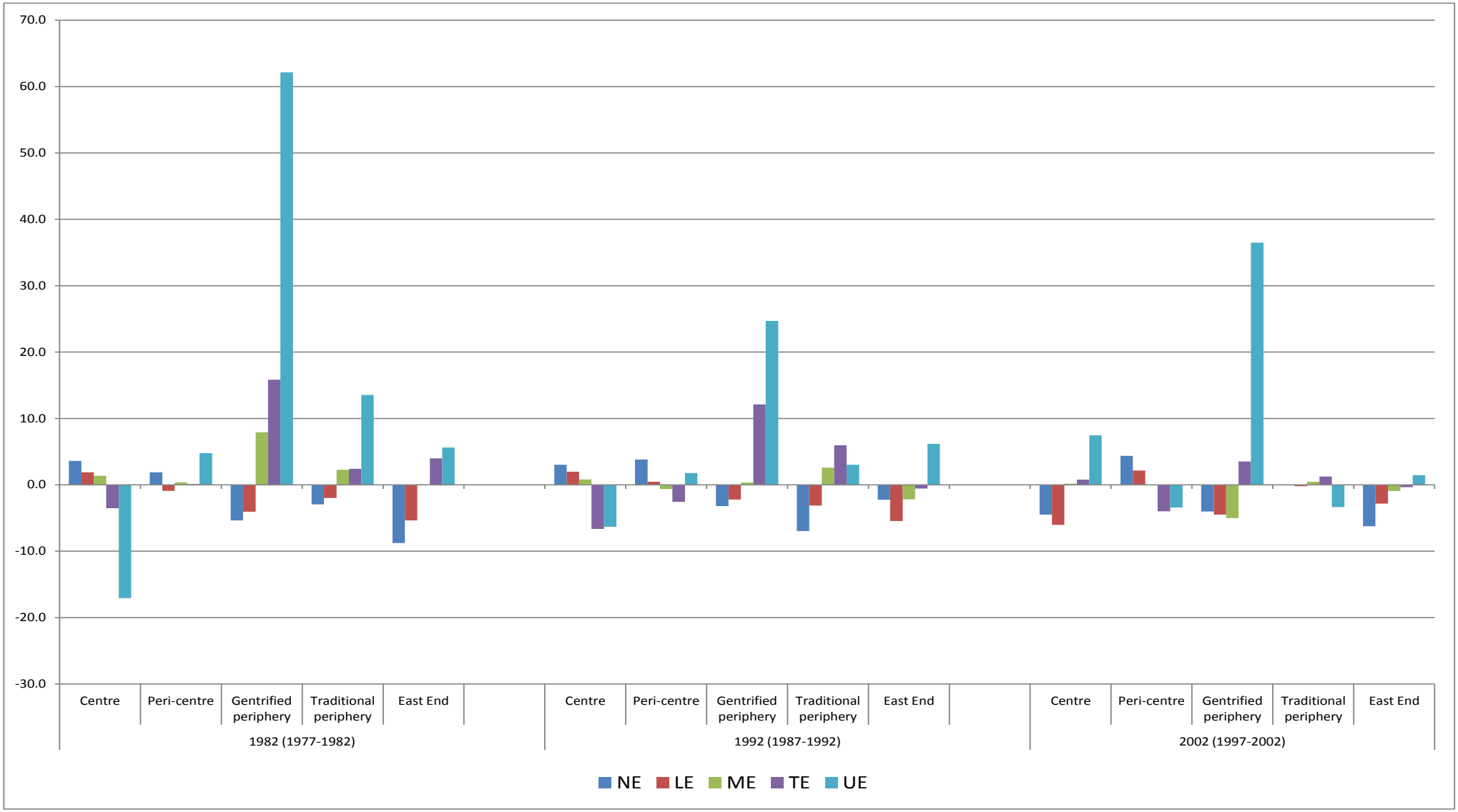
Third is the change in direction in the impact of internal migration on the educational composition of the Traditional Periphery. In 1977-82 and 1987-92, internal migration tended to diversify the traditional periphery by increasing the local share of above high school educated population while reducing the share of people with lower educational qualifications. In 1997-2002, however, the impact reversed with internal migration operating to contract the share of highly educated individuals.

Fourthly, the results reveal that internal migration contributed to accentuate the existing disproportionate base of highly educated individuals Northern-Eastern Affluent Areas by reducing the local share of less educated population while increasing the proportion of university educated people. In this sense, internal migration does not seem to have eroded the human capital of Northern-Eastern Affluent Areas. On the contrary, it promoted the concentration of highly educated individuals in these areas fostering a pattern of educational residential segregation in the GSMA.

The fifth finding regards to the effect of internal migration in the educational composition of the center. During the reference period, and in direct association with the reduction of net out-migration from the center (reduction which is better measure in the case of intra-metropolitan migration because of the problem of synonymy explained in the methodology framework), internal migration change totally its effect. It moved from being an eroding force of the center's qualified human resources base to a force that increased the percentage of population highly educated while reducing the share of other groups. In 1977-1982 internal migration caused a reduction of 20% in the share of population highly educated while in 1997-2002 it caused an increase of almost 10% of the share of this population (chart 2). In this way, the efforts to renew and to make more attractive the central "broad area)" of the GSMA have apparently modified the characteristics of the migrants. This allowed simultaneously to reduce the rates of out-migration and to raise the in-migration of population with university studies to a greater extent than the rest of the educational groups.

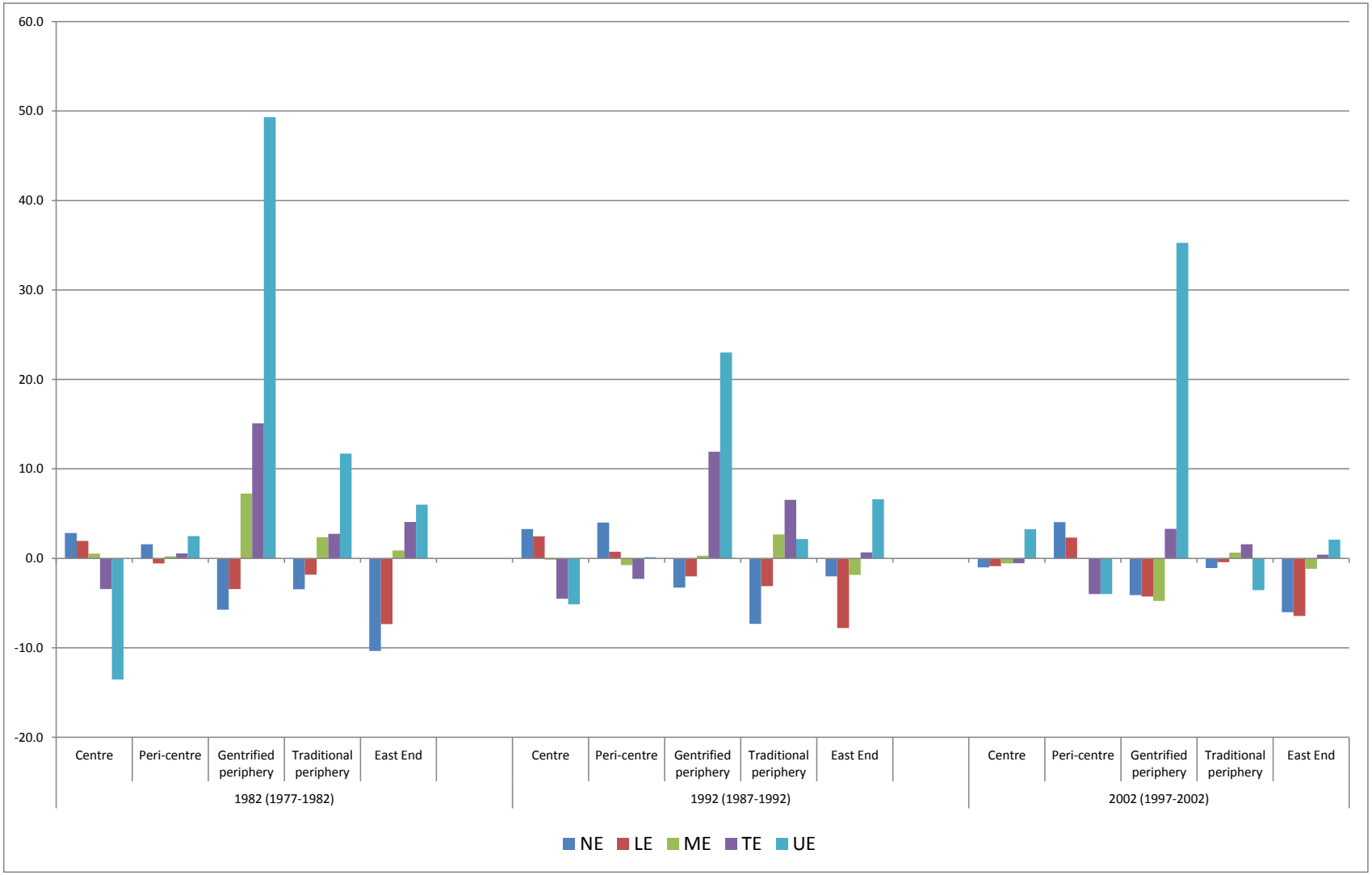
And the sixth finding, the Peri-centre also changes, but in an inverse sense to the centre. Internal migration improved its educative composition in the Peri-centre between 1977-1982, it had no impact in 1987-1992 (because it lifted the proportion of both extremes: population without education and population wit university education) and finally it deteriorated the educational composition in 1997-

Chart 1
GSMA, broad areas: relative change of the educational structure due to total internal migration (CIM) population 25+, 1977-1982, 1987-1992, 1997-2002.



Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).
Note: NE: No education; LE: Low education (elementary or primaryl); ME: Medium Education (secondary-high school); T: Technical education (post secondary but vocationa) and UE: University or higher education).
Chart 2

GSMA, broad areas: relative change of the educational structure due to total intra-metropolitan migration (CIM) population 25+, 1977-1982, 1987-1992, 1997-2002.



Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).
Note: NE: No education; LE: Low education (elementary or primaryl); ME: Medium Education (secondary-high school); T: Technical education (post secondary but vocationa) and UE: University or higher education).

6. IMPACT OF INTERNAL MIGRATION ON EDUCATIONAL RESIDENTIAL SEGREGATION

Tables 4 and 5 show for the first time rigorous estimations about the effect of internal migration and intra-metropolitan migration (residential mobility) on residential segregation by educational levels at different two geographical scales i.e. broad zones and municipalities. The results demonstrate that internal migration has had effects on the residential segregation index used in this research (dissimilarity index between educational groups), during all the observation period. Fore example in 1977-1982 total internal migration slashed the dissimilarity index of young people aged 25-24 with no education by 10.3% (Table 4) and in 1997-2002 intra-metropolitan migration lifted dissimilarity index of people aged 25 an over with university education by 2.3% (Table 4). Effects sharply vary according educational level, age and years, however most of these change do not follow clear patterns. Anyway, this result allow testing the hypothesis on the reductive effect of migration on educational residential segregation.

And the empirical test rules against this hypothesis, because in the 1997-2002 period, which fully captured the process of socio-spatial transformation of the GSMA as it was explained in the backgrounds section, the results suggest the opposite. Reductive effects on segregation were more frequent and greater in 1977-1982 and in 1987-1992 than in 1997-2002. This is immediately apparent in the table because the negative values were colored with red and this color predominates widely in the bottom and middle of the table while disappearing in the upper one. **According to the 2002 census, in the period 1997-2002, migration tend to increase residential segregation for the five socio-educational groups, the two geographical scales ("broad areas" and counties), and the two types (total and intra-metropolitan), examined in this work.**

Moreover the strongest hypothesis related to a specific educational group, namely the reduction of the segregation of the group of higher educational level by the geographical dispersion of the upper class, is discarded, not only for the period 1997-2002, but also for the three five-year migration period examined, since in all of them migration tended to raise the residential segregation index of this group. One of the strengths of the procedure applied in this paper is to synthesize in a single indicator the effect of all migratory exchanges, and not only those that are most visible to the population, the media or even the scholars. What happened in the period 1977-2002 was not a weakening of the Northern-Eastern End as the habitat of the wealthy population. The exit of affluent population from the Northern-Eastern End occurred indeed. However, this exit was outnumbered by the incoming educated people who fostered a massive expansion and consolidation of the Northern-Eastern End as the habitat of the upper class. Due to the space restrictions in the Northern-Eastern End, this consolidation operated by occupying empty spots (little valleys, hills and even some ravines) in the foothills of the Andean Mountains, as well as the vertical growth by the replacement of houses by blocks, necessary to settle the persistent draw of educated people from other broad areas and the rest of the country. Therefore, what is now categorically shown is that the combination of all the effects of migration on the educational composition of all the "broad areas" and municipalities of GSMA has increasing the segregation index of the more educated group, against the widely prevailing hypothesis in the mainstream literature.

The most excluded group, the population without education, registered a decrease in its residential segregation due to internal migration in 1977-1982. Although it is a small reduction effect (-1.2% total migration and -0.2% intra-metropolitan migration in five years), it is a totally surprising result, because in that period several slums and poor human settlement were moved from the Northern-Eastern End to other "broad areas" of the city (mostly the periphery, and sometimes beyond, towards localities that lies dozen kilometers from the boundaries of GSMA). These transfers should have been increase segregation, because they reduced the social mix in the Northern-Eastern End and reinforced the concentration of poor people in the periphery. This puzzle can be solved by inspecting the flows of all the educational groups instead of drawing conclusions from only the two polar educational groups. In fact the results fully support the hypotheses about de "segregative" effect of migration for population (aged 25 and older) without education, since it reduced the fraction of this population residing in the Northern-Eastern End (where they were underrepresented) and it increased its share in the traditional periphery (where it was over-represented). But these effects were outnumbered by two different forces: (i) the increase in the

representation of the "rest" of the educational groups in the periphery; ii) increased share of this population in the centre and Peri-centredue to migration.

The other educational groups do not present clear patterns and, as already mentioned, there are fewer hypothesis about them (ECLAC, 2014, Roberts and Wilson, 2009).

It should be noted that all these results are quite robust because they keep for both types of migration and also after controlling age. With regards to the distinction between total and intra-metropolitan migration, more important than the coincidence in the sign between the two (which is not so strange, taking account that the intra-metropolitan migration is a subset of the total migration) is that the fraction representing the effect of the intra-metropolitan migration within the total has tended to decrease, despite this migration has tended to increase its share within the migration of the GSMA. The explanation of the above is that while in the periods 1977-1982 and 1987-1992 extra-metropolitan migration had little effect on segregation (not on the level of migrants, but because the pattern of territorial settlement of migrants and in-migrants by level of education did not differ significantly from the pattern of location of non-migrants), there appears to be a greater difference in the period 1997-2002 and thus have a more significant effect on segregation. An important case is the segregation of the group of university students, because the finding discussed above and contrary to the bulk of the literature (the lifting effect of the segregation of this group that had the migration) is NOT explained by the migration of Norther-Eastern End with the rest of the country. The latter also contributes to the increase of segregation, because high educated migration tends to be concentrated in the central zone and the Northern-Eastern End, but so does intra-metropolitan migration.

Table 4
GSMA, broad areas: relative change of the dissimilarity index (at broad area scale) of educational groups due to total and intra-metropolitan migration (CIM) population aged 25+, 25-24 and 35-59, 1977-1982, 1987-1992 and 1997-2002.

Census and five-years migration period	Agre group	Indicators: i) factual dissimilarity index; ii) counterfactul dissimilarity index; iii) relative effect of migration (per hundred) on dissimilarity index	Total					Intra-metropolitan				
			NE	LE	ME	TE	UE	NE	LE	ME	TE	UE
2002 (1997-2002)	25+	Factual	12.31	15.33	10.33	4.97	36.71	11.85	15.11	10.16	5.02	36.53
		Counterfactual	11.62	14.47	9.49	4.55	34.66	11.65	14.81	9.65	4.49	35.47
		Relative effect	***5.9***	***5.9***	***8.8***	***9.2***	***5.9***	***1.7***	***2.0***	***5.3***	***11.9***	***3.0***
	25-34	Factual	11.00	12.93	18.30	2.95	36.92	10.10	12.83	17.59	2.91	36.35
		Counterfactual	9.83	9.99	16.81	1.95	32.90	9.90	12.00	16.78	2.18	34.17
		Relative effect	***11.8***	***29.4***	***8.9***	***51.5***	***12.2***	***2.1***	***6.9***	***4.8***	***33.1***	***6.4***
	35-59	Factual	11.28	15.80	12.98	7.36	37.12	11.09	15.77	12.86	7.39	37.14
		Counterfactual	10.74	15.09	12.23	7.17	35.76	11.01	15.50	12.43	7.37	36.57
		Relative effect	***5.1***	***4.7***	***6.2***	***2.7***	***3.8***	***0.7***	***1.8***	***3.4***	***0.3***	***1.6***
1992 (1987-1992)	25+	Factual	11.34	16.88	3.59	10.50	39.45	11.00	16.91	3.41	10.40	40.23
		Counterfactual	12.45	17.72	4.11	11.95	37.55	12.11	17.70	4.17	11.64	38.78
		Relative effect	***-8.9***	***-4.8***	***-12.8***	***-12.2***	***5.1***	***-9.2***	***-4.5***	***-18.2***	***-10.7***	***3.7***
	25-34	Factual	8.14	12.2	10.44	11.48	37.32	7.52	12.5	10.29	11.7	36.65
		Counterfactual	10.99	13.43	9.41	12.62	38.17	10.20	13.60	9.57	12.64	37.34
		Relative effect	***-25.9***	***-8.8***	***10.9***	***-9.1***	***-2.2***	***-26.3***	***-7.8***	***7.5***	***-7.3***	***-1.9***
	35-59	Factual	10.34	19.58	5.02	12.75	41.42	10.28	19.53	4.99	12.77	41.67
		Counterfactual	10.91	19.90	5.54	13.20	39.20	10.86	19.95	5.64	13.26	40.24
		Relative effect	***-5.2***	***-1.6***	***-9.3***	***-3.4***	***5.7***	***-5.3***	***-2.1***	***-11.4***	***-3.7***	***3.6***
1982 (1977-1982)	25+	Factual	12.13	20.57	11.08	13.98	39.30	11.92	20.63	11.34	13.97	40.31
		Counterfactual	12.28	21.18	11.53	13.92	37.50	11.94	21.08	11.73	14.13	38.03
		Relative effect	***-1.2***	***-2.9***	***-3.9***	***0.4***	***4.8***	***-0.2***	***-2.1***	***-3.4***	***-1.1***	***6.0***
	25-34	Factual	7.28	17.3	8.45	15.42	33.94	7.17	17.4	8.37	15.4	34.56
		Counterfactual	8.11	18.69	7.95	14.99	35.16	7.52	18.33	8.27	15.57	35.07
		Relative effect	***-10.3***	***-7.6***	***6.4***	***2.8***	***-3.5***	***-4.6***	***-4.9***	***1.3***	***-1.1***	***-1.4***
	35-59	Factual	13.39	22.97	14.46	13.30	47.02	13.39	22.99	14.58	13.49	47.56
		Counterfactual	13.18	23.24	14.75	13.45	44.08	13.05	23.23	14.86	13.56	45.53
		Relative effect	***1.6***	***-1.2***	***-2.0***	***-1.1***	***6.7***	***2.6***	***-1.0***	***-1.9***	***-0.5***	***4.5***

Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).
Note: NE: No education; LE: Low education (elementary or primary); ME: Medium Education (secondary-high school); T: Technical education (post secondary but vocational) and UE: University or higher education).
Note: negative effects are in red color.

Table 5
GSMA, broad areas: relative change of the dissimilarity index (at municipality scale) of educational groups due to total and intra-metropolitan migration (CIM) population aged 25+, 25-24 and 35-59, 1977-1982, 1987-1992 and 1997-2002.

Census and five-years migration period	Agre group	Indicators: i) factual dissimilarity index; ii) counterfactul dissimilarity index; iii) relative effect of migration (per hundred) on dissimilarity index	Total					Intra-metropolitan				
			NE	LE	ME	TE	UE	NE	LE	ME	TE	UE
2002 (1997-2002)	25+	Factual	20.18	21.65	11.58	13.60	39.78	18.89	20.74	10.84	12.79	40.36
		Counterfactual	19.20	21.10	10.74	12.85	38.51	18.06	20.53	10.17	12.13	39.45
		Relative effect	**5.11**	**2.64**	**7.87**	**5.86**	**3.31**	**4.56**	**1.04**	**6.61**	**5.48**	**2.31**
	25-34	Factual	18.29	21.70	17.01	12.63	39.64	16.97	20.21	18.48	11.81	39.87
		Counterfactual	16.95	20.78	16.08	12.06	37.40	15.92	19.70	17.89	11.54	38.39
		Relative effect	**7.92**	**4.41**	**5.82**	**4.77**	**5.97**	**6.56**	**2.62**	**3.31**	**2.35**	**3.87**
	35-59	Factual	20.83	24.66	14.83	16.98	40.77	20.30	24.03	13.71	15.92	41.86
		Counterfactual	20.51	24.74	14.19	16.97	40.09	20.05	23.88	13.29	16.13	41.35
		Relative effect	**1.57**	**-0.32**	**4.49**	**0.07**	**1.69**	**1.26**	**0.61**	**3.17**	**-1.28**	**1.23**
1992 (1987-1992)	25+	Factual	13.45	15.81	9.75	17.05	43.11	13.04	15.66	10.02	17.28	43.94
		Counterfactual	13.61	14.81	9.30	17.43	42.29	13.39	14.83	9.59	17.35	43.07
		Relative effect	**-1.20**	**6.81**	**4.74**	**-2.18**	**1.95**	**-2.57**	**5.57**	**4.42**	**-0.45**	**2.03**
	25-34	Factual	**13.44**	**21.08**	**12.31**	**16.45**	**41.17**	13.23	21.33	12.36	16.61	41.80
		Counterfactual	14.16	19.49	10.62	15.99	38.83	13.78	19.80	11.00	16.11	39.50
		Relative effect	**-5.06**	**8.17**	**15.85**	**2.92**	**6.04**	**-4.00**	**7.71**	**12.34**	**3.05**	**5.83**
	35-59	Factual	17.37	26.10	12.94	17.39	47.47	17.43	26.13	12.99	17.47	47.66
		Counterfactual	16.72	25.38	12.14	17.01	45.77	17.04	25.65	12.39	17.16	46.53
		Relative effect	**3.89**	**2.83**	**6.60**	**2.26**	**3.72**	**2.31**	**1.89**	**4.79**	**1.82**	**2.42**
1982 (1977-1982)	25+	Factual	14.90	23.78	13.97	17.50	42.92	14.75	23.88	14.29	17.61	43.58
		Counterfactual	15.19	24.00	14.22	16.83	42.50	14.90	23.97	14.50	17.15	42.87
		Relative effect	**-1.86**	**-0.92**	**-1.75**	**4.00**	**0.98**	**-1.00**	**-0.41**	**-1.43**	**2.65**	**1.66**
	25-34	Factual	12.40	22.45	12.25	16.81	40.70	12.68	22.53	12.39	17.02	41.31
		Counterfactual	12.58	22.83	12.14	15.53	40.43	12.24	22.75	12.57	16.16	40.56
		Relative effect	**-1.38**	**-1.68**	**0.88**	**8.23**	**0.67**	**3.63**	**-0.93**	**-1.37**	**5.30**	**1.85**
	35-59	Factual	18.27	27.46	20.76	19.00	51.77	18.28	27.54	20.88	19.17	52.32
		Counterfactual	17.47	26.93	20.37	18.33	50.30	17.46	27.05	20.57	18.52	50.92
		Relative effect	**4.62**	**1.96**	**1.95**	**3.63**	**2.91**	**4.69**	**1.82**	**1.52**	**3.54**	**2.75**

Source: Authors' elaboration based on Chilean censuses microdata (1982, 1992 and 2002).
Note: NE: No education; LE: Low education (elementary or primary); ME: Medium Education (secondary-high school); T: Technical education (post secondary but vocational) and UE: University or higher education).
Note: negative effects are in red color.

7. CONCLUSIONS, LESSONS AND CHALLENGES

Persistent patterns of socio-economic residential segregation are a predominant concern in developing countries in Asia, Africa and Latin America and industrialised highly unequal nations, such as the US and the UK. Spatial mobility represents a key mechanism to pursue opportunities and escape from unfavorable local conditions. We develop a methodological approach to quantify the impact of internal migration on educational residential segregation in the GMSA and empirically assess five hypotheses.

Our results revealed that intra-metropolitan migration to the Gentrified Periphery increased the local proportion of highly educated individuals (Hypothesis 1). While this area experienced the largest increase in the GMSA in the 1997-2002 period, it remained to house a small share of highly education population of the GSMA, only 5%. Private housing developments, such as condos and gated communities, aimed at upper and upper middle class have underpinned the rising number of highly educated residents in this area. However the peak of this effect was not in 1997-2002 as suggested by mainstream literature.

We found evidence that Affluent Northern-Eastern Areas have consistently increased their share of highly educated population attracting university educated individuals from within the GSMS and beyond metropolitan borders. This finding only partially support our hypothesis 3 and it is in conflict with most existing literature (Rasse, 2016), which indicates that Northern-Eastern Areas have experienced a net migration losses of high-income groups from late 1990's, due to young wealthy families moving to the Gentrified Periphery area and municipalities beyond the metropolitan boundaries. While young wealthy families moved to the Gentrified Periphery area, this turnout was small. The flow of wealthy highly educated people moving into Affluent Northern-Eastern Areas outnumbered the outflow. Thus, the resulting net balance was an increase in share of university educated people in these areas – a fact that was not explored in previous analyses.

We found partial evidence to support Hypothesis 2 and 4. Our findings revealed that internal migration raised the share of highly educated individuals in the Traditional Periphery during the 1977-82 and 1987-92 census periods supporting Hypothesis 2. However, this effect was not persistent over time. During the 1997-2002 census period, internal migration operated to reduce the local share of highly educated people. This is contrary to common belief because while the Traditional Periphery attracted highly educated individuals in the 1997-2002 period, it also enticed less educated populations in a similar magnitude. As a result, internal migration reduced the local base of university educated people challenging the hypothesis of social diversification in the metropolitan periphery.

Our findings also provide partial support for an erosion of the educational base in the Peri-centre (Hypothesis 4). A reduction in the share of university educated individuals due to internal migration is only found for the 2002 census. Internal migration operated to raise the share of both people without educational qualification, and those with high educational qualification in 1977-82 and 1987-92, reflecting the socio-economic diversity of municipalities in the Pericentre. This area comprised a large number of municipalities in decay and varying levels of deprivation, and two municipalities (San Miguel and Macul) which were the centre of urban renewal and middle-class gentrification. This socio-economic diversity has been the result of "natural" processes as the Peri-centre has remained absent in urban redevelopment plans despite its considerable population size.

Our findings also support the hypothesis 5 about a renewed attraction of central areas in the GMSA for highly educated individuals. Despite overall internal migration losses, these areas experienced an increase in the share of university educated population in the 1997-2002 period due to internal migration (both intra and extra metropolitan migration). Urban renewal development programme and re-population policies coincided with this trend.

Finally, the accumulated evidence provided no support for a reduction in educational residential segregation. Overall, internal migration acted to increase educational residential segregation in the GSMA, particularly in the 1997-2002 period. Decreases in residential segregation were found for some educational groups at the lower end of the educational spectrum. This contrasts with expectations from prior work which points to increasing residential segregation of low educated families (Lombardi and Veiga, 1989). Additionally, reductions in educational residential segregation resulting from internal migration were observed during the 1977-82 and 1987-92, not in the 1997-2002 period, when they were expected to be

more pronounced (Rasse, 2016; Sabatini et al, 2009). We found no evidence of reductions in residential segregation among highly educated individuals due to internal migration, contrasting with prior work pointing to a trend of increasing dispersion of upper class families in the GSMA (De Mattos, 2010; Sabatini et al, 2009; Galetovic and Jordan, 2006).

Together, these findings expand our understanding of socio-economic segregation by revealing important structural changes in the contemporary patterns of educational residential segregation in the GSMA and the way in which internal migration has shaped these patterns. They also challenge the prevailing narrative of declining socio-economic residential segregation and continuing gentrification of traditional peripheral areas in the GSMA by providing robust evidence of the reverse trends. These findings call for re-theorisation of the factors driving residential segregation in the GSMA.

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ANNEX

Table A
GSMA, 1997-2002, by broad areas: Growth effect of migration (net migration rate) on population (25 year and over) by total internal migration and intra-metropolitan migration

TOTAL INTERNAL MIGRATION, POPULATION 25+, 1997-2002

Current residence (GSMA's broad areas and two other zones)	Residence 5 years before (GSMA's broad areas and two other zones)								Total 1997 (2)	Calculations		
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (1)		Mid-term population [(1)+(2))] / 2 (3)	Net Migration (1)-(2) (4)	Net Migration Rate [{(4)/5}/(3)]* 1000 (5)
Centre	246,269	15,990	1,609	18,810	9,812	2,159	19,133	313,782	404,426	359,104	-90,644	-50.5
Peri-centre	15,889	678,853	4,319	34,757	8,413	2,777	19,351	764,359	823,113	793,736	-58,754	-14.8
Gentrified periphery	2,303	5,361	125,742	5,604	10,010	504	4,792	154,316	150,719	152,518	3,597	4.7
Traditional periphery	37,188	88,653	11,722	1,138,642	17,861	7,544	35,695	1,337,305	1,250,062	1,293,684	87,243	13.5
East End	12,173	11,520	3,489	13,914	397,406	2,791	28,978	470,271	463,891	467,081	6,380	2.7
Rest of Metropolitan Region	7,332	8,062	1,156	13,838	6,620	300,755	11,875	349,638	325,373	337,506	24,265	14.4
Rest of Country	83,272	14,674	2,682	24,497	13,769	8,843	4,877,878	5,025,615	4,997,702	5,011,659	27,913	1.1
Total	404,426	823,113	150,719	1,250,062	463,891	325,373	4,997,702	8,415,286	8,415,286	8,415,286	0	0.0

INTRAMETROPOLITAN MIGRATION, POPULATION 25+, 1997-2002

Current residence (GSMA's broad areas and two other zones)	Residence 5 years before (GSMA's broad areas and two other zones)								Total 1997 (7)	Calculations		
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (6)		Mid-term population [(6)+(7))] / 2 (8)	Net Migration (6)-(7) (9)	Net Migration Rate [{(9)/5}/(8)]* 1000 (10)
Centre	246,269	15,990	1,609	18,810	9,812			292,490	313,822	303,156	-21,332	-14.1
Peri-centre	15,889	678,853	4,319	34,757	8,413			742,231	800,377	771,304	-58,146	-15.1
Gentrified periphery	2,303	5,361	125,742	5,604	10,010			149,020	146,881	147,951	2,139	2.9
Traditional periphery	37,188	88,653	11,722	1,138,642	17,861			1,294,066	1,211,727	1,252,897	82,339	13.1
East End	12,173	11,520	3,489	13,914	397,406			438,502	443,502	441,002	-5,000	-2.3
Rest of Metropolitan Region												
Rest of Country												
Total	313,822	800,377	146,881	1,211,727	443,502			2,916,309				

Source: Author's calculations base on census 2002 microdata.

Table B

GSMA, 1997-2002: Internal migration effect on percentage of population (25 years and over) with university education

Current residence (GSMA's broad areas and two other zones)	Residence 5 years before (GSMA's broad areas and two other zones). Population 25+, 1997-2002								Total 1997 (2)
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (1)	
Centre	246,269	15,990	1,609	18,810	9,812	2,159	19,133	313,782	404,426
Peri-centre	15,889	678,853	4,319	34,757	8,413	2,777	19,351	764,359	823,113
Gentrified periphery	2,303	5,361	125,742	5,604	10,010	504	4,792	154,316	150,719
Traditional periphery	37,188	88,653	11,722	1,138,642	17,861	7,544	35,695	1,337,305	1,250,062
East End	12,173	11,520	3,489	13,914	397,406	2,791	28,978	470,271	463,891
Rest of Metroolitan Region	7,332	8,062	1,156	13,838	6,620	300,755	11,875	349,638	325,373
Rest of Country	83,272	14,674	2,682	24,497	13,769	8,843	4,877,878	5,025,615	4,997,702
Total	404,426	823,113	150,719	1,250,062	463,891	325,373	4,997,702	8,415,286	8,415,286

Current residence (GSMA's broad areas and two other zones)	Residence 5 years before (GSMA's broad areas and two other zones). Population 25+ and university education, 1997-2002								Total 1997 (4)
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (3)	
Centre	38,360	3,422	367	4,039	4,305	471	6,228	57,192	68,596
Peri-centre	2,505	59,691	408	3,904	2,277	293	2,873	71,951	80,215
Gentrified periphery	754	1,049	10,777	1,165	5,179	69	973	19,966	14,286
Traditional periphery	4,955	8,321	854	98,974	3,600	763	4,983	122,450	118,442
East End	5,897	4,780	1,384	5,225	190,326	1,154	12,946	221,712	215,593
Rest of Metropolitan Region	1,090	918	140	1,715	3,334	18,827	1,440	27,464	22,753
Rest of Country	15,035	2,034	356	3,420	6,572	1,176	485,148	513,741	514,591
Total	68,596	80,215	14,286	118,442	215,593	22,753	514,591	1,034,476	1,034,476

Current residence (MAGS's broad areas and two other zones)	Residence 5 years before (MAGS's broad areas and two other zones), flow indicador: percentage of people with university studies, population 25+, 1997-2002								Total 1997 [(2)/(4)] (6)	Calculations	
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 [(3)/(1)] (5)		Absolut effect [(5)-(6)] (7)	Relative effect [(7)/(6)]*100 (8)
Centre	15.6	21.4	22.8	21.5	43.9	21.8	32.6	18.2	17.0	1.3	7.5
Peri-centre	15.8	8.8	9.4	11.2	27.1	10.6	14.8	9.4	9.7	-0.3	-3.4
Gentrified periphery	32.7	19.6	8.6	20.8	51.7	13.7	20.3	12.9	9.5	3.5	36.5
Traditional periphery	13.3	9.4	7.3	8.7	20.2	10.1	14.0	9.2	9.5	-0.3	-3.4
East End	48.4	41.5	39.7	37.6	47.9	41.3	44.7	47.1	46.5	0.7	1.4
Rest of Metroplitan Region	14.9	11.4	12.1	12.4	50.4	6.3	12.1	7.9	7.0	0.9	12.3
Rest of Country	18.1	13.9	13.3	14.0	47.7	13.3	9.9	10.2	10.3	-0.1	-0.7
Total	17.0	9.7	9.5	9.5	46.5	7.0	10.3	12.3	12.3	0.0	0.0

Source: Author's calculations base on census 2002 microdata

Table C (continues)

GSMA, 1997-2002: Internal migration effect on residential segregation (dissimilarity index) of population (25 years and over) with university education

Current residence (GSMA's broad zones and two other zones)	Residence 5 years before (GSMA's broad zones and two other zones), population 25+, 1997-2002								Total 1997 (2)
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (1)	
Centre	246,269	15,990	1,609	18,810	9,812	2,159	19,133	313,782	404,426
Peri-centre	15,889	678,853	4,319	34,757	8,413	2,777	19,351	764,359	823,113
Gentrified periphery	2,303	5,361	125,742	5,604	10,010	504	4,792	154,316	150,719
Traditional periphery	37,188	88,653	11,722	1,138,642	17,861	7,544	35,695	1,337,305	1,250,062
East End	12,173	11,520	3,489	13,914	397,406	2,791	28,978	470,271	463,891
Rest of MAGS	7,332	8,062	1,156	13,838	6,620	300,755	11,875	349,638	325,373
Rest of Country	83,272	14,674	2,682	24,497	13,769	8,843	4,877,878	5,025,615	4,997,702
Total	404,426	823,113	150,719	1,250,062	463,891	325,373	4,997,702	8,415,286	8,415,286
Current residence (GSMA's broad areas and two other zones)	**Residence 5 years before (GSMA's broad areas and two other zones), population 25+ and university education (MINORITY), 1997-2002**								Total 1997 (4)
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (3)	
Centre	38,360	3,422	367	4,039	4,305	471	6,228	57,192	68,596
Peri-centre	2,505	59,691	408	3,904	2,277	293	2,873	71,951	80,215
Gentrified periphery	754	1,049	10,777	1,165	5,179	69	973	19,966	14,286
Traditional periphery	4,955	8,321	854	98,974	3,600	763	4,983	122,450	118,442
East End	5,897	4,780	1,384	5,225	190,326	1,154	12,946	221,712	215,593
Rest of the Metropolitan Region	1,090	918	140	1,715	3,334	18,827	1,440	27,464	22,753
Rest of Country	15,035	2,034	356	3,420	6,572	1,176	485,148	513,741	514,591
Total	68,596	80,215	14,286	118,442	215,593	22,753	514,591	1,034,476	1,034,476
Current residence (GSMA's broad areas and two others zones)	**Residence 5 years before (GSMA's broad areas and two other zones), population 25+ and WITHOUTuniversity education (MAJORITY = REST OF POPULATION RESPECT TO POPULATION WIT UNIVERSITY EDUCATION), 1997-2002**								Total 1997 (2)
	Centre	Peri-centre	Gentrified periphery	Traditional periphery	East End	Rest of Metropolitan Region	Rest of Country	Total 2002 (1)	
Centre	207,909	12,568	1,242	14,771	5,507	1,688	12,905	256,590	335,830
Peri-centre	13,384	619,162	3,911	30,853	6,136	2,484	16,478	692,408	742,898
Gentrified periphery	1,549	4,312	114,965	4,439	4,831	435	3,819	134,350	136,433
Traditional periphery	32,233	80,332	10,868	1,039,668	14,261	6,781	30,712	1,214,855	1,131,620
East End	6,276	6,740	2,105	8,689	207,080	1,637	16,032	248,559	248,298
Rest of the Metropolitan Region	6,242	7,144	1,016	12,123	3,286	281,928	10,435	322,174	302,620
Rest of Country	68,237	12,640	2,326	21,077	7,197	7,667	4,392,730	4,511,874	4,483,111
Total	335,830	742,898	136,433	1,131,620	248,298	302,620	4,483,111	7,380,810	7,380,810

Table 3 (end)

GSMA, 1997-2002: Total Internal migration effect on residential segregation (dissimilarity index) of population (25 years and over) with university education

	CURRENT				FACTUAL	PAST (FIVE YEAR BEFORE PREVIOUS TO CENSUS)				COUNTER-FACTUAL
Current residence (GSMA's broad areas and two others zones)	Minority (population with univesity education) (1)	Mayority (rest) (2)	Minority spatial distribucion (by broader zones) (1i/1t) (3)	Majority spatial distribucion (by broader zones) (2i/2t) (4)	Diference between spatial distributions and dissimilarity index ABS[(3)-(4)] (5)	Minority (population with univesity education) (6)	Mayority (rest) (7)	Minority spatial distribucion (by broader zones) (1i/1t) (8)	Majority spatial distribucion (by broader zones) (2i/2t) (9)	Diference between spatial distributions and dissimilarity index ABS[(3)-(4)] (10)
Centre	57,192	256,590	0.116	0.101	0.015	68,596	335,830	0.138	0.129	0.009
Peri-centre	71,951	692,408	0.146	0.272	0.126	80,215	742,898	0.161	0.286	0.125
Gentrified periphery	19,966	134,350	0.040	0.053	0.012	14,286	136,433	0.029	0.053	0.024
Traditional periphery	122,450	1,214,855	0.248	0.477	0.229	118,442	1,131,620	0.238	0.436	0.198
East End	221,712	248,559	0.449	0.098	0.352	215,593	248,298	0.434	0.096	0.338
TOTAL GSMA	493,271	2,546,762	1.000	1.000	0.734	497,132	2,595,079	1.000	1.000	0.693
Rest of Country	Dissimilarity index (factual)				36.71	Dissimilarity index (counterfactual)				34.66
Total										

EFFECT OF INTERNAL MIGRATION ON SEGREGATION (DISSIMILARITY INDEX)	
Absolute	Relative
36.71 - 34.66 = 2.1	**- 34.66)/ 34.66 =**

Source: Author's calculations base on census 2002 microdata