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ANALYSING THE SOCIAL EXTERNALITIES OF TRANSPORT PROJECTS

THE CASE OF THE METRO DE LIMA

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Being a dissertation submitted to the faculty of The Built Environment as part of the requirements for the award of the MSc. Transport and City Planning at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

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LIST OF ABBREVIATIONS

L1	Linea 1
L2	Linea 2
AATE	Autoridad Autónoma del Tren Eléctrico
ATU	Autoridad de Transporte Urbano
BRT	Bus Rapid Transit System
MHI	Middle-High income
MI	Middle income
MLI	Middle-Low income
EAP	Economically Active Population
ENAHO	Encuesta Nacional de Hogares
INEI	Instituto Nacional de Estadística e Informática
APEIM	Asociación Peruana de Investigación de Mercado
TOD	Transport Oriented Development

ABSTRACT

Recently the planning field has been questioning about gentrification and displacement processes due to transport investments. Making efforts to measure gentrification and displacement, authors have tried many tools to find correlations between the new transport project and its potential impacts in the urban space. Rather than finding a relationship, this study focuses on identifying the potential externalities of the first Metro line in Lima in three different socioeconomic areas, and its results when transport and development are not well articulated.

Based on the literature review, the study explores two components of change within a neighbourhood; the impact on land and the population change. The spatial analysis uses information from the development projects around the stations, while the population analysis focuses on identifying patterns of gentrification and displacement in four variables: income, education, working skills and age. A comparative cohort analysis is applied using Census data from the Peruvian government to identify the change in ten years.

The study found different impacts according to the socioeconomic levels; revealing issues related to a lack of an urban plan supporting development in middle-low income areas and, the opposite effect in middle-high income areas- where the reduction of land value is attracting people with less affordability. One of the findings supported by the literature review is the effects on the middle-income zone, which is being upgraded by new housing developments incrementing the density of the area and experiencing significant changes in population. The results show a necessity to shift to an integrated city vision and a partnership between urban planners and transport experts to diminish the negative impacts on the urban form.

1. INTRODUCTION

Emerging cities are currently facing issues related to accessibility due to increasing motorisation levels and urban sprawl (Clark, 1958; Levy, 2013; Vasconcellos, 2014). In this context, transport projects are seen as forming the backbone of economic progress for cities across the globe, bringing connectivity and modernity to cities while increasing accessibility for users. However, as well as positive outcomes, some equality problems like gentrification, displacement and affordability, also need to be discussed.

Lima is one of the most populous cities in Latin America and has witnessed many changes over the last decades (Gámez, 2018). Since the 1990s, as a result of a free Transport Market Policy, the streets of Lima have been turned into a battleground between competing transport providers (Bielich, 2009). This disorganised "transport system" has highlighted equity issues within society, that is fragmenting the city.

The Metro de Lima is one of the first transport infrastructures that was initially thought of as a tool to reorganise the transport system (Kohon, 2015) and shorten distances between the periphery and the city centre by reducing travel time, particularly for the people living in the suburbs. This innovation in transport has also been seen as an effort to place the city at the forefront of cutting-edge technology, on a par with large cities in developed countries. However, there are social externalities that could shadow the positive outcomes eventually. At present, only a few studies are assessing the social impacts of transport projects in the Latin-American region.

Gentrification is a concept that has been studied for more than forty years in the global north, although this concept has been contested recently in the context of South America (Betancur, 2014; Janoschka and Sequera, 2016). What focuses the attention of academics is how common people perceive the meaning of gentrification in this region, considering that gentrification is a process that brings revitalisation and positive outcomes to a particular area (Miyagi, 2017; Yi y Azcorbe, 2016), ignoring the constant struggle of poorer residents who are forced to relocate due to the rising housing prices (De la Roca et al., 2017). Recently, many academics in the field of urban planning have started to study the impact of transport projects on society and the spatial implications as a result of their implementation (Bardaka et al., 2018; Bocarejo et al., 2013; Bowes and Ihlanfeldt, 2001; Dong, 2017; Lin and Chung, 2017). However, most of these studies are based on developed countries rather than emerging cities, cities characterized by different development conditions, splintered social classes and power relationships underlying the urban form (Levy, 2013). For this reason, this dissertation aims to give an initial approximation of the social impacts of transport projects in Lima, which have not been researched in great detail thus far.

The study will focus on analysing Line 1 of the Metro de Lima, before and after the opening of the final project in 2014, using secondary data from real estate and from the last two previous censuses. This will facilitate a comparative analysis over a ten-year period of the social and spatial form.

Gentrification theory is used as a framework to identify patterns of displacement and gentrification caused by the Metro de Lima. The research question that this study aims to answer is: *What are the social externalities caused by the Metro de Lima? Which* will be undertaken through the following complementary objectives:

- Determine the catchment areas of L1 metro stations.
- Identify land value changes over time within the catchment areas in three different socioeconomic neighbourhoods.
- Analyse the population changes around metro stations.
- Explore the displacement process of cohorts in each socioeconomic level.

The study will conclude with an analysis of the mechanisms used by the current government, and a reflection on the necessity of policies that will be able to mitigate the externalities identified.

2. LITERATURE REVIEW AND FRAMEWORK

2.1. TRANSPORT, SOCIAL EXCLUSION AND EQUITY

Transport plays an essential role in society by providing access and increasing mobility within a city. However, current planning models tend to disregard the social aspects and the interactions that underpin these models (Levy, 2013). It is this model of planning, incentivised by globalisation and the push towards more modernised cities, which leads to the development of large-scale transport systems (Vasconcellos, 2014). However, the lack of economic resources to support large-scale projects is one of the reasons why the government makes use of public-private partnerships (Melville, 2016; Siemiatycki, 2010). This funding model, based on the capitalist model of Neoliberalism, does not take into account the needs of the poor. Moreover, as Levy (2013) says, in most cases, this model leads to forced evictions of disadvantaged groups, impacting significantly on the social composition as a result (Levy, 2013).

The lack of understanding of the interactions between social exclusion and transport needs to be studied using the theories of Social Justice and Equity (Fainstein, 2010; Marcuse et al., 2009; Mercier, 2009). The majority of the research about social exclusion and transport is focused on topics regarding mobility and accessibility (Cass et al., 2005; Lucas, 2012; Stanley and Lucas, 2008; Ureta, 2008). Therefore, there is a need to understand the externalities of transport projects within local areas where the level of access has improved, and to analyse how these transport interventions change the social realm (Lucas, 2012) – changes which can result in social phenomena like gentrification and displacement within the upgraded area.

In the context of emerging cities, social exclusion is not a minority problem (Stanley and Lucas, 2008); in fact, the majority of the population is affected by this inequity, underpinned by socioeconomic differences and class struggle. This issue highlights the necessity of a social perspective in the transport planning field, considering not only the positive impacts on the broader population as the primary objective but also the local groups that might be affected by the externalities of the project in pursuit of development.

2.2. GENTRIFICATION: DEFINITION AND THEORIES

The word 'gentrification' is defined as a process of 'upgrading' deprived areas, allowing an influx of higher-level earners or people of different social status, thereby displacing the resident population as a result of the changes (Atkinson, 2012, 2000; Revington, 2015). The term was coined by the British sociologist Ruth Glass, who observed and described an invasion process by the middle class in working-class neighbourhoods (Atkinson, 2000; Glass, 1964; López-Morales, 2018; Revington, 2015).

Since then, researchers from developed cities have studied this process and its implications within the urban space. The findings on revitalized areas after a period of decay revealed an underpinning conflict of power which was being reflected in the land-space organisation, affecting the more disadvantaged populace because of its socioeconomic status, social class, education, and race (Janoschka and Sequera, 2016). The meaning of gentrification is the opposite of 'filtering', which means the influx of lower-income populations into higher-income areas (Clark, 1992); while filtering can result in the depreciation of land values, gentrification is related to increasing land values.

Despite the apparent effects on the real estate sector, there are also clear impacts on demographics which are associated with the gentrification process. These can include a change in the racial makeup of the area, variations in occupations and working skills, educational qualifications and social class (Fan and Guthrie, 2012). However, the concept must vary according to the context of the city and its economic conditions (Zuk et al., 2018). Then, two factors are involved in the gentrification process: a social component, defined by the change on population attributes and a physical element characterised by the reinvestment or new developments in the housing market (Atkinson, 2012).

However, the topic is still controversial. While some authors argue about changes in the social realm and the burden of disadvantaged people who assume the social costs by the potential displacement, others emphasise the positive impacts due to the revitalisation of neighbourhoods in the name of development. The last ones explain the gentrification process as a positive solution to achieve societal goals and to allow a more varied population as a result of the new housing investments (Freeman and Braconi, 2004). In respect thereof, the political field can significantly influence the second standpoint; as a matter of fact, local governments in the interest of promoting neighbourhood´s progress and welfare, prompt the revitalisation of the urban environment.

2.3. The Relationship between Displacement and Gentrification

The displacement of people as a result of development is something that has not been widely studied in social sciences (Janoschka and Sequera, 2016) and is one of the main concerns of the gentrification phenomena (Zuk et al., 2018). This process of social change refers to the forced movement of groups of people from their current place to another (Unesco, 2017), particularly in the case of vulnerable groups who have restricted options when looking for a decent place to live.

According to Marcuse (1985), there are two clear types of residential displacement. The first type, 'direct displacement', is associated with evictions, foreclosures and physical causes; while 'indirect displacement' is primarily the result of economic factors such as rent increases, higher taxes and higher housing prices. However, identifying displacement is challenging, mainly because the reasons

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for displacement may not necessarily be the result of gentrification (Atkinson, 2000, 2012). Therefore, it is complex to determine the causes of why people move from one place to another.

However, many of the inaccuracies when studying displacement focus on the displacement of the 'final resident'; ignoring the 'chains of displacement' including all the households involved in the process (Janoschka and Sequera, 2016; Marcuse, 1985; Slater, 2009; Zuk et al., 2018). Marcuse (1985) adds another dimension of displacement, the 'exclusionary dimension', which refers to the situation whereby a household cannot move to another area due to increasing house prices – a term related to social exclusion. Expanding further in this matter, 'displacement' is materialised as a spatial redistribution; however, has other implications on households in terms of behaviour and lifestyle that should be analysed (Chapple, 2017).

2.4. GENTRIFICATION AND DISPLACEMENT IN THE LATIN-AMERICAN CONTEXT

In the Latin-American region, the term gentrification is synonymous with revitalisation. Similar to Freeman and Braconi's (2014) ideas, people tend to think of it as a positive mechanism for improving an area, with no detrimental effects on the local population (Betancur, 2014). Very few studies have been carried out within the Latin-American context. According to Sequera and Janoschka (2016), there are reasons why this phenomenon has not been studied in detail. These include the temporal scale and resistance to importing the 'gentrification' term from the global north alleging different circumstances; and political arguments associated with the neoliberal model of modernisation.

However, over the last decades, some academics have started to contest the gentrification process in the region, recognising the different aspects involved in the gentrification and displacement processes in Latin America and demanding a wider area of research that is not just focused on the classic spatial analysis, but in the underpinning social issues (Marcuse et al., 2009). In fact, Latin America is witnessing rapid economic growth (Vasconcellos, 2014), and together with the constant fight against poverty, social exclusion is being highlighted, and poorer populations are being stigmatised under the progressive discourse (Chapple, 2017), which reflects the underpinning power struggle between social classes. This situation resonates the need to understand better social change processes. Currently, with social mobility, the middle class is defining the socially acceptable use of urban space, which encourages gentrification, displacement and other social changes within the city (Contreras et al, 2016; Janoschka and Sequera, 2016; Martí-Costa et al., 2016).

2.5. TRANSPORT INDUCED GENTRIFICATION

In recent years, researchers have focused on analysing the impact of transport projects in the neighbourhoods they serve, and on how this spatial change affects the communities (Baker and Lee, 2019; Bardaka et al., 2018; Dawkins and Moeckel, 2016; Dong, 2017; Grube-Cavers and Patterson,

2015; Jones and Ley, 2016; Lin and Chung, 2017; Moore, 2015). This topic causes controversy in the field of transport planning because it questions the role of transport as the backbone of development and the substantial benefits that brings to the served areas (Suzuki et al., 2013).

Within Latin America, some studies have identified patterns of gentrification related to the construction of transport projects. The case of the Bogota and the BRT 'Transmilenio' is one of the projects where patterns of gentrification were observed, particularly in zones where access to public transport was limited (Bocarejo et al., 2013; Munoz-Raskin, 2010). In Curitiba, Brazil, something similar occurred with the opening of their first BRT (Pardo, 2009). The Metro de Santiago is another case of a transport project within a particular region showing gentrification patterns around its stations (Casgrain and Janoschka, 2013).

Debates about the cause-and-effect relationship between transport and gentrification are still ongoing, and more research is necessary, particularly in emerging cities where transport projects are in high demand to bridge the infrastructure gap (Serebrisky et al., 2017).

2.6. DIFFERENT MODELS USED TO MEASURE GENTRIFICATION AND DISPLACEMENT

Measuring gentrification and displacement is a complicated task. Many studies have been carried out in an attempt to better understand whether transport investments lead to gentrification. Factors such as household income, education, working skills and land value, have been considered in models in order to find correlations between a gentrified area and the location of transport projects. In order to discover the relevant techniques used most recently for assessing gentrification, Ley and Jones (2016) used census information regarding income and rental housing and found a direct relationship between gentrification and its proximity to Skytrain stations in Vancouver, a process reinforced by municipality policies supporting TOD mechanisms applied incorrectly and facilitating the displacement of people. The study by Atkinson (2000) used a 'longitudinal analysis' to demonstrate gentrification in London during the 1980s but insists on the need for qualitative tools also to support the results. Acknowledging the difficulties in measuring gentrification, Grube-Cavers and Patterson (2015) used a methodology based on 'survival analysis' – an innovative technique for determining levels of gentrification in different cities in Canada. In most cases, patterns of gentrification were found, but no robust relationship between gentrification and the transport project.

Appendix A summarises the different models used to assess gentrification and displacement, and the variables considered for the analysis. However, the majority of the studies focus on gentrification and displacement processes in developed countries, and this is one of the reasons for studying this topic in the Latin-American context.

2.7. THE CAPITALISATION OF TRANSPORT THROUGH LAND VALUE

One of the signs of gentrification is reflected in the increasing cost of land and properties. In the case of transport, many studies have been carried out to understand how transport projects lead to a rise in house prices around stations. Hedonic models are often used to measure the value of this easy access and proximity to transport stations.

A study conducted by Agostini and Palmucci (2017) analysed the impact of the Metro in Santiago de Chile on land prices. The results showed a 3% increase in property prices after the announcement of the project and an almost 6% increase after the basic engineering works had begun. In this regard, Zamorano (2018) based his study on identifying increasing land values due to the Mexican BRT construction in different socioeconomic neighbourhoods, showing variations according to the zones where the study was applied. This was not the only study pointing out the variance of impacts on land value according to the economic level. Many studies have demonstrated this effect, showing that middle-income zones experience a boom in terms of land value (Bocarejo et al., 2013). In fact, the analysis carried out in the Transmilenio BRT catchment areas showed how the middle-income real estate market gives an increased value to station proximity (Munoz-Raskin, 2010). These studies reflect the impact of transport on land value and the potential effects of gentrification due to affordability.

On this matter, Appendix B compiles different projects around the world where easy access to transport infrastructure was reflected in land value changes.

3. CASE STUDY AND CONTEXT

The idea for the Metro de Lima was developed during the mid-80s with the future vision of having a Metro system that is similar to those in the developed world (Correo, 2010; Díaz, 2010). The lack of financing put the project on hold for a long time. However, over the years, Lima experienced an unexpected growth population, followed by increased levels of motorisation (Bielich, 2009; IDB, 2018), confirming the necessity of a large-scale transport system.

The first Metro line, designated L1, was conceived and pushed through by one of the most unpopular Peruvian governments during one of the biggest economic periods of crisis that the country had experienced. The project was suspended for many years because of misappropriations and corruption scandals (America, 2017), which overshadowed the construction of the line and led to many delays. However, it was eventually opened to the public in 2014 (Newell, 2010). Over the years, the project underwent several modifications, with one of the crucial changes being its length, which was extended with a second-phase project once it was realised that the first route would not be serving the most populated neighbourhoods (Kohon, 2015). The L1 project was designed as an elevated train and railway viaduct, with the final route consisting of 26 stations (Figure 01) crossing 11 neighbourhoods (AATE, 2019). These days, L1 serves San Juan de Lurigancho and Villa El Salvador -two of the largest working-class districts in Lima located in the outskirts of the city- and people can travel from these neighbourhoods to the central business area in just 20 minutes (Andina, 2015), showing a positive outcome as travel time was reduced in 50%.
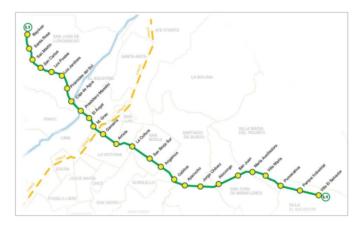

Figure 1: L1, Metro de Lima
Source: (Via Expresa, 2017)

Soon after the opening, the L1 was carrying over 300,000 passengers a day, exceeding its designed capacity. In 2016, a line expansion was approved, which is currently being carried out by the AATE. However, at present, the project has overtaken capacity again, with L1 now moving approximately

530,000 passengers a day, particularly from the stations of Bayovar, Grau, La Cultura, Villa El Salvador and Gamarra (AATE, 2019).

In 2010, realising the need for a large-scale transport system in the city, and after conducting some initial studies, the government came up with the Basic Metro Network (Figure 02). The network consisted on a six-line Metro system which was intending to make up the principal transport axes of the city, meaning that alternative mass public transport could reach to other working-class neighbourhoods and distant impoverished zones (Metro de Lima y Callao, 2019). However, the network approved by the government was found to be inadequate regarding the location of the lines, as it only represented the main road axes of the city. Therefore, in 2017, AATE launched a transport planning project with a 2050 vision to create the foundations for an integrated transport system for Lima city, including the Metro network, a suburban train, a bus system and the BRT (Gestión, 2018; A. Ugaz, 2018).

Figure 2: Basic Network of Metro de Lima
Source: (Metro de Lima y Callao, 2019)

4. METHODOLOGY

As explained in the literature review, some authors used statistical tools to measure gentrification and to understand the impacts of transport projects in society, often without having a cause-and-effect relationship to gentrification and displacement. On this matter, there are two types of research to address this topic. The first approach focuses on analysing demographic information and social changes over time within the gentrified neighbourhoods, both quantitatively and qualitatively. The second approach uses econometric models, such as hedonic regressions, to analyse land price variations around stations using real estate datasets.

Due to the lack of studies on displacement and gentrification in Latin America, this study aims to understand displacement and to identify gentrification patterns due to the Metro de Lima. Based on Atkinson (2000) and Zamorano (2018) studies; the proposed methodology adopts a two-fold approach involving a spatial analysis and a population analysis. These analyses will provide a better comprehension of the variables involved in the gentrification and displacement processes around the Metro de Lima.

Phase	Objectives	Methodology	Data
1	Recognise the catchment areas of L1	Socio-economic analysis of areas served by L1.	AATE, APEIM, Poverty maps.
2	Identify land value changes over time.	Data comparison between catchment and control areas.	Real estate data Internet research
3	Analyse population changes around the Metro stations.	Data comparison using census information.	Census 2007 Census 2017
4	Explore the displacement process at the socioeconomic level.	Cohort analysis (longitudinal analysis) using different variables.	Census 2007 Census 2017

Table 1: Methodology summary

4.1. IDENTIFYING CATCHMENT AREAS

L1 serves both high- and low-income neighbourhoods. The station selection is made according to the socio-economic characteristics of each area to contrast the results. This research only focused on stations that mostly served just one neighbourhood.

According to APEIM (2019), there are five socioeconomic levels, from A (the highest) to E (the lowest). The formula to calculate these levels is based on ENAHO surveys, which are carried out every year by INEI. APEIM has standardised the procedure to manage the same variables when comparing levels

(APEIM, 2019). However, the sample used in the ENAHO surveys is not representative of the area and can result in misrepresentation of the results, which is one of the reasons for using census data for added robustness (INEI, 2017); this information is contrasted with the last edition of poverty maps provided by INEI (INEI, 2016) .

Previous studies have considered the size of the catchment areas as being $0.5 - 0.8$ km, which is based on what people consider 'walking distance' to the stations (Agostini and Palmucci, 2017; Zamorano, 2018), although these vary according to the author and the study conditions. For this research, the catchment area is set in 1 km due to the quantity of real estate information within the area. Figure 03 shows the catchment areas and the stations selected.

Figure 3: Catchment areas

4.2. IDENTIFYING LAND VALUE CHANGES

For identifying land value changes over time, this stage focused on gathering real estate price information (quantitative data) in different years and using descriptive statistics to show trends over time. Thereby it will be easy to identify changes in land value before and after L1 opening. The increase in prices around the catchment areas will give us an idea of the relationship between land values and transport.

For this section of the methodology, the use of control areas with similar population compositions, socioeconomic levels and spatial characteristics, was crucial to understanding the impact of L1 on land values. Table 2 shows the selection of the stations, as well as the control areas, according to three socioeconomic levels: middle-high, middle and middle-low income.

CATCHMENT AREAS		CONTROL AREAS		Socioeconomic Level	Income Level (Poverty Maps)
Station	Zone	Station	Zone		
Ayacucho Station	Surco	-	San Miguel	B/A	Middle-High income (MHI)
Arriola Station	La Victoria	-	Rimac	B/C	Middle Income (MI)
Parque Industrial Station	Villa El Salvador	-	Ate	C/D	Middle-Low Income (MLI)

Table 2: Catchment areas and control areas according to socioeconomic level

Source: based on APEIM and INEI

Most of the information for this stage of research was found on the internet – displayed on real estate sites such as Nexo and Urbania or from lists provided by realtors. However, prices had changed over time and demanded exhaustive online research to obtain the real prices used by the time each project was launched. The real estate data were analysed by comparing prices per square metre before and after the line opening using similar neighbourhoods as control areas. Table 3 shows a summary of the periods of time that real estate projects were found online, which is also listed in Appendix C.

Socioeconomic level	Middle-Low Income (MLI)	Middle Income (MI)	Middle-High Income (MHI)
Zone	Villa El Salvador	La Victoria	Surco
Real estate data available	2012, 2014, 2016, 2019	2013, 2014,2016, 2017, 2018, 2019	2013, 2015, 2016, 2017, 2018, 2019

Table 3: Real estate data per period

Figure 4 displays the location of developments and housing projects around the catchment areas selected. Very few information was found in the catchment area of Villa el Salvador, and the housing developments were located out of the catchment area; however, it was still considered to analyse the impact of the Metro in this zone.
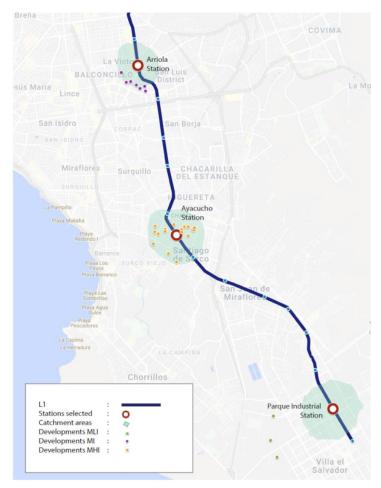

Figure 4: Real estate data around stations

4.3. IDENTIFYING DISPLACEMENT AND GENTRIFICATION PATTERNS

4.3.1. COHORT ANALYSIS

The population analysis is based on longitudinal observation using a cohort analysis within the catchment areas; this will help to identify possible displacement due to the proximity of Metro stations. A cohort analysis is a method that is mostly used in medical and social sciences; it consists in the observation of people's behaviour before and after an incident occurs (S.S. Halli, 1992). This

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methodology use groups of people sharing the same characteristics and analyse the cohorts over time. The changes observed will provide insights into displacement related to the gentrification variables identified in the literature review.

The analysis was made by comparing variables in two different periods. The first period, before the launch of L1, used information from the 2007 Census; the second period was after L1 was launched. This study concentrates on following the same cohorts over time within the same area. This simple comparison between variables and cohorts will allow us to have an idea of migration in and out of the neighbourhood and will give an approximation of displacement and mobility of various demographic groups in the catchment area of the station.

The population was grouped into 10-year age brackets in order to have the same time-period of analysis between the census and the groups being analysed. Table 4 shows the four cohorts selected. The grounds for the cohorts' selection depended on two factors: people considered part of the economically active population, and people living in urban areas. A cohort containing people less than 20 years old was not used because of the increasing birth rate over the years, which can represent an important variation between groups. Additionally, there were no cohorts with people older than 69 because the average life expectancy, which varies between 73 and 75 years in the case of Peru, could affect the displacement results (INEI, 2018).

Cohort code	2007 Census (age)	2017 census (age)
A	20-29	30-39
B	30-39	40-49
C	40-49	50-59
D	50-59	60-69

Table 4: Cohorts over time

4.3.2. SELECTING VARIABLES

The selection of variables was based on previous gentrification studies considering socioeconomic factors as one of the principal indicators for gentrified neighbourhoods (Revington, 2015). For the particular case of Lima, there were differences between the two census variables which needed a standardised process in order to work with the same information in the two periods. For this section of the analysis, there were four variables chosen, covering population characteristics to analyse the displacement of people and gentrification patterns. These variables are shown in Table 5.

Code	Variable	Area
VAR01	Permanency	Location
VAR02	Housing tenancy	Economic
VAR03	Education level	Education
VAR04	Main Occupation	Working Skills

Table 5: Variables from the two censuses

The cohorts were analysed over time using the same variables. Additionally, a correlation R analysis of the variables between VAR01 (the type of permanency) and the other variables was applied in both periods to understand the relationship between variables and the location. The correlation will give us an idea of the relationship between the variables selected and the areas where people live.

However, the information from the census between these two periods has improved. The last Census Dataset (2017) contains more information about the population, which is being analysed using three additional variables shown in Table 6. These other variables will provide further details on the three socioeconomic areas and population behaviour.

Code	Variable	Area
VAR05	Job Location	Mobility
VAR06	Car Ownership	Economic
VAR07	Race	Ethnicity

Table 6: Additional variables

4.4. RESEARCH ETHICS

This dissertation uses a quantitative methodology using secondary data such as Census information, publicly available from the Peruvian National Institute of Statistics, and real estate information available on webpages primarily. It is essential to underline that Census datasets do not contain personal details, and the real estate information was gathered using information from real-estate sites and some companies which have declared not to publish private data from the projects. Due to the lack of available data, some meetings and interviews with real estate companies and relevant authorities were carried out to gather information related to the research topics and most of the meetings resulted in additional vital verbal information for the research purposes. The risk assessment carried out for this research is shown in Appendix D.

5. ANALYSIS OF THE RESULTS

This chapter shows the results of both the spatial and population analyses within the three catchment areas selected according to the socioeconomic level: Surco (MHI), La Victoria (MI) and Villa El Salvador (MLI). The spatial analysis focuses on time-series graphs about price changes compared with control areas with similar socioeconomic characteristics. On the other hand, the cohort analysis is shown in tables and figures showing the difference between the two periods of analysis around the stations.

5.1. SPATIAL ANALYSIS: CATCHMENT AREAS VERSUS CONTROL AREAS

The diverse impacts on properties according to socioeconomic levels are shown in Figures 05, 06 and 07. In the case of MLI areas, Figure 05 shows similar trend lines comparing catchment and control areas. The catchment area shows a slightly positive slope compared to the control area; however, it is not dominant. On the other hand, Figure 06 displays the MI results showing a steeper increasing trend, within the catchment area in comparison with the control area, which shows a standard increase in land prices, particularly after 2014 (L1 opening). The case of MHI is peculiar: as can be observed in Figure 07, the impact on the land value within the catchment area is opposite to the other socioeconomic levels. It tends to show a decrease around the catchment areas, while in the control areas the land prices are either stable or increasing.
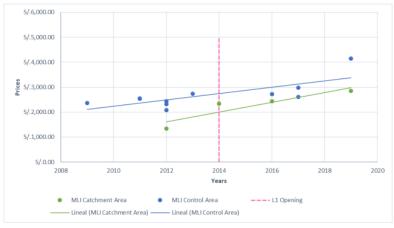

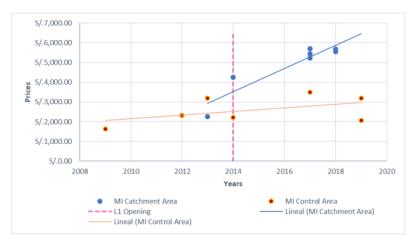*Figure 5: MLI real estate trend line (catchment vs control)*

Figure 6: MI real estate trend line (catchment vs control)
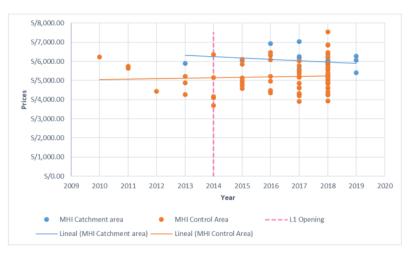

Figure 7: MHI real estate trend line (catchment vs control)

Examining the results in the three catchment areas, show that the most impacted zone is the middle-income neighbourhood. This finding reflects the social mobility patterns and the increase in the 'new middle class' previously discussed by Janoschka and Sequera (2016). Furthermore, as already examined in the literature review, similar outcomes were observed in previous studies, registering high levels of land values in middle-income areas where there was substantial investment in transport (Bocarejo et al., 2013; Munoz-Raskin, 2010). Contrary to MI, MHI is experiencing a reduction in land value prices around Metro stations, which reflects the value people from MHI give to living near a Metro station, which coincides with their socioeconomic level and the fact that they live in a 'car-oriented' neighbourhood.

As can be observed in Figure 05, the control area for MLI has experienced an increase in property values during the past year, which might be associated with the current construction of L2, the second line of the Metro de Lima.

5.2. CHANGES IN POPULATION COHORTS

The results of the cohort analysis are summarised in Appendix E. The overall analysis of the outcomes shows more evidence of displacement in the MLI and MI areas, while showing less evidence in MHI. The groups showing the highest levels of displacement patterns were Cohorts A and B – this particular 'mobility' can be associated with stability and maturity, both features of these age groups. The analysis by each variable is displayed in graphs according to the socioeconomic area.

MIGRATION IN/OUT

Figure 08 shows information about the fluctuation of people moving into and out of the area of analysis according to the four cohorts over a ten-year period. A negative percentage indicates people moving into the neighbourhood. Comparing the three zones of study, La Victoria (MI) shows the highest levels of out-migration in the four cohorts; being "Cohort A" the group with more incidence in terms of out-migration 30%. People living in Villa El Salvador (MLI), have similar tendencies across the four cohorts. On the other hand, Surco shows an increasing number of people moving into the area, particularly for Cohorts' B and C. This area shows low levels of out-migration, compared to MHI and MI.
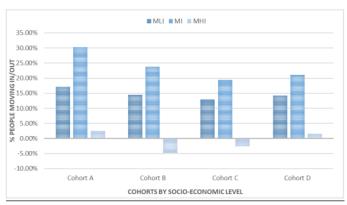

Figure 8: Population change over time by cohort

HOUSE TENANCY

This variable shows the changes in house tenancy over the ten years. Cohorts A and B are the groups showing the most variance. Figure 09 displays the movement pattern according to the socioeconomic level of each cohort and showing the two leading options of house tenancy. In the four cohorts' analysis, the MHI zone shows less variance compared to the other two zones. Cohorts A and B in MI show higher levels of displacement compared to Cohorts C and D, which can be due to economic

reasons, considering the rise of property values in the zone and the age variable. A similar pattern is observed in the 'owned houses'. The case of MLI only presents higher rates of displacement of people owning a property in the four groups; however, these low levels of displacement in the category 'rented' can be associated to the property values in the zone of analysis, which keeps the same increasing trend comparing with similar socioeconomic areas. The rental market is probably influenced by socioeconomic factors and the low levels of development within this zone despite the presence of a Metro station. The opposite effect is observed in MHI, particularly in Cohort A, which shows an increase of 5% of people renting a house in this area. The other three cohorts within this area show an increasing number of people who now own a house in a neighbourhood.
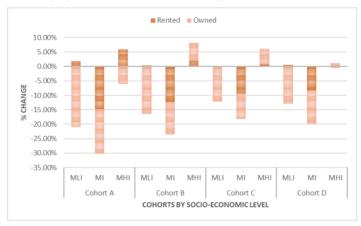

Figure 9: Change on type of tenancy by cohorts

EDUCATION

Figure 10 shows the changes in education level according to the cohorts analysed in five categories: No Education, High School, Technical Complete, College Complete and College Incomplete.
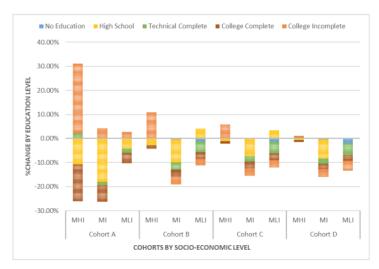

Figure 10: Change in Education level by cohorts

Education is related to age, with the youngest cohorts showing the most change. This result might be reflecting the positive change observed in College Incomplete numbers in Cohorts A and B. This increased number is found in the four groups within MHI, and this area also shows an influx of people who hold technical qualifications. There is an apparent reduction in the number of people with high school diplomas, particularly in the MI zone. However, the analysis of this variable can also be an indicator of progress, in that people have improved their education level after ten years.

Focusing on the last two cohorts, C and D, the analysis shows a similar pattern of displacement of people with high school diplomas in MI. The opposite effect is shown in MLI, where Cohort C shows an influx of people with high school diplomas. In this zone, the major displaced group in the two cohorts is technical education complete, which can be a sign of social mobility within this socioeconomic area.

WORK SKILLS

Figure 11 shows the variance in work skills between cohorts within the three areas. Five categories are considered: scientists and academics, technicians, construction workers, commerce, and office workers. Cohort A shows a large influx of scientists and scholars in MHI, almost 28% of the difference in ten years. On the other hand, office workers in MI show more levels of displacement. The same happens with construction workers in Cohorts B, C and particularly D, which is the most affected group. Cohorts C and D show more levels of displacement in almost all categories.

In the case of commerce, there is an increasing number of people moving in MHI, while technicians show lower levels of change compared with other categories. However, there is an evident displacement of people in the last two cohorts mentioned.

When comparing the different cohorts, Cohort A shows a reverse effect in the three areas of analysis. However, the difference between each area is explicit, being MHI the zone with more influx of people in four of five categories. The MI area is the most affected in this group showing high levels of displacement, particularly for office workers. In the case of Cohort B, the difference between socioeconomic areas is even more precise, with Cohort A showing positive mobility; while in the overall balance, MHI and MI show more patterns of displacement. On the other hand, Cohorts C and D present patterns of displacement in all the work skills categories.
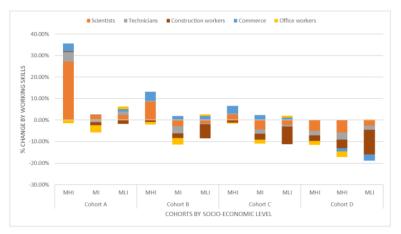
Figure 11: Change in working skills by cohorts

Appendix E shows the correlation between the variables permanency and the others analysed for the cohort analysis, supporting the finding displayed in the previous graphics.

5.3. POPULATION ANALYSIS

Appendix F summarises the overall analysis of population change using the same cohort variables and the three additional variables analysed to a better comprehension of the neighbourhood characteristics.

Migration Change

Figure 12 displays the population changes within the three analysis areas, with MI and MLI showing signs of displacement. Indeed, MI shows evidence of high levels of displacement, compared with MLI. Conversely, MHI shows patterns of people moving into the area.
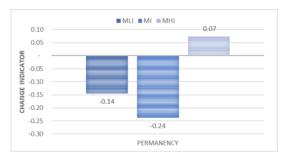

Figure 12: Migration change by socioeconomic level

Figure 13 shows changes in tenancy type. In accordance with migration change, MI shows high levels of people who have moved out, the indicator in both categories, owned and renting. In the case of MLI and MHI, both areas show signs of increasing numbers of property renters, which reflects the increase

in the rental market as a result of the government's policies (Fondo Mi vivienda, 2019). However, MLI shows a reduction of 19% of people owning a house in the zone. In the three sectors, there is an increasing number of people who live in a ´granted´ dwellings -properties previously in dispute due to illegal appropriation and that after a process are now surrendered.
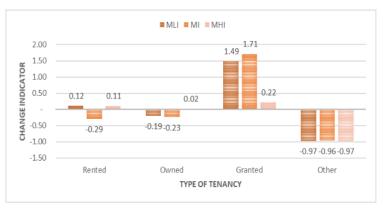

Figure 13: Tenancy change by socioeconomic level

Education Level

There is a gap in education levels between the three zones of analysis. While MLI predominantly contains people with basic levels of education, MHI, shows an influx of people holding a superior education degree, reaffirming the relationship between education levels and socioeconomic areas (Dong, 2017). The case of people living in MI shows similar patterns of education levels with MLI; nonetheless, there is a reduction in the number with high school education diplomas. The MI zone shows the majority of changes in terms of education level, while the other areas keep the standard criteria according to the socioeconomic scale.

Work Skills

Within the three areas, the number of government workers has increased. MLI commerce is still the dominant activity, although there is an increasing number of academics. On the other hand, MI shows no signs of dominant change due to work skills – commerce is still the dominant sector, which can be related to the proximity of one of the largest commercial textile emporiums within La Victoria district and the easy access to this area using the Metro stations. MHI keeps the tendency of having highly skilled workers; indeed, these numbers have increased.

5.4. COMPLEMENTARY VARIABLES

The analysis of the additional variables was conducted by using information from the last census, which was useful in providing helpful insights into the areas analysed.

<u>Job Location</u>

In the case of MLI, there were no significant differences between working and living in the same zone and only living. On the other hand, MI showed high levels of people living and working within the area. Contrary to the other locations, people residing in MHI prefer to work outside the neighbourhood. According to the last Origin-Destiny survey carried out in Lima, one of the principal reasons for moving around the city is work. This variable provides a better perception of people´s preferences and how they value time and distance according to their socioeconomic area. While MLI makes no preference in the positive of living and working in the same area, MI gives higher weight to living in the same area and possibly the facility to have good transport connections to move around. On the other hand, MHI does not value distance in the same way as living in a more pleasant and less dense neighbourhood.
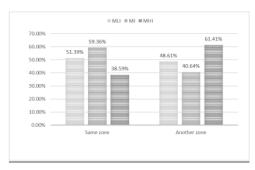

Figure 14: Job Location

<u>Car Ownership</u>

As expected, people in the MLI and MI areas with a lower socioeconomic level have much lower levels of private car ownership, with only 18% and 20% owning a vehicle. In contrast, 62% of the population of MHI owns a car. The car has long been seen as a sign of economic progress and class status; a concept imported from the American cities to show the power of people on roads (Banister and Hickman, 2013). Despite the current congestion problems in Lima, having a car is still a symbol of elevated economic status. This is reflected in the previous results, where MHI shows high levels of car ownership compared to the other sectors.

Figure 15: Car Ownership

Race

Ethnicity is one of the variables that must be considered when talking about gentrification. This variable was not considered before in the previous census; however, the interpretation of this attribute is essential when talking about inequalities in order better understand the dominant ethnic groups and their relationship with the socioeconomic area.

Comparing the three sectors, 'mestizo' is the most representative ethnicity, followed by 'Quechua' in MLI and MI areas; whereas, in MLI, the second most dominant race is Caucasian. The area showing most variety in terms of ethnicity is MI. Quechua are native inhabitants of Peru who have their roots in the highlands; people considered Quechua also speak the same indigenous language. During the mid-80s, there was an immigration explosion, and lots of people moved to the capital and settled in the peripheries (INEI, 2009). The analysis in the MI area shows Quechua as being the second dominant ethnicity in the zone; showing a changing pattern and signs of prosperity within this group.
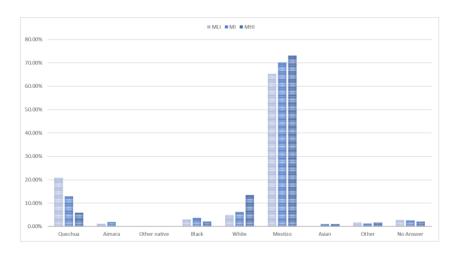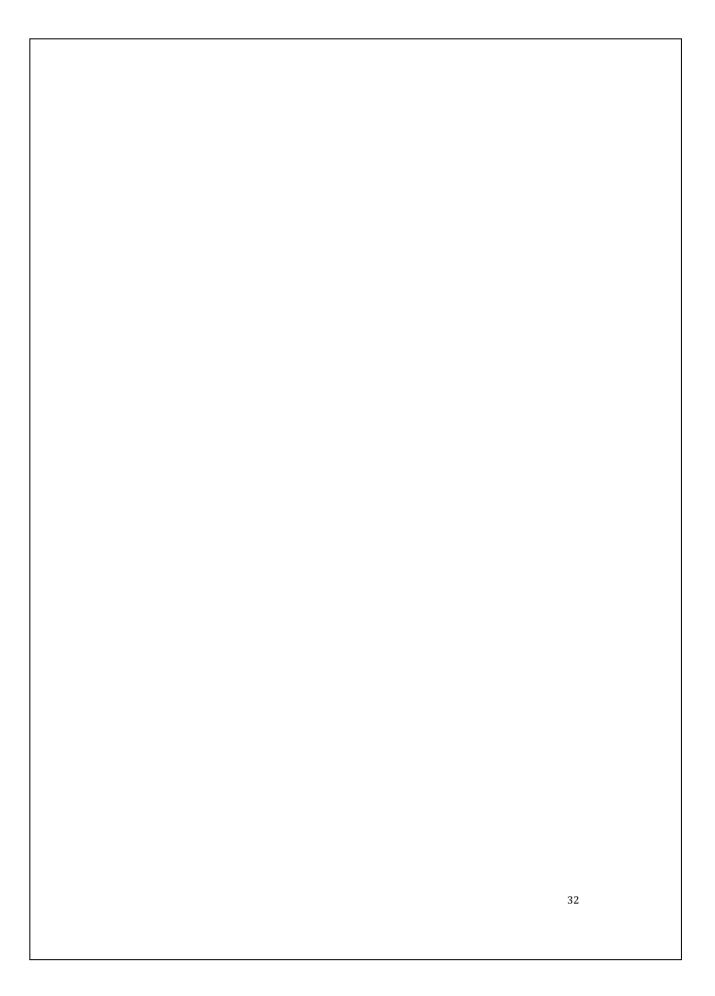

Figure 16: Race

6. DISCUSSION

This section provides further exploration of the analysis to extend the knowledge of the social impacts as a result of the construction of the L1 line in Lima. The discussion will be carried out by exploring the relationship transport-land value and the arguments behind the population change due to the Metro. Followed by an impression on the ongoing Metro project in Lima and the utility of this research and the examination of potential policy outcomes in the transport planning field to reduce the social externalities. Finally, a reflection on the limitations and suggestions for future research on this matter.

6.1. TRANSPORT – LAND VALUE RELATIONSHIP

The spatial analysis that was carried out in the three areas was key to understanding the different patterns according to the socioeconomic areas and the property market behaviour when it comes to the construction of new transport projects (Estupiñan, 2011). The results observed match with the urban dynamics and its relationship with mobility patterns; this can be verified by observing the neighbourhood characteristics when analysing car ownership in each area.

This analysis gives an insight into people's preferences according to their economic status. Easy access to transport facilities seems to be more valuable in middle and middle-low-income zones, particularly in La Victoria (MI), where the quantity of development has increased exponentially in the surroundings. The list of apartment projects (appendix E) in La Victoria is large compared to Villa El Salvador, which is a sign of upgrade and revitalisation due to the Metro station. On the other hand, Surco has always been a high-class neighbourhood, characterised by low-density buildings and low-rise constructions. Nonetheless, the pattern is changing. The recent projects built around the Metro station are designed with more storeys and can support more capacity; however, this varies according to distance. These more densely packed projects that are available for lower prices around the station is attracting people on lower incomes and is densifying the zone as a result. As a reflection of this relationship, governments should consider tools to densify MLI zones where urban projects are limited.

This analysis shows how the Metro has a direct effect on land values and can have a positive or negative effect depending on the groups analysed. The case of Lima is unique because L1 was put on hold for many years, and the urban demographics and the settlement of poorer people have changed since the Metro was originally planned. However, there have been efforts and good intentions on the part of the AATE and the government to modify the project and meet expectations (AATE, 2019), but the current impact analysis does not consider these external impacts on populations (CPS, 2018). Indeed, the impact analysis recognises the 'revitalisation' of the zone and the revaluation of the properties as positive outcomes for the people living in the area.

6.3. THE METRO NETWORK AND FUTURE LINES

This research focused its attention on L1: a project whose main aim was connecting the population outside the city centre to Lima's central business district. The increase in accessibility is one of the positive outcomes benefiting the most disadvantaged groups, and it is reflected in the last survey by Origin-Destiny (JICA, 2013). However, social externalities and changes in the social realm are not being considered and need further analysis for the entire Metro Network.
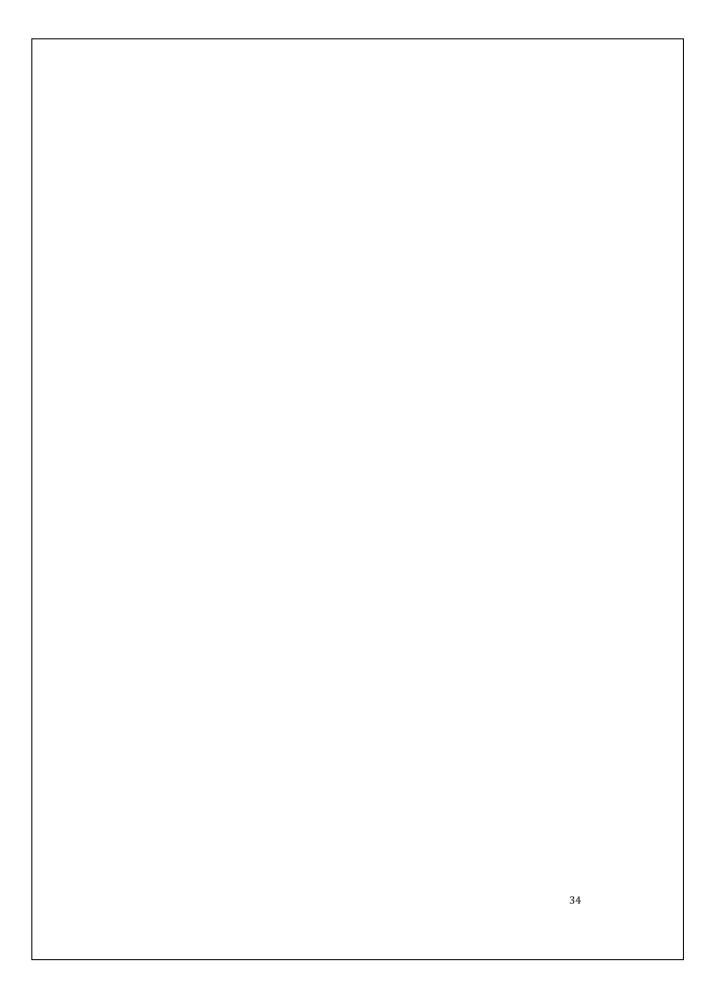
Currently, the ongoing Metro project is contemplating the construction of a second line (L2) going from east to west, and part of the L4 railway line connecting the Metro network with the Lima's International Airport. However, the project was not devised as a Metro line from the start; it was first planned as a complementary BRT line connecting the mainline of the BRT 'Metropolitano' (PERÚ21, 2012, p. 21). The project changed in form due to a lack of adequate public transportation to move people from east to west, and to provide secure access and quality mobility service from the city to the airport. However, as explained in the literature review, most of the Metro projects around the world have resulted in increasing house prices around Metro stations compared to BRT lines (Estupiñan, 2011). Based on that, L2 requires further analysis in terms of how it will impact on the land values within the station catchment areas, particularly when considering the low and middles socioeconomic characteristics of the neighbourhoods that L2 and branch L4 go through.

The lack of mechanisms for controlling land values and reducing displacement within the catchment areas shows the necessity of changing the model used for funding transport projects. The AATE (2019) has considered the use of government funding for the next lines, allowing them to have better control over land and provide adequate levels of density and development.

Unlike L1, the new L2 line is conceived as an underground project. Despite using public land, the magnitude of the project demands the use of adjacent properties; however, the government has been working in proper mechanisms for legal evictions (Ugaz, 2018). This is still a 'direct displacement' that should be taken into account in any future analysis.

6.4. POLICY OUTCOMES

The urban sprawl in Lima was an unexpected event incentivised by a centralised city. This model promoted the immigration of people from other provinces looking for better living conditions in the capital. The result was the emergence of new settlements in the outskirts of the city characterised by low-skilled labour and low education levels, areas that are stigmatised by their socioeconomic condition and groups that have been marginalised in many aspects, one of them the transport field.

were not considered in the study because of the informality of the rental market, but it would have been interesting to analyse the changes in the rental market over time in the same way as land values.

In the case of the census data gathered from INEI, the information did not provide information at the same scale of the catchment areas. However, the station selection was made considering neighbourhoods where the Metro is the only large-scale transport project in the area. The case of La Victoria is unique because some areas are also served by the BRT, and could have affected the results. In addition, a comparison between three different socioeconomic areas needs to be undertaken.

The final reflection point is about the quality of data that needs to be gathered in developing countries like Peru. The generation of data is crucial for recognising problems and identifying future solutions and policy outcomes. This research aims to be a starting point for understanding the social impacts of the Metro in terms of gentrification theory. However, it does not aim to identify to what extent the Metro generates displacement and gentrification; the population change can also be related to other factors like other spatial changes and commerce in the area. A wider analysis is needed considering these additional variables.

7. CONCLUSIONS

The main aim of transport is to "unlock the city" and bring people together by increasing levels of accessibility; furthermore, this should be principally designed in favour of disadvantaged cohorts who are already affected by the spatial distribution. There are lots of benefits of transport projects like the Metro de Lima; in fact, most of the positive outcomes focus on increasing mobility levels and the reduction of travel time. This current tendency is reflected in most of the social impact assessment (Kohon, 2015); however, there is a clear impact of transport and the spatial distribution that should be taking into account before the construction of the project.
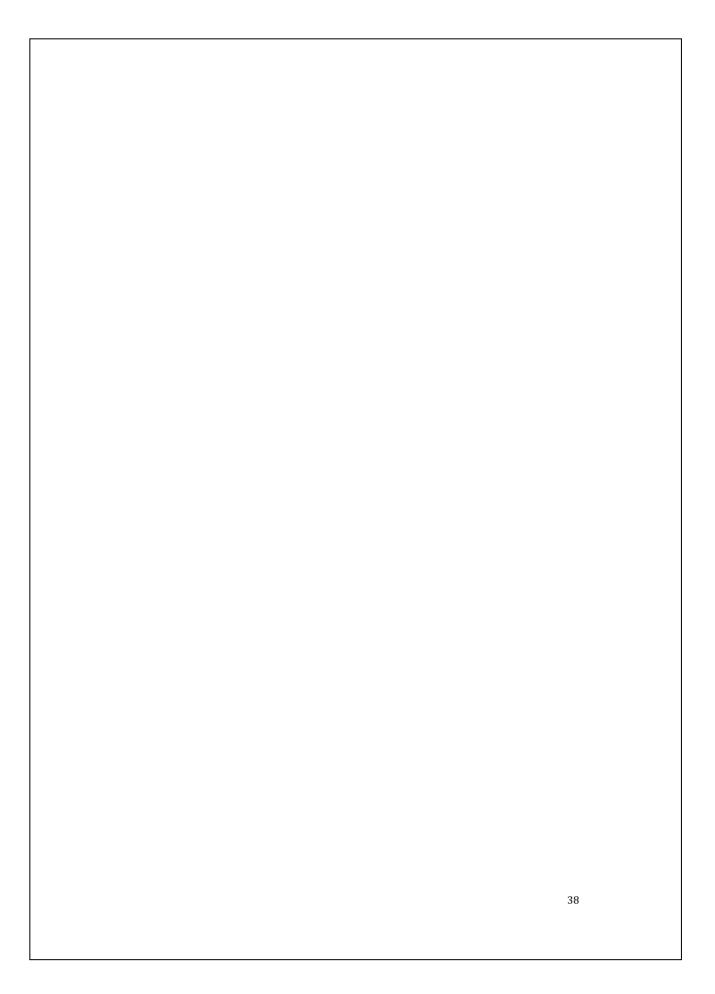
The aim of this study was not to find a relationship between transport and gentrification; but, to analyse indicators of change in zones where the Metro was constructed and; by this, expose the social externalities according to different neighbourhoods and the dynamics between transport and the urban space. The effects according to the socioeconomic level reflect the underlying power struggle and the burgeoning new middle-income class in the city of Lima. The factors drivers of displacement related to transport gentrification are still unclear in the context of Lima, but it is a process happening and need to be exposed to become aware of its consequences in the urban space.

In the particular case of Lima city, the current situation of transport is unsustainable and massive transport projects are essential for development. There is a wide gap in terms of transport infrastructure compared with other cities in the Latin American region -L1 in Lima was first opened after 45 years of difference with the Metro de Santiago in Chile (Ugaz, 2018). Modernisation is vital for society; however, this search for development cannot be a driver of inequalities. A holistic approach is needed to reduce the social externalities reinforcing differences between classes. What makes us reflect upon the lack of densification in more deprived areas where the Metro arrives; and could be one of the reasons why people is moving to other socioeconomic areas, where the development has boosted the zone. However, in many developed cities this "upgrade" around stations has only reinforced gentrification patterns (Bowes and Ihlanfeldt, 2001); considering that, local authorities should take advantage of the issues observed in first-world cities and look for a balance to promote equity in the city in the next Metro Projects.

This topic might be controversial in the planning field because it confronts two different purposes of a transport project: The broader objective to benefit the whole city and the impacts on the local population. However, this could be anticipated by governments by including the social impacts of transport at the local level and adequate proposals to avoid gentrification and displacement issues in the future metro lines.

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APPENDIX A: TRANSPORT AND GENTRIFICATION STUDIES

The list below summarises the types of methodologies and considered variables used to assess gentrification and displacement.

Author(s)	Research	Methodology	Variables/ indicators
Bardaka et al. (2018)	Causal identification of transit induced gentrification and spatial spillover effects: The case of Denver	Difference-in-Difference model (1), econometric analysis	Socioeconomic: education, income and profession. Housing: rent and housing value
Atkinson (2000)	Measuring gentrification and displacement in Great London.	Longitudinal study	Age, income and ethnicity.
Moore (2015)	Gentrification and displacement: The impacts of mass transit in Bangkok	Semi-structured interviews	Household income, education, tenure, gender, age.
Baker and Lee (2017)	How does Light Rail Transit Impact Gentrification?	SAR – Spatial regressions, neighbourhood change index (NCI)	Socioeconomic characteristics, displacement indicators (race, education)
Lin and Chung (2017)	Metro-induced gentrification: A 17-year experience in Taipei	Regression analysis to identify the relationship between proximity and gentrification	Education, House price, type of floor, employment
Dong (2017)	Rail- Transit induced gentrification and the affordability paradox	Difference-in-Difference analysis	Demographic composition, housing characteristics and tenure.
Grube-Cavers and Patterson (2014)	Urban Rapid Rail Transit and gentrification in Canadian urban centres: A survival analysis approach	Survival analysis (2) using a survival model.	Education and housing prices
Jones and Ley (2016)	Transit-oriented development and gentrification along Metro Vancouver's low-income Sky Train corridor.	Census analysis of gentrified zones using census data and interviews.	Income, housing, refugees location.

(1) *Difference-in-difference model (DiD): Comparison using control areas*
(2) *Survival analysis: it is a collection of statistical procedures for analysing data where the outcome variable is time until an event occurs. Used when the independent variable effects vary over time.*

APPENDIX B: TRANSPORT-LAND VALUE STUDIES

The list below contains the different models used to assess gentrification and displacement, and the variables considered for the analysis.

Author	City	Type of Project	Findings
(Gibbons and Machin, 2005)	Massachusetts – USA	Metro System	Increasing prices on the housing market along the stations
(Agostini and Palmucci, 2017)	Santiago, Chile	Metro System	Increase of property values according to the level of the project development.
(Cervero, 2010)	San Diego – USA	BRT System	A strong relationship between transit proximity and land values.
(Yen et al., 2018)	Gold coast, Australia	LRT System	Increase of property prices early stages. After the announcement, additional increment after financial commitments.
(Rodríguez and Mojica, 2009)	Bogotá, Colombia	BRT System	Increase of property values according to the level of the project development.
(Munoz-Raskin, 2010)	Bogotá Colombia	BRT System	Premium prices to walking distance stations.

APPENDIX C: REALTORS DATASET

The table below summarises the Real Estate projects gathered from different websites used for the spatial analysis. The source provides location information used for geographically reference the projects using ArcGis.

Neighbourhood	Socio economic Level	Code	Sect or	Realtor	Project Name	Price/m2 (s/.)	Year	Source
Villa el Salvador	MLI	1	C +	Viva GyM	Los Parques de Villa El Salvador I	S/.1,338.71	2012	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Villa el Salvador	MLI	2	C +	Viva GyM	Los Parques de Villa El Salvador II	S/.2,342.86	2014	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Villa el Salvador	MLI	3	C +	Viva GyM	Los Parques de Villa El Salvador III	S/.2,443.11	2016	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Villa el Salvador	MLI	4	C +	Viva GyM	Los Parques de Villa El Salvador III	S/.2,857.14	2019	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	1	C +	Grupo Acuario	Residencial Las Torres de Sta Clara II	S/.2,370.00	2009	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	2	C +	Cimentare	Residencial Alcántara	S/.2,543.86	2011	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	3	C +	Paz Centenario	Condominio Jardines de Sta Clara	S/.2,547.17	2011	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	4	C +	Besco	Condominio Central 10.5	S/.2,321.80	2012	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	5	C +	Paz Centenario	Condominio Prados del Sol	S/.2,439.81	2012	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	6	C	Grupo Paredes	Las Torres de Ate	S/.2,085.37	2012	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	7	C +	Grupo Caral	Condominio La Ribera de Sta. Clara	S/.2,732.00	2013	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	8	C +	Nellyta Inversiones	Residencial Nelly	S/.2,715.60	2016	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	9	C +	Armas Doomo	Edificio Alto Vida	S/.2,983.00	2017	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx

				Líder Grupo Constructor				
ATE	MLI	10	C +		Kampu Condominio Santa Clara II	S/.2,606.00	2017	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
ATE	MLI	11	C+	Grupo DyM	Residencial Prado	S/.4,150.00	2019	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
La Victoria	MI	1	C	Paz Centenario SA	Condominio Parque Los Olivos	S/.2,267.87	2013	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
La Victoria	MI	2	B	V&V Grupo Inmobiliario	Edificio Limited	S/.4,244.76	2014	https://urbania.pe/blog/proyectos-inmobiliarios/el-edificio-limited-un-nuevo-proyecto-en-santa-catalina/
La Victoria	MI	3	B+	My Home	Milenium Santa Catalina	S/.5,223.68	2017	https://nexoinmobiliario.pe/proyecto/venta-de-departamento-631-millenium-la-victoria-lima-lima-my-home
La Victoria	MI	4	B+	Grupo Lar	Hara	S/.5,450.00	2017	https://www.adondevivir.com/propiedades/hara-santa-catalina-52756011.html
La Victoria	MI	5	B +	My Home	Você	S/.5,705.00	2017	https://urbania.pe/inmueble/proyecto-tempo-lima-la-victoria-urbana-peru-4091
La Victoria	MI	6	B	GRB Inmobiliaria	Aldana 161	S/.5,679.78	2018	https://www.adondevivir.com/propiedades/proyecto-aldana-161-54348433.html
La Victoria	MI	7	B +	Grupo Elide Inmobiliaria	Las Terrazas	S/.5,550.00	2018	https://urbania.pe/inmueble/proyecto-residencial-parque-santa-catalina-lima-la-victoria-inmobiliaria-pajuelo-4527
Rimac	MI	1	C +	Virú	Residencial Virú	S/.2,301.59	2012	https://www.mivivienda.com.pe/PortalCMS/archivos/documentos/RevistaFondoMIVIVIENDAN60.pdf
Rimac	MI	2	C	Valora Inmobiliaria	Residencial Celeste	S/.3,201.58	2013	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Rimac	MI	3	B	Inm. Ntra. Señora de Copacabana	Los Jardines de Rimac II	S/.3,502.00	2017	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Rimac	MI	4	B	Líder Grupo Contructor	Alameda Alcazár	S/.2,214.29	2014	https://www.lider.com.pe/proyectos/condominio-alameda-alcazar
Rimac	MI	5	C	Besco	Altos del Rimac	S/.2,064.00	2019	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Rimac	MI	6	B	Besco	Condominio Nuevo Alcazár	S/.2,328.57	2012	http://condominionuevoalcazar.com/
Rimac	MI	7	C	Paz Centenario	Condominio Parq. Rimac	S/.1,630.60	2009	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Rimac	MI	8	C	Besco	Pradera del Rimac	S/.3,198.00	2019	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
Surco	MHI	1	B +		Edificio Punta Sal	S/.5,900.25	2013	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	2	B +	Manserpro	Edificio Mult. Canopus	S/.6,041.00	2015	https://urbania.pe/buscar/proyectos-propiedades

District	Class	No.	Category	Developer	Project	Price	Year	URL
Surco	MHI	3	A	Inmobiliaria Vivir	Alpamare	S/6,930.00	2016	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	4	A	Grupo Dicon	Residencial Vista Honduras	S/7,040.00	2017	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	5	A	FCM Constructora	Edificio Wiese	S/6,170.00	2017	https://nexoinmobiliario.pe/
Surco	MHI	6	A		Castellana Select	S/6,246.00	2017	https://nexoinmobiliario.pe/
Surco	MHI	7	A	Edifikarte	Casa Club La Republica	S/5,604.00	2017	
Surco	MHI	8	A	Grupo Dicon	Residencial Parque Vicmar	S/5,831.00	2018	https://nexoinmobiliario.pe/
Surco	MHI	9	A	Danfra	Residencial Nahia	S/5,220.00	2018	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	10	A	Grupo Dicon	Residencial Lapeyre	S/5,271.00	2018	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	11	A	Avenir grupo Inmobiliario	Here	S/5,955.00	2018	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	12	A	Venti Grupo Inmobiliario	Edificio Paseo la castellana	S/6,227.00	2018	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	14	B +	Team Group Inmobiliaria	Edificio Ankary	S/6,069.00	2018	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	15	A	Constructora Atlas	Proyecto Kenko	S/6,056.00	2019	https://urbania.pe/buscar/proyectos-propiedades
Surco	MHI	16	B+	Espacios y Estructuras Inm.	Edificio HQ3	S/6,270.00	2019	https://www.adondevivir.com/propiedades/edificio-punta-sal-380-santiago-de-surco-53542724.html
Surco	MHI	17	A	R&S Inmobiliaria	Doña Maria	S/5,414.00	2019	https://www.adondevivir.com/propiedades/frente-a-parque-cibeles-estreno-flat-129-m-sup2--50055264.html
San Miguel	MHI	1	A	Las Leyendas Inmobiliaria	Leyendas de San Miguel	S/6,226.00	2010	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
San Miguel	MHI	2	B +	Paz Centenario	Panoramic Cond.	S/5,636.00	2011	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
San Miguel	MHI	3	B +	Ay G Edificaciones	Terrazas De La Costanera	S/5,753.00	2011	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
San Miguel	MHI	4	B +	Maria Auxiliadora	Residencial Costa Azul	S/4,260.00	2013	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
San Miguel	MHI	5	B +	Grupo Caral	Los Prados de San Miguel	S/4,448.00	2012	https://www.mivivienda.com.pe/portalweb/fondo-MIVIVIENDA/revistas.aspx
San Miguel	MHI	6	B	Innova Perú Corporación	Residencial Escardo I	S/5,216.00	2013	https://nexoinmobiliario.pe/
San Miguel	MHI	7	B +	Grupo Caral	Uptown	S/4,882.00	2013	https://nexoinmobiliario.pe/

Distrito	Tipo	N°	Categoría	Inmobiliaria	Proyecto	Precio	Año	Fuente
San Miguel	MHI	8	B +	Betania Inmobiliaria	Mar Azul	S/5,158.00	2014	https://nexoinmobiliario.pe/
San Miguel	MHI	9	B +	Actual Inmobiliaria	Costanera 25	S/6,364.00	2014	https://nexoinmobiliario.pe/
San Miguel	MHI	10	B +	Grupo MG	Ed. Mar de Plata	S/5,144.00	2015	https://nexoinmobiliario.pe/
San Miguel	MHI	11	C +	Rocazul	Ipanema	S/4,111.00	2014	https://nexoinmobiliario.pe/
San Miguel	MHI	12	B +	Grupo Vida	Ocean View	S/4,592.00	2015	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	13	C +	Grupo Vida	Ibiza	S/4,172.00	2014	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	14	B +	CYN Inmobiliaria	Residencial Patriotas	S/4,831.00	2015	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	15	C +	Interhouse Servicios Inm.	Residencial Quorom	S/3,704.00	2014	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	16	B +	Urbana Peru	Alegro San Miguel	S/5,861.00	2015	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	17	B +	Progen Construye	Las Casas de San Miguel	S/6,118.00	2015	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	18	B +	Concreta Soluciones	Residencial Maranga	S/4,958.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	19	B +	Premium Contructora	Residencial Alameda de Sucre	S/4,353.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	20	B +	Imagina	Magic Ocean	S/6,471.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	21	B	Urbanica Proyectos Inm.	Residencial Ventura	S/4,983.00	2015	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	22	B +	Ciudaris	Liber Park	S/4,764.00	2015	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	23	B +	Inmobiliaria Cantabria	Edificio Motion	S/6,317.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	24	B +	Caba	Solatium	S/6,092.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	25	B +	Grupo Sol Inmuebles	Edificio Paseo la Marina	S/3,920.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	26	B +	Inversiones Boston	Escardo 450	S/4,489.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	27	B +	Origen Grupo Inmobiliario	Edificio Lirio	S/5,221.00	2016	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	28	B +	Viva Gy M	Parques Del Mar II	S/4,197.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	29	B	Inmobiliaria Atlas	Razuri II	S/4,627.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	30	B +	Ciudaris	Shine	S/5,762.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	31	B	Grupo Caral	Valente	S/5,178.00	2017	https://urbania.pe/buscar/proyectos-propiedades

Distrito	MHI	N°	Cat.	Constructora	Proyecto	Precio	Año	URL
San Miguel	MHI	32	B	Force House	Res. Oceanica	S/4,599.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	33	B +	Edificaciones Inmobiliarias	Paseo Del Parque	S/5,385.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	34	B +	VK Sol Inversiones	Edificio Alta Mira	S/4,293.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	35	B +	Inverfina	Edificio Josefina V	S/4,870.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	36	B	Imagina	Alto Venezuela	S/5,213.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	37	B +	Capac Asociados	SM Park	S/5,017.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	38	B +	Edificaciones Inmobiliarias	Residencial El Prado	S/4,331.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	39	B +	Grupo T&C	Bertolotto	S/6,376.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	40	B	Lider Grupo Constructor	Modo	S/3,930.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	41	B +	Edificaciones Inmobiliarias	Avida	S/5,586.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	42	B +	Brocksa Grupo Inmobiliario	Edificio Pershing	S/5,172.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	43	B +	3 Grupo Inmobiliario	Residencial Quadrato	S/5,856.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	44	B +	AAJEI Constructora	Residencial El Encanto II	S/5,525.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	45	A	Paz Centenario	Vista Azul	S/4,830.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	46	B +	Granadero	Altus one	S/6,015.00	2017	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	47	B +	Casa y Gestión	Buena vista II	S/5,186.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	48	B	DKASA inmobiliaria	Residencial Torino	S/4,902.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	49	B	Casa y Gestión	Ocean Bertolotto	S/6,232.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	50	B+	Grupo T&C	Costanera 29	S/5,398.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	51	B+	Edificaciones Inmobiliarias	Lares de San Miguel	S/5,160.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	52	B+	HJC Inversiones SAC	Luminor II	S/6,466.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	53	B+	Inversiones Dkasa	Residencial Catania	S/4,602.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	54	B +	Capac Asociados	SM Park	S/4,278.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	55	B +	Grupo T&C	Bertolotto	S/6,845.00	2018	https://urbania.pe/buscar/proyectos-propiedades

District	Type	No.	Class	Líder Grupo Constructor	Modo	Price	Year	URL
San Miguel	MHI	56	B			S/7,552.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	57	B +	Edificaciones Inmobiliarias	Avida	S/5,918.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	58	C +		Libertad 18	S/4,886.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	59	A	Paz Centenario	Vista Azul	S/5,154.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	60	B	Casa y Gestión	OB 350	S/6,862.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	61	B+	Grupo T & C	Costanera 29	S/5,674.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	62	B+	Edificaciones Inmobiliarias	Lares de San Miguel	S/5,696.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	63	B+	Inversiones Dkasa	Residencial Catania	S/4,633.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	64	B+	Grupo Inmobiliario BLF	Sumo 105	S/5,262.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	65	B+	Edificaciones Inmobiliarias	Vibra	S/5,920.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	66	B+	MCR Inmobiliaria	La Moraleja	S/4,921.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	67	B+	Lima In	San Marino	S/5,080.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	68	B+	Labok Grupo Inmobiliario	Pacific Ocean Tower	S/5,558.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	69	B+	Rocazul	Vistamar	S/5,312.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	70	B+	AG Proyectos	Yanacoto	S/4,420.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	71	B+	Inversiones Dkasa	Savona	S/4,259.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	72	B+	Piedra Alta Inversiones	Res. Munaysenca 121	S/4,862.00	2018	https://urbania.pe/buscar/proyectos-propiedades
San Miguel	MHI	73	B+	Piedra Alta Inversiones	Edificio Parque Quiñones I	S/4,241.00	2018	https://urbania.pe/buscar/proyectos-propiedades

* Prices are shown using the local currency, Nuevos Soles.

RISK ASSESSMENT FORM

FIELD / LOCATION WORK

△UCL

The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form

http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf

DEPARTMENT/SECTION BARTLETT SCHOOL OF PLANNING
LOCATION(S)
PERSONS COVERED BY THE RISK ASSESSMENT STUDENT AND SUPERVISOR

BRIEF DESCRIPTION OF FIELDWORK INTERVIEWS TO STAKEHOLDERS (PERSON-TO-PERSON AND VIA INTERNET)

Consider, in turn, each hazard (white on black). If **NO** hazard exists select **NO** and move to next hazard section.

If a hazard does exist select **YES** and assess the risks that could arise from that hazard in the risk assessment box.

Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.

ENVIRONMENT	The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard
e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.	Examples of risk: adverse weather, illness, hypothermia, assault, getting lost. Is the risk high / medium / low ? LOW

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

- ☐ work abroad incorporates Foreign Office advice
- ☐ participants have been trained and given all necessary information
- ☐ only accredited centres are used for rural field work
- ☐ participants will wear appropriate clothing and footwear for the specified environment
- ☐ trained leaders accompany the trip
- ☐ refuge is available
- ☐ work in outside organisations is subject to their having satisfactory H&S procedures in place
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

EMERGENCIES	Where emergencies may arise use space below to identify and assess any risks
e.g. fire, accidents	Examples of risk: loss of property, loss of life

NO RISKS

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

- ☐ participants have registered with LOCATE at http://www.fco.gov.uk/en/travel-and-living-abroad/
- ☐ fire fighting equipment is carried on the trip and participants know how to use it
- ☐ contact numbers for emergency services are known to all participants
- ☐ participants have means of contacting emergency services
- ☐ participants have been trained and given all necessary information
- ☐ a plan for rescue has been formulated, all parties understand the procedure
- ☐ the plan for rescue /emergency has a reciprocal element
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

NONE

FIELDWORK   1   May 2010

EQUIPMENT	Is equipment used?	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. clothing, outboard motors.	Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

- ☐ the departmental written Arrangement for equipment is followed
- ☐ participants have been provided with any necessary equipment appropriate for the work
- ☐ all equipment has been inspected, before issue, by a competent person
- ☐ all users have been advised of correct use
- ☐ special equipment is only issued to persons trained in its use by a competent person
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	Is lone working a possibility?	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. alone or in isolation *lone interviews.*	Examples of risk: difficult to summon help. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

- ☐ the departmental written Arrangement for lone/out of hours working for field work is followed
- ☐ lone or isolated working is not allowed
- ☐ location, route and expected time of return of lone workers is logged daily before work commences
- ☐ all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle
- ☐ all workers are fully familiar with emergency procedures
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK   **2**   May 2010

ILL HEALTH	The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.
e.g. accident, illness, *personal attack, special personal considerations or vulnerabilities.*	Examples of risk: injury, asthma, allergies. Is the risk high / medium / low? LOW

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

☐	an appropriate number of trained first-aiders and first aid kits are present on the field trip
x	all participants have had the necessary inoculations/ carry appropriate prophylactics
x	participants have been advised of the physical demands of the trip and are deemed to be physically suited
☐	participants have been adequate advice on harmful plants, animals and substances they may encounter
☐	participants who require medication have advised the leader of this and carry sufficient medication for their needs
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT	Will transport be required	NO		Move to next hazard
		YES	X	Use space below to identify and assess any risks
e.g. hired vehicles	Examples of risk: accidents arising from lack of maintenance, suitability or training Is the risk high / medium / low? LOW			

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

X	only public transport will be used
☐	the vehicle will be hired from a reputable supplier
☐	transport must be properly maintained in compliance with relevant national regulations
☐	drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
☐	drivers have been trained and hold the appropriate licence
☐	there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
☐	sufficient spare parts carried to meet foreseeable emergencies
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	Yes	If 'No' move to next hazard
			If 'Yes' use space below to identify and assess any

	risks
e.g. interviews, observing	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? LOW

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

X	all participants are trained in interviewing techniques
X	interviews are contracted out to a third party
X	advice and support from local groups has been sought
X	participants do not wear clothes that might cause offence or attract unwanted attention
X	interviews are conducted at neutral locations or where neither party could be at risk
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

WORKING ON OR NEAR WATER	Will people work on or near water?	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. rivers, marshland, sea.	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

☐	lone working on or near water will not be allowed
☐	coastguard information is understood; all work takes place outside those times when tides could prove a threat
☐	all participants are competent swimmers
☐	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons
☐	boat is operated by a competent person
☐	all boats are equipped with an alternative means of propulsion e.g. oars
☐	participants have received any appropriate inoculations
☐	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)	Do MH activities take place?	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.	Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?		

CONTROL MEASURES	Indicate which procedures are in place to control the identified risk

- ☐ the departmental written Arrangement for MH is followed
- ☐ the supervisor has attended a MH risk assessment course
- ☐ all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
- ☐ all persons performing MH tasks are adequately trained
- ☐ equipment components will be assembled on site
- ☐ any MH task outside the competence of staff will be done by contractors
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

SUBSTANCES	Will participants work with substances	No	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
e.g. plants, chemical, biohazard, waste	Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?		

CONTROL MEASURES   Indicate which procedures are in place to control the identified risk

- ☐ the departmental written Arrangements for dealing with hazardous substances and waste are followed
- ☐ all participants are given information, training and protective equipment for hazardous substances they may encounter
- ☐ participants who have allergies have advised the leader of this and carry sufficient medication for their needs
- ☐ waste is disposed of in a responsible manner
- ☐ suitable containers are provided for hazardous waste
- ☐ OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS	Have you identified any other hazards?	No	If 'No' move to next section If 'Yes' use space below to identify and assess any risks
i.e. any other hazards must be noted and assessed here.	Hazard: Risk: is the risk		

CONTROL MEASURES   Give details of control measures in place to control the identified risks

Have you identified any risks that are not adequately controlled?	NO	X	Move to Declaration
	YES		Use space below to identify the risk and what

action was taken

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research?

If yes, please state your Project ID Number

For more information, please refer to: http://ethics.grad.ucl.ac.uk/

DECLARATION	The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

[X] I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk

[ ] I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

NAME OF SUPERVISOR BEATRIZ MELLA LIRA

**** SUPERVISOR APPROVAL TO BE CONFIRMED VIA E-MAIL ****

FIELDWORK   5   May 2010

APPENDIX E: COHORT ANALYSIS SUMMARY BY VARIABLE AND R CORRELATION

Permanency

	MLI		MI		MHI	
	Permanency	No Perm.	Permanency	No Perm.	Permanency	No Perm.
Cohort A	17.19%	15.96%	30.31%	28.85%	2.53%	-4.87%
Cohort B	14.51%	13.83%	23.74%	22.79%	-4.77%	-12.02%
Cohort C	12.90%	12.82%	19.40%	19.08%	-2.59%	-8.42%
Cohort D	14.22%	14.13%	21.15%	20.79%	1.60%	-3.25%

Type of tenancy

Group	Area	Rented	Owned	Granted	Other
Cohort A	MLI	1.82%	-21.00%	4.46%	-2.96%
	MI	-14.72%	-15.41%	2.63%	-3.71%
	MHI	5.91%	-6.03%	1.10%	-3.43%
Cohort B	MLI	0.44%	-16.50%	4.73%	-3.59%
	MI	-12.35%	-11.28%	3.34%	-4.14%
	MHI	2.03%	6.05%	0.38%	-3.35%
Cohort C	MLI	0.28%	-12.14%	1.88%	-3.24%
	M	-9.41%	-8.77%	3.21%	-4.66%
	MHI	0.61%	5.54%	0.14%	-3.45%
Cohort D	MLI	0.49%	-12.97%	0.77%	-2.69%
	M	-8.30%	-11.63%	3.07%	-4.76%
	MHI	-0.32%	1.15%	0.91%	-3.10%

Education level

Group	Area	N.A	Pre-school	Elementary	High School	Technical Incomplete	Technical Complete	University Complete	University Incomplete
Cohort A	MHI	-0.14%	-0.06%	-0.79%	**-10.64%**	-6.59%	2.14%	**-15.36%**	**28.92%**
	MI	-0.12%	-0.11%	-1.65%	**-18.01%**	-6.54%	-1.23%	-6.80%	4.15%
	MLI	-0.24%	0.03%	0.15%	-3.94%	**-9.93%**	-1.90%	-4.16%	2.80%
Cohort B	MHI	-0.13%	-0.03%	-0.15%	-2.58%	-1.73%	-0.24%	-1.32%	**10.95%**
	MI	-0.28%	-0.02%	-1.20%	**-9.65%**	-3.38%	-2.88%	-3.05%	-3.28%
	MLI	-1.22%	0.05%	-0.90%	4.01%	**-6.39%**	-4.56%	-2.71%	-2.79%
Cohort C	MHI	-0.13%	0.03%	0.05%	-0.94%	-1.26%	0.30%	-1.01%	**5.55%**
	MI	-0.21%	0.07%	-1.10%	**-7.08%**	-2.83%	-2.35%	-2.76%	-3.13%
	MLI	-1.27%	0.19%	1.12%	3.41%	**-5.51%**	-4.98%	-2.74%	-3.12%
Cohort D	MHI	-0.03%	0.00%	-0.17%	-0.57%	-1.15%	0.42%	-0.84%	0.74%
	MI	-0.33%	0.00%	-2.89%	**-8.02%**	-2.22%	-2.02%	-2.37%	-3.30%
	MLI	-2.04%	0.00%	4.00%	0.05%	-4.96%	-4.86%	-2.38%	-4.02%

WORKING SKILLS

		Government workers	Academics and scientists	Technicians	Office workers	commerce	Farmers	Operators	Construction workers	No qualified workers	Others
Cohort A	MHI	3.61%	27.18%	4.40%	-1.50%	3.65%	0.02%	0.56%	0.30%	-10.49%	-2.25%
	MI	0.24%	2.43%	-1.07%	-3.25%	0.25%	0.00%	-6.07%	-1.36%	-7.15%	-2.29%
	MLI	0.14%	2.28%	1.75%	1.18%	1.09%	-0.08%	-0.96%	-1.75%	-6.31%	-2.04%
Cohort B	MHI	4.07%	8.42%	0.67%	-1.23%	4.15%	-0.06%	1.14%	-0.88%	-2.77%	-3.03%
	MI	0.21%	-2.90%	-3.31%	-3.02%	1.96%	-0.02%	-2.28%	-2.19%	-3.90%	-2.67%
	MLI	0.20%	-1.44%	-0.53%	0.68%	1.90%	-0.14%	1.93%	-6.47%	-1.73%	-2.31%
Cohort C	MHI	2.96%	2.55%	0.61%	-0.45%	3.49%	-0.03%	0.91%	-1.16%	-1.25%	-5.35%
	MI	0.23%	-4.40%	-1.97%	-1.88%	2.38%	0.04%	-0.76%	-2.70%	-4.03%	-4.00%
	MLI	0.06%	-2.16%	-0.76%	0.91%	1.12%	0.02%	2.32%	-8.30%	-2.79%	-3.15%
Cohort D	MHI	1.23%	-4.92%	-2.12%	-1.85%	0.26%	-0.13%	0.53%	-2.59%	-2.35%	-5.33%
	MHI	-0.01%	-5.72%	-3.37%	-2.55%	-1.52%	-0.15%	-1.79%	-3.98%	-6.15%	-3.68%
	MLI	-0.15%	-2.46%	-2.07%	0.29%	-2.99%	-0.23%	1.29%	-11.40%	-7.72%	-2.72%

CORRELATION ANALYSIS

	MLI	MI	MHI
Type of Tenancy	0.953262	0.975288573	0.950903598
	0.997000	0.954941221	0.983328448
	0.972743	0.99490683	0.986118854
	0.961496	0.921425751	0.976279957

Education	-0.783917237	-0.809825232	-0.673689911
	0.940116377	0.890991233	0.839972225
	-0.075008212	-0.601320807	-0.85608485
	0.997200111	0.996761922	0.87969182
	0.976598763	0.985778075	0.9759283
	0.980092471	0.991588899	0.984928938
	0.956043931	0.988561852	0.980233305
	0.979665294	0.992430975	0.994684896

Working Skills	0.925726908	0.85337525	0.94985126
	0.97811648	0.989503908	0.978244133
	0.953741399	0.988952943	0.975742343
	0.952747463	0.990012864	0.979989602
	0.99452779	0.991643305	0.991801071
	0.705227788	0.786369136	0.561846019
	0.995904657	0.982454065	0.984010087
	0.989714544	0.986654671	0.974661508
	0.97040707	0.98711855	0.991196863
	0.866809656	0.874041262	0.894549846

Variables	Area	MLI	MI	MHI
VAR01	Permanency	Evidence of displacement of about 14% compared to 2007.	Evidence of out-migration 24%	7% more population compared to previous data.
VAR02	Type of tenancy	The number of people renting a property has increased by 12%. However, there is a reduction in owned properties of about 19%.	There is evidence of fewer people having a property or renting one, 29% and 23% less than the previous period.	The quantity of owned properties remains with less variance and a tendency to increase. The amount of rented houses has increased by 11%
VAR03	Education Level	The dominant education level is still high school; however, people holding a superior education level has reduced.	There is a reduction quantity of people holding high school level education. However, this is still the dominant group. Categories within superior education levels have reduced less than high school; however, the difference between both is minimal.	The quantity of people with superior education has increased; on the other hand, there is evidence of fewer people with basic education levels. Particularly people with college complete has risen by 35%
VAR04	Occupation	The dominant group in the area is still commerce. However, there are signs of displacement related to mine workers, construction workers and unskilled labour. The number of academics and government workers has also increased.	There is an increasing number of people in commerce and people working for the government compared to the last period. The other working skills have reduced.	There is an increasing number of skilled professional workers; the opposite effect is seen in less-skilled categories.

Variables	Area	MLI	MI	MHI
VAR05	Job Location	There is no relevant difference between people's preference in the job location.	The quantity of people working and living in the same neighbourhood is almost 60%.	The number of people living and working in the same area is only 40%.
VAR06	Car Ownership	People owning a vehicle is 18%	The number of people owning a car is only 20%	62% of the population in the zone owns a vehicle.
VAR07	Race	Quechua is the second dominant ethnic group., followed by white people and white with less than 5%.	Aside, Mestizo, the second dominant group is Quechua with 12%	The second dominant ethnic group with 14%