Chapter 24
Changes in Spatial Inequality and Residential Segregation in Metropolitan Lima

Graciela Fernández-de-Córdova, Paola Moschella, and Ana María Fernández-Maldonado

Abstract Since the 2000s, Lima city shows important changes in its socio-spatial structure, decreasing the long-established opposition between the centre and the periphery, developing a more complex arrangement. Sustained national economic growth has allowed better socio-economic conditions in different areas of the city. However, high inequality still remains in the ways of production of urban space, which affects residential segregation. To identify possible changes in the segregation patterns of Metropolitan Lima, this study focuses on the spatial patterns of occupational groups, examining their causes and relation with income inequality. The analysis is based on the 1993 and 2007 census data, measuring residential segregation by the Dissimilarity Index, comparing with the Diversity Index. The results confirm trends towards increased segregation between occupational groups. Top occupational groups are concentrated in central areas, expanding into adjacent districts. Bottom occupational groups are over-represented in distant neighbourhoods. In-between, a new, more mixed, transitional zone has emerged in upgraded formerly low-income neighbourhoods. Areas of lower occupational diversity coincide with extreme income values, forming spaces of greater segregation. In the metropolitan centre–periphery pattern, the centre has expanded, while the periphery has been shifted to outer peripheral rings.

Keywords Residential segregation · Spatial inequality · Index of dissimilarity · Occupational diversity · Lima

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24.1 Introduction

Inequality is a complex social condition with multiple dimensions that leads to economic, social and environmental imbalances and generates spatial disparities between and within different territories (ECLAC 2018; Jordán et al. 2017). Measured by the Gini index, Latin American countries comprise the most unequal world region, a position verified through analysis of tax data on personal income in selected countries (Barcena and Byanyima 2016). Inequality generates socio-spatial segregation when the formation of residential areas of groups of people with similar socio-economic status—be it voluntary or forced—limits the interactions between those groups. The intensity of residential segregation will then depend on the degree of income inequality (Chapin 1965; Sabatini 2006). Consequently, Latin American cities are highly residentially segregated, which is illustrated by notorious examples of gated communities and 'fortified enclaves' for the rich and upper middle class (Caldeira 2000; Coy and Pöhler 2002).

The objective of this chapter is to analyse the recent changes in residential segregation by socio-economic status in the city of Lima, the capital city of Peru. And additionally, to explore the extent of the effects that national economic trends have had on the conditions of socio-spatial segregation in Metropolitan Lima. In a country as Peru, whose societal relationships are characterized by highly asymmetrical power relations (Drinot 2006), socio-economic segregation has been a common and persistent urban phenomenon. However, socio-spatial segregation only became a mark of the city during the process of rapid urbanization that Lima experienced since the mid-1950s. The impact of the widespread emergence of peripheral informal settlements on Lima was overwhelming. The process definitely modified the structure of the city (Driant 1992), shaping it into a strongly segregated pattern of centre–periphery.

Sustained improvement of the national economy in the 2000s has led to a substantial growth of purchasing power of population groups living in the older periphery, at the intermediate zone of urban expansion in Metropolitan Lima. This process promoted the expansion of public and (mostly) private investments in infrastructure, services and housing towards this area (Chion 2002), contributing to social diversification and the improvement of quality of life. These changes have led to trends towards the reduction of the degree of socio-spatial segregation, observed in some of these peripheral areas (Fernández-de-Córdova et al. 2011). Desegregation was also observed in many other cities in Latin America (Sabatini 2015; Aguilar and Escamilla 2015).

This study is carried out following Sabatini's (2006) segregation scale approach, which pays attention to the spatial scale in measuring inequality. Its main assumption is that high levels of inequality are not necessarily negative, but the impact of high inequality depends on the size and hierarchy of socio-economic groups. "If segregation occurs within a reduced geographic scale, like a small city or through the conformation of smaller, socially homogenous neighborhoods, the negative effects of segregation can be less significant or non-existent." (Sabatini 2006: 9). The analysis is based on occupational categories, which are used as a proxy for socio-economic

status. Residential segregation is measured by means of the Dissimilarity Index and then compared with the Diversity Index to examine the utility of the different indices and spatial units for understanding residential segregation between occupational groups. Residential segregation is related to income inequality. The study uses data from the 1993 and 2007 national census of population and housing, and where possible other census data.

The text is organized into five sections. The following describes the context of Metropolitan Lima: the main features of its urban development; the welfare and housing systems in the country, forms of income inequality in Peru, and the occupational structure in Lima. The third section presents the analysis of residential segregation based on the index of dissimilarity, location quotient and the classification of neighbourhoods according to the occupational composition. Section four presents the analyses of occupational diversity by income level. The last section presents the main findings and conclusion.

24.2 The Context: Metropolitan Lima

Metropolitan Lima is the largest Peruvian metropolis, and the fifth largest in Latin America, housing 9.5 million out of the 31.25 million Peruvian inhabitants in 2017 (INEI 2018). The city is divided into 50 districts that belong to the two provinces of Lima and its port, Callao (see Fig. 24.1). Lima faces the Pacific Ocean and has a

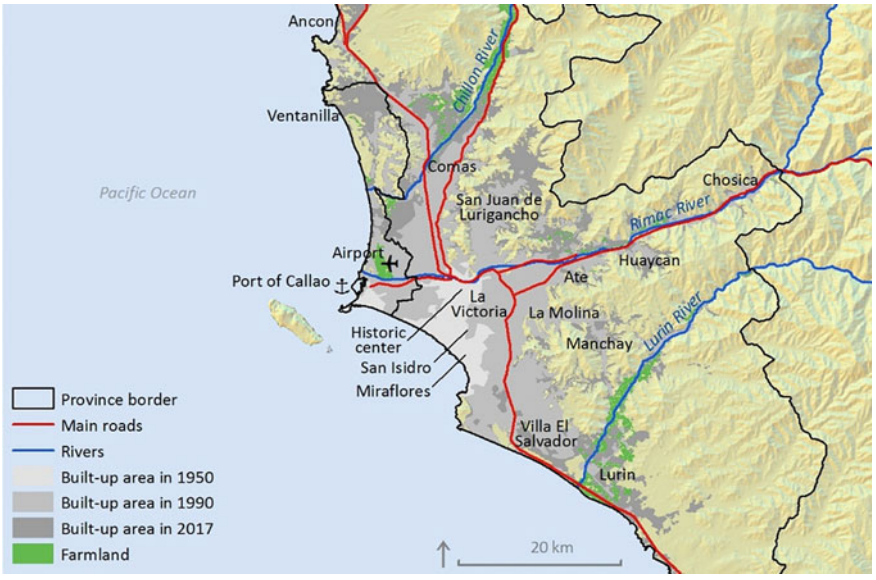

Fig. 24.1 Geography of metropolitan lima

central position on both the Peruvian and the South American west coasts. Its urban area is developed along two main axes, extending themselves more than 100 kms from north to south, and 60 kms from east to west. Its urban structure has two main zones, central and peripheral.

The central zone is composed of the historic centre surrounded by districts urbanized under formal patterns in the plain areas. It is extending from the historic centre of Lima to the coastal Miraflores district in the South, concentrating commerce, employment and urban amenities. It also has a larger share of apartment buildings, although the higher population density is located towards the east and north (Vega-Centeno et al. 2019). The informal peripheral zone follows an urban continuum of radial and irregular morphology that responds to the expanding of the self-built settlements on the Andean slopes (Fernández-de-Córdova et al. 2016).

24.2.1 Metropolitan Lima's Urban Development

Lima has experienced significant levels of residential segregation since its foundation. The historical patterns of social and economic exclusion inherited from the centuries-long Spanish rule have guided the processes of urban growth and development since then (Fernández-de-Córdova et al. 2011). In the twentieth century, Lima's urban evolution has been strongly marked by the presence of informal self-built neighbourhoods (Driant 1992). Between the 1940s and the 1970s, a demographic transition process radically increased the size of the Peruvian population, attracting people from over-populated rural areas to the cities, and especially to Lima, which was initiating a process of industrialization by imports substitution. From 1940 to 1972, Lima's population grew five-fold, from 0.64 million to 3.3 million (INEI 2007). Most newcomers were unskilled rural migrants, who were unable to find a place in the formal labour market. Without other possibilities, they built their own settlements on the hillsides, during a period in which the state promoted the formation of massive informal neighbourhoods in peripheral areas in order to solve the acute housing problem in the city (Calderón 2012).

After the 1970s, Lima continued extending itself horizontally, mostly through low-rise self-built housing in the urban periphery. In the 1981–1993 period, Lima's urban population increased by 37.3%, from 4.6 million to 6.3 million, while its urban area increased by 51.4% in the same period. Likewise, in the 1993–2007 period, the population grew by 33.6%, up to 8.4 million. while its urban area extended itself by 74.5% to 69,033 hectares (INEI 2008). Since the 2000s, visible transformations have been observed in Lima's segregated urban structure, associated with the structural adjustment policies initiated in the 1990s. They prompted a significant growth in the service, financial, telecommunications, construction and employment sectors (Chion 2002). In spatial terms, they led to trends towards the formation of Lima's intermediate zone located between the historic core and more distant neighbourhoods. The recomposition brought along the diversification of social groups in this intermediate zone according to income, occupation and migratory origin, as well

as by greater complexity of functional relations, leading to the formation of new sub-centres (Fernández-de-Córdova et al. 2016).

24.2.2 The Peruvian Welfare System

Peru clearly follows the liberal welfare model, shaped by the free-market ideology that is dominant in the country's political economy. In the liberal system, welfare is the responsibility of each individual, according to their own ability to respond to market conditions. The Peruvian state considers that social welfare will be generated by a competitive economy delivering high rates of economic growth. Studies about the conditions of public welfare in Latin America consider that the region has welfare states 'in transition' (Esping-Andersen 1996), as their efforts to spread public welfare to all are still fragmentary. The Peruvian welfare system, therefore, provides a relatively low coverage and exhibits a low level of social expenditure even when compared to other Latin American countries. An OECD study on global inequality (2015) verified this, noting that the Peruvian redistribution policies are minor in comparison to other Latin American and emerging countries, leading to lower redistributive effects.

Three priorities guide social interventions in Peru (El Peruano 2004): (1) the development of human capabilities; (2) the promotion of employment and generation of economic opportunities; and (3) developing a network of social protection. Following this, Peru has increased public spending in the education sector, especially in basic education, in the last 10 years. However, in a comparative perspective these spending levels are much below the average education expenditure in OECD member countries, below other countries of Latin America, and below countries with similar GDP per capita (Guadalupe et al. 2017). Furthermore, the generation of considerable tax revenues during the period of high economic growth (2004–2014) was helpful to increase social investment and to expand assistance programmes for the most vulnerable population. The total budget for social expenditure increased by 230% between 2004 and 2016 (Trivelli and Urrutia 2018). This contributed to important reductions of child malnutrition; maternal mortality; and income poverty (from more than 50% in 2004 to less than 23% in 2014); while the coverage of basic services was extended (Mendoza Nava 2015).

The Peruvian Ministry of Development and Social Inclusion is in charge of social programmes to tackle extreme poverty. These include *Qali Warma*, *Pensión 65, Cuna Más, Juntos*, Foncodes, *Contigo* y *PAIS*; executed through direct social assistance, localized investments and income redistribution through monetary transfers. *Pension 65* and *Juntos,* which deliver direct cash transfers to vulnerable households, are the ones that have more significantly contributed to social welfare. Together they received 1.3% of the 2016 national budget and greatly contributed to reducing inequality (Trivelli and Urrutia 2018).

24.2.3 Income Inequality in Peru

Peru has also experienced a period of high economic growth and macroeconomic improvements in the 2000s, leading to one of the most significant poverty reductions in Latin America. Poverty levels were reduced by 61% between 2004 and 2014 when economic growth reached an annual average of 6.4%, which also enabled the reduction of inequality levels, although less significantly. This was more visible in Lima, whose Gini index was reduced to 0.40, while the country's index decreased to 0.46 in 2017 (ECLAC 2018). In the same period, 40% of lower income households in Lima increased their per capita income by 6.8%, a proportion higher than the national average (4.4%) (Grupo Banco Mundial 2015). In 2017, the average monthly income per capita in Lima was US$ 581.6, widely exceeding the national average of US$ 417.1 (Zucchetti and Freundt 2018).

Going into more detail when it comes to changes in income inequality in Peru as measured by the Gini index between 1997 and 2016 with data from the World Bank (2019), we find a switch from increase to decrease. The values of the Index peaked in 1999 (56.3), decreasing during the period of high economic growth (2003–2015), down to 43.5 in 2015. Despite the decrease during the 'economic miracle years', income inequality is still high in Peru. From the total country income, the share of the first quintile is 5%, while that of the fifth quintile is 43% (ECLAC 2018). Furthermore, the steep decrease of the Gini index in Peru has been questioned because its values are based on national household surveys (Encuesta Nacional de Hogares), which are focused on measuring the needs of lower income groups, and do not properly include the highest income groups (Francke 2017; Alarco et al. 2019). Corrected estimates give higher values than the official ones, although they also show reduction trends as of 2005. Measures of economic inequality by means of the Gini index of wealth and bank deposits, however, show upward trends in the last decade (Alarco et al. 2019).

24.2.4 The Housing System in Peru

According to the results of the 2017 census (INEI 2018), 76% (5.8 million) homes were owner-occupied, 16.3% (1.2 million) were rented and 7.5% were homes without ownership or rent exchange. Social housing is not considered as an apart category, so it is included in owner-occupied. An unequal country as Peru carries a long-standing housing shortage, which deepened during the period of rapid urbanization. Affordable housing has been a constant challenge. Laissez-faire political attitudes towards informal housing, coupled with the inexistence of deliberate housing policies, have led to a vast housing shortage. Furthermore, in the early 1990s, the Peruvian state practically withdrew from the housing sector. In 1992, the Fujimori administration closed the Ministry of Housing, the Central Mortgage Bank, the Housing Bank and dismantled housing cooperatives and public programmes for land delivery. Housing

finance lost all priority, and the right to adequate housing was removed from the 1993 constitution (Fernández-Maldonado 2010). According to census data, home construction in the 1990s—amounting to 120,000 homes per year—was mostly produced through informal urban processes.

In 2001, the new democratic government reorganized and rebuilt the housing sector, establishing a deliberate social housing policy to tackle the huge housing demand. As a typical neoliberal policy, it promotes access to 'formal markets' subsidizing the housing demand and creating financial mechanisms to facilitate housing affordability. The private construction sector is responsible for the production of affordable housing, the financial sector provides the mortgage loans (in which in the event of non-payment the state assumes the debt), while the state provides direct subsidies to meet the demand. To encourage the private construction of affordable homes, an effort was made to create favourable conditions for the builders, both in terms of regulations and finance (Calderón 2012). The state had to take almost all risks of the financial transactions (Calderón 2009).

The policy is implemented through two different programmes: *Mivivienda* (FMV) and *Techo Propio*. FMV targets middle-income households to finance the purchase of new homes valued less than 127,000 US$, providing a subsidy to contribute to the down payment, which depends on the amount of credit requested and the type of building materials (traditional or sustainable) of the new home. *Techo Propio* targets lower income households to finance the improvement of substandard dwellings; the building of a home in own land; or the purchase of new homes valued less than 15,500 US$. Its subsidy varies according to the modality to which the household is applying: home improvement, building or buying a new house (Fernández-Maldonado and Bredenoord 2010).

The housing policy had a rebound effect, pushing downward the property prices, promoting a real estate push in the commercial housing market, which allowed the redirection of construction capital to income sectors never previously considered before (Calderón 2009), producing a real estate boom in Metropolitan Lima and other large cities during the mid-2000s. On the other hand, the free market dynamics in the social housing sector—in aspects of home construction, land market and financial market—gave the large construction companies almost free hands to decide where to invest and for whom. In this context, the social housing system has mainly benefitted middle- and low-middle-income groups, considered more profitable for the construction sector (Fernández-Maldonado and Bredenoord 2010). The social housing policies for low-income groups have had many problems, failing to meet the policy goals. This is mainly due to limitations of these groups' access to credit, as they generally lack formal (stable) employment (Romero et al. 2005). Only 30% of the national target—to build 100,000 houses between 2003 and 2012, 10,000 per year—was met (Calderón 2014).

Despite the real estate boom, the total number of homes built has been very low in relation to the enormous housing deficit. There was a slight reduction of the quantitative deficit in the 1993–2007 inter-census period, but the deficit coming from informal housing increased by 135% in the same period. This led to an increase

in the total housing shortage by 82%, to 1.86 million homes nationwide. Neighbourhood improvement policies have been almost completely focused on the legal regularization of land property, through an agency created in 1996, COFOPRI, the Agency for the Formalization of Informal Property. Only granting land titles, and without improving access to housing, education and employment, COFOPRI does not help much to tackle the housing shortage (Calderón 2016). So far there are no realistic proposals promoting a sufficient amount of affordable housing to counteract informal urbanization processes.

24.2.5 Occupational Structure in Metropolitan Lima

Figure 24.2 shows the percentage of occupational categories in Metropolitan Lima according to the 1993, 2007 and 2017 censuses, in terms of Top occupational categories (managers, professionals) Middle occupational categories (associate professionals, clerks, service workers, craft workers) and Bottom occupational categories (machine operators, unskilled workers). In the three census years, the trend is towards professionalization, as the top occupational groups grow and bottom groups diminish. The predominant are middle occupational categories: the highest proportion is in services and sales (SER), which increased in each census year (16, 20 y 22%); while crafts and related trades (CRA) tended to decrease. Associate professionals and technicians (APR), and clerical support workers (CLE) also grew slightly. Elementary occupations/unskilled workers (UNS) conform the highest proportion among the bottom occupational categories, although they decreased in the last inter-census period (18, 19 and 15%). The population of migrant origin in Metropolitan Lima, 10% of the total number of occupied persons, is mostly engaged in elementary occupations. In 1993, 34% of recent migrants (referred to the last 5 years prior to the census) were engaged in this category, while in 2007 their proportion decreased to 28%.

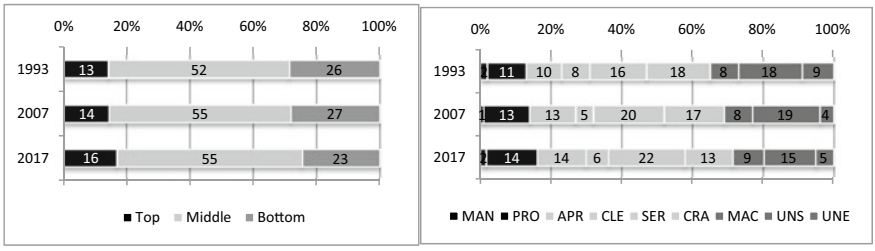

Fig. 24.2 Distribution of occupational groups and change over time in Lima in 1993, 2007 and 2017. (*Data source* INEI 1993; 2007; 2018)

24.3 Residential Segregation According to the Analysis of Occupational Groups

24.3.1 Segregation Between Extreme Socio-Economic Groups: Index of Dissimilarity

The dissimilarity index proposed by Duncan and Duncan (1955) allows comparing the segregation between two groups across all spatial units in the city in order to evaluate the degree of inequality of their spatial distribution. The dissimilarity index between top and bottom occupational categories in Metropolitan Lima was 0.42 in 1993 and remained the same in 2007. This is an intermediate value, which indicates that almost half of the people employed as managers and professionals groups would have to be relocated to achieve a uniform residential distribution across the census areas of the city (average population size 5,443 in 2017). In 2007, the dissimilarity index at the district level (average population size 188,247 in 2017) indicates that the districts of the central area are very uniform in the internal distribution of these occupational groups, with values between 0 and 0.4 in the study period. On the other hand, districts with greater dissimilarity are found in Lima's south and east, but without exceeding the 0.6 value.

Among occupational groups, the highest dissimilarity index was found between managers and craft workers, which did not change over time (Table 24.1). Other high index values correspond to managers and machine operators, as well as to managers and unskilled workers. During the period under study, the dissimilarity increased between the associate professionals, and some middle and bottom groups. On the contrary, it decreased between the unskilled workers, and the middle and bottom groups. It also declined among the managers, professionals and associate professionals.

Table 24.1 Indices of dissimilarity in Lima (multiplied by 100)

1993 \ 2007	MAN	PRO	APR	CLE	SER	CRA	MAC	UNS	TOP	MID	BOT
MAN		13	22	25	42	53	49	47			
PRO	17		14	18	36	47	43	41			
APR	28	18		8	25	37	33	31			
CLE	25	15	9		24	36	32	31			
SER	42	35	21	28		15	13	13			
CRA	53	47	33	39	16		10	12			
MAC	50	44	29	36	15	12		13			
UNS	45	41	29	34	17	16	19				
TOP										32	42
MID									33		13
BOT									42	14	

24.3.2 Distribution of Extreme Occupational Categories According to Location Quotient in 1993 and 2007

The distribution of the top and bottom occupational categories is analysed at the urban area level (census tract), which corresponds to a census unit of an area of approximately 60 blocks and with an average population of 5,443 people. The information available at the census tract level makes it possible to compare data only from 1993 and 2007, as the results of the census of 2017 are not yet available at this level.

24.3.2.1 Spatial Distribution of Top Occupational Categories

In 1993, the analysis of the spatial distribution of managers and professionals reveals a high concentration in the central area and some districts located at the eastern periphery with a location quotient of 1.6–3.2. In contrast, in the peripheral districts, the concentration of managers and professionals is lower than the city average (0.0–0.8) and the values are shown in a scattered manner (Fig. 24.3). Analysis for 2007 shows that the highest residential concentrations of managers and professionals changes, the special mix decreases and the distribution becomes more homogeneous, where older neighbourhoods have a greater presence of managers and professionals. In the near periphery towards the north, north-west and south, the concentration of managers increases (location quotient higher than 1.2) together with the expansion of the higher income areas and the physical improvement of neighbourhoods there.

24.3.2.2 Spatial Distribution of Bottom Occupational Category

The location of machine operators and unskilled workers is less uneven than the top category with a predominance of location quotient values between 0.4 and 1.6. In 1993, values similar to the metropolitan average predominate (0.8–1.2). Values above average (1.2 or more) are scattered, especially in the periphery, while lower than average values (0–0.8) are concentrated in the central area. In 2007, analysis shows that the low concentration values of unskilled workers are maintained; however, their distribution changes and a pattern of centre–periphery residential segregation intensifies. The central area only has the lower intermediate value (0.4–0.8) and forms a large homogenous area, while no average value groups are found, as it was in 1993. In contrast, the periphery has a higher concentration of unskilled workers, mainly in the more distant periphery. Only some groups at the northern and eastern periphery close to the centre maintain the concentration of middle-low value (0.4–0.8).

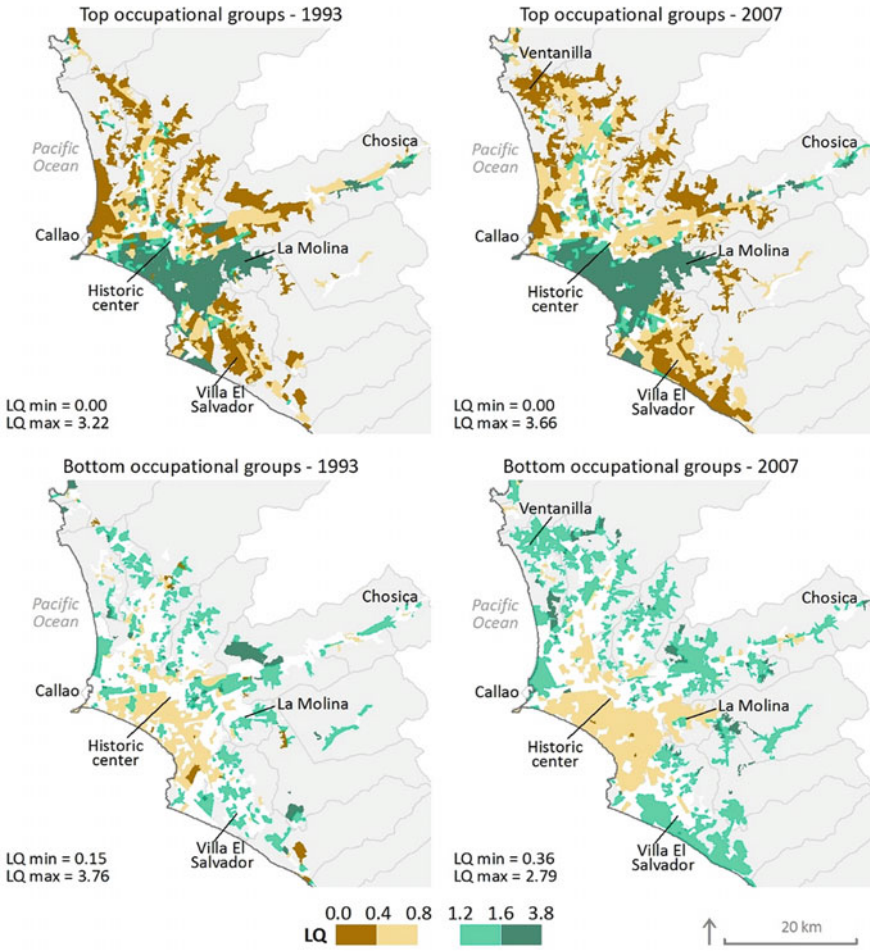

Fig. 24.3 Location quotient maps for the top and bottom occupational groups in Lima. (*Data source* INEI 1993; 2007)

24.3.2.3 Relationship of the Residential Distribution of Top and Bottom Occupational Categories

An opposite segregation pattern for the top and bottom occupational categories in the study period. Top occupational groups are over-represented in the central area that is very homogeneous, and the top group expands towards the east, incorporating the district of La Molina. In the periphery, there are two axes with high presence of top groups in the north and east (Chosica), which coincide with the roads and the earlier settlement of the periphery (see Fig. 24.1). Otherwise, bottom occupational groups

are over-represented in the urban periphery. The results indicate that the centre–periphery residential divide between top and bottom occupational groups has been reinforced. On the one hand, there is a greater homogeneity of concentration of top occupational groups in the central area and first peripheral expansion; on the other hand, bottom groups concentrate in the most recent peripheral expansions.

24.3.3 Classification of Neighbourhoods According to Occupational Composition

According to the share of occupational categories, a typology of neighbourhoods types can be built related to their socio-economic composition (Marcińczak et al. 2015). Considering the low share of top occupational categories in Lima's population, there is no neighbourhood classified as High SES with more than 50% of employees being Managers and Professionals. In most neighbourhoods, more than 50% of the population belong to the middle SES classification (Technicians and associate professionals, Clerks, Service workers and Craftworkers), while the bottom occupational categories predominate in only a few dispersed neighbourhoods (Fig. 24.4).

In 1993, the distribution of middle-to-high groups was alternated with mixed neighbourhoods. In 2007, many mixed neighbourhoods became middle to high, so that an axis of upgrading SES neighbourhoods was formed. This concentration did not spread across the entire central area, but included neighbourhoods from the south of the historic centre (San Isidro and Miraflores) to the east (La Molina), forming a

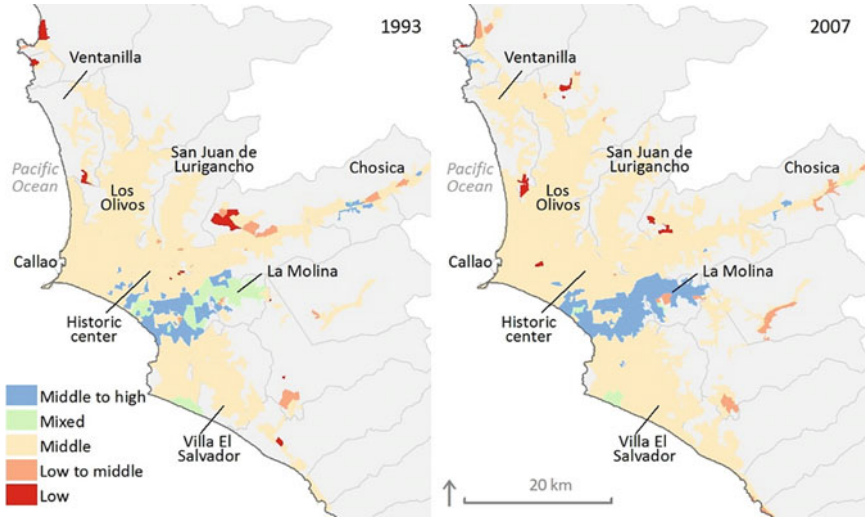

Fig. 24.4 Classification of neighbourhoods by socio-economic composition in Lima. (*Data source* INEI 2009; 2016)

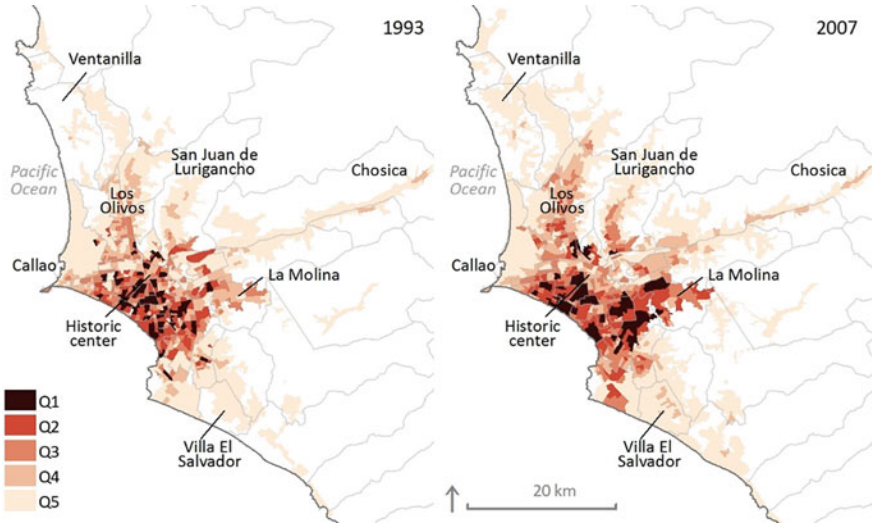

Fig. 24.5 Location of the top occupational group in Lima. (*Data source* INEI 1993; 2007)

new centre–east axis from the centre of the bay to the east. This new axis is located at the south of the central–east foundational axis road linking the port with the highlands. This new distribution shows the differences between the new central axis and the rest of the city, which is remarkable when taking into account the previous findings showing a traditional centre–periphery structure (Fig. 24.5).

The distribution of employees belonging to the top occupational group (Fig. 24.5) shows their tendency to expand the central area with the highest proportion groups (Q1 and Q2). Group Q1, corresponding to neighbourhoods with 20% of the top group employees, is dispersed and atomized throughout the central area. In 2007, neighbourhoods in this category form small groups in the central area and the surrounding east and north areas.

24.4 Differences in Occupational Diversity by Income Level

24.4.1 Occupational Mix in Neighbourhoods

The residential distribution of socio-economic groups can also be analysed with diversity indices that allow to examine the mix of different groups or categories. The diversity index of Simpson (1949) is one of the most often used measures of spatial diversity. It has been widely used in ecology and also in social studies to measure income diversity (Fernández-de-Córdova et al. 2011; Talen 2006; Miles et al. 2010), race (Nguyen 2010), ethnicity (Laurence 2011; Walks and Maaranen

2008), language (Greenberg 1956), family and housing type (Talen 2006), among other variables. Simpson (1949) proposed an index of diversity independent of the size of the sample that indicates the probability that two individuals chosen at random belong to the same group. The inverse version of the formula of the Simpson index is used, known as Simpson's Diversity index $D = 1\text{-}\sum(n/N)^2$, where n is the total number of individuals of one category and N is the total number of individuals of all categories. The value of D ranges from 0 to 1, where 1 represents the greatest diversity, in other words, the presence of individuals from a greater number of categories with an even balance among categories.

The diversity of occupational groups in Lima's neighbourhoods in 1993 shows the predominance of high and similar values (between 0.8 and 0.88) in different parts of the city (Fig. 24.6). Different degrees of reduction of the diversity index and the conformation of clearer residential patterns are observed, compared with the occupational diversity in 2007. The most salient is the greater homogenization of the occupational groups in two specific parts of Lima where the values of diversity index range between 0.6 and 0.8. One is located in the new centre–east axis, south of the historic centre and belongs to the highest income districts. The second is located at the north end of the city and belongs to the lowest income districts (Ventanilla). These are recently formed low-income neighbourhoods with poor accessibility to/long distance from central areas. All the neighbourhoods of greater diversity of occupational groups are located outside the city's central axis, in the north, east and south axes.

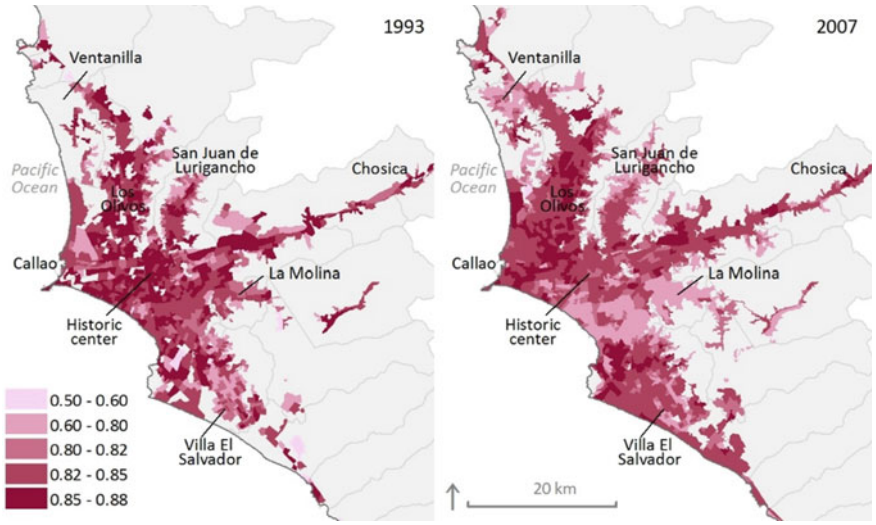

Fig. 24.6 Diversity index of socio-economic groups at census tract level in Lima. (*Data source* INEI 1993; 2007)

24.4.2 Changes in the Spatial Distribution of Income

Data about the estimated income at block level by the INEI (2009; 2016) indicates a marked residential differentiation in Metropolitan Lima. The central areas congregate the population with medium and high incomes, while the lower income populations are located in the periphery. The high-income population is concentrated in the new centre–east axis. Conversely, the low-income population is scattered and located in the urban periphery in the north, east and south. This pattern of income distribution is clearly related to the phases of metropolitan growth, confirming the findings from previous studies (Driant 1992; Piron et al. 2015) stating that the older neighbourhoods present larger levels of consolidation and integration.

The analysis of the changes in income between 2007 and 2013 reveals a greater polarization (Fig. 24.7). The high-income areas have remained at the centre–east axis and have expanded to the east and west. In contrast, low-income areas have spread to the extreme north and north-east of the city. This corresponds to a trend of change of the high-income zone that was traditionally located between the historic centre and its southern expansion (Miraflores), while in 2007, there is a greater concentration from the centre of the bay to the east. In 2013, the high-income groups had residentially spilled over to the new centre–east axis of the city, which includes La Molina (Fernández-de-Córdova et al. 2011).

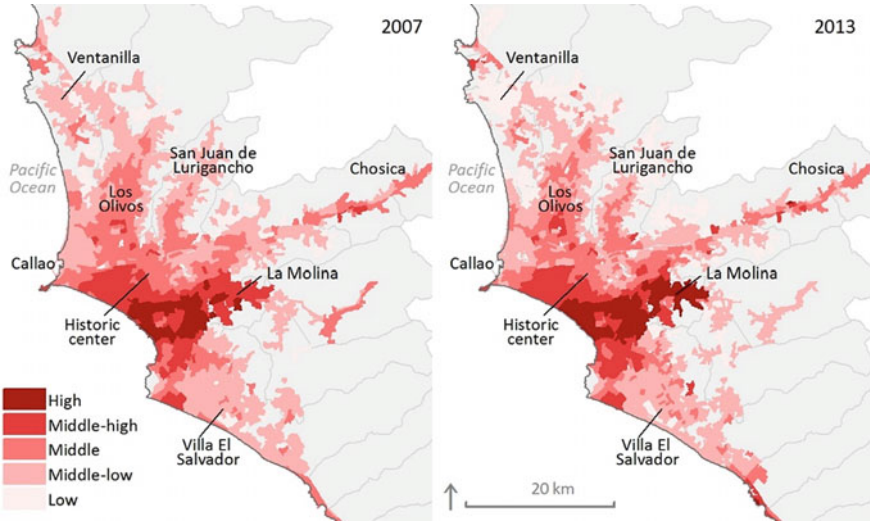

Fig. 24.7 Average income strata at census tract level in Lima. (*Data source* INEI 2009; 2016)

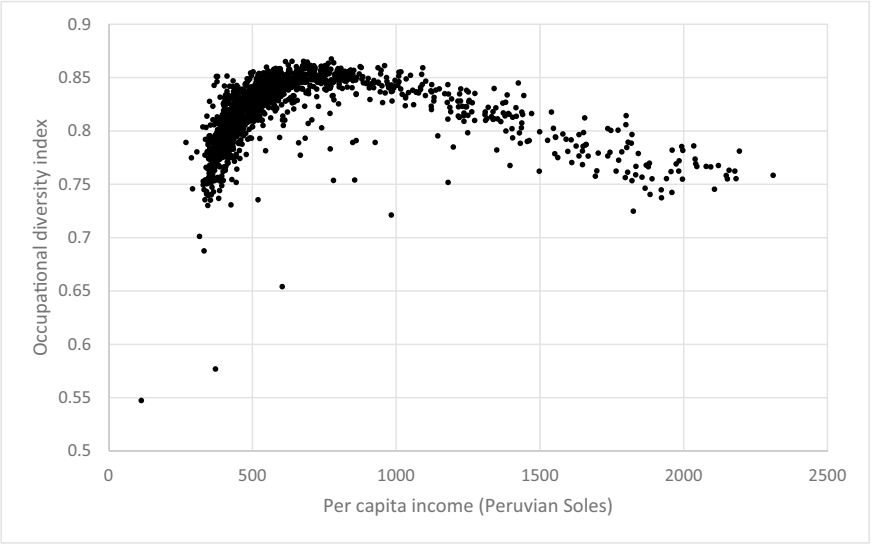

Fig. 24.8 Relationship between occupational diversity and average income at census tract level in Metropolitan Lima. (*Data source* INEI 2007; 2009)

24.4.3 Income and Spatial Relationship with Occupational Diversity

Analysis of the spatial relationship between the residential distribution of income groups (Fig. 24.7) and occupational diversity of neighbourhoods (Fig. 24.6) revealed that the areas with lower occupational diversity coincide with extreme values of income. As observed in the Scatter Plot (Fig. 24.8), there is a high curvilinear correlation between these variables. This indicates that middle-income and lower middle-income groups live in neighbourhoods with greater diversity of occupational groups. In contrast, higher income groups tend towards self-segregation, living in areas with less occupational diversity (between 0.72 and 0.8). At the opposite extreme, the poorest populations live in less diverse neighbourhoods, too, with diversity values around 0.75, and in some cases as low as 0.55. Furthermore, the gradient toward self-segregation in medium-income to high-income population is smooth. On the contrary, the gradient of the exclusion of the low-income population is quite pronounced. This means that, among the poor, a slightly different lower income level implies a significant change in the occupational diversity in the neighbourhoods where they reside.

24.5 Conclusions

The objective of this chapter was to identify the conditions of socio-spatial segregation in Metropolitan Lima, exploring the effects that recent economic trends may have had in those conditions. The study relies on an analysis of the residential distribution of occupational groups based on the Peruvian 1993 and 2007 national censuses data. In general terms, a process of professionalization is taking place in Metropolitan Lima but middle occupational groups are still the largest occupational groups. The results obtained from the analyses between 1993 and 2007, according to the different indices indicate that, at the level of the metropolis, the dissimilarity between the extreme categories has an intermediate level with little changes over time. The analysis of the residential clustering of occupational categories and occupational diversity in the neighbourhoods confirm the trends towards increased segregation. In the central area, a high concentration of top groups and low levels of diversity remains, and these characteristics expand into adjacent districts. Bottom groups are over-represented in the more distant neighbourhoods. In -between the centre and periphery, a new transitional zone has emerged where formerly low-income neighbourhoods have upgraded and become more mixed.

In the bottom occupational groups, there is a clear segregation between the central zone and the periphery in 2007. The areas of lower occupational diversity coincide with extreme income values, forming spaces of greater segregation. The location preferences of higher income groups are recent neighbourhoods in, or closer to, the central area. While lower income groups live segregated in recently formed peripheral neighbourhoods. Even when in the closer periphery the levels of inequality and segregation have been reduced, between the more homogeneous urban spaces of the central and periphery zones, the dual city effect is reproduced. It appears that in the centre–periphery pattern, the centre has been expanded, while the periphery has been shifted to the outer peripheral rings.

The decrease in income inequality is related to the positioning of Peru as a middle-income country during the 2000s (Grupo Banco Mundial, undated), which contributes to greater diversity in the middle sectors located in the periphery near the centre. However, segregation is increased in the extreme groups, located downtown (higher SES) and recent peripheries (low SES). These findings coincide with the effects of the trends in the country's economic growth in the two last decades. First, a decline in socio-spatial segregation in the closer peripheries was observed, associated with a visible improvement of income inequality and decrease of poverty at the country level and metropolitan level. However, the deceleration of economic growth that has occurred in recent years has mostly affected the groups living in the more distant periphery, which usually are the most exposed to such negative economic trends (Jordán et al. 2017; Cohen and Debowixz 2001). Since the decisions guiding (public and) private urban investments respond to market criteria, income inequality is then translated into limited access to mobility, infrastructure, urban services and employment.

It is now widely recognized that the reduction of inequalities is critical for all countries and regions (OECD 2015). The development priorities towards inclusive and sustainable growth require to act frontally against income inequality and residential segregation, implementing public policies for the redistribution of income, employment and social welfare (Barba Solano 2011).

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