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Mapping Amenities and Urban Competitiveness to Attract FDI

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Summary

In contemporary world, city is powering regional and national economic growth. Urban competitiveness depicts a city's ability to attract investments as well as enhancing quality of life for residents. FDI firms are with highest mobility worldwide and can bring in capitals, jobs and knowledge; therefore, city's ability to attract FDI works as a proxy for measuring overall urban competitiveness in this study. Based on literature review, it is determined by a combination of traditional "hard" qualities and "soft" amenities, the former contains productivity, infrastructure and economic structure, and the latter refers to cultural and entertainment environment.

This study aims at explaining the "soft" amenity factors' impact on city's FDI competitiveness. The research is conducted on two levels. The general study analyses at city level by using a sample of 150 global cities from Global Urban Competitiveness Report (GUCR) and modelled through a conventional Ordinary Least Square (OLS) regression. The specific study targets on the neighbourhood level in city of Johannesburg and London. By using detailed geographical information, local Geographical Weighted Regression (GWR) estimations are deployed to capture the spatial heterogeneity.

Research confirmed the positive relationship between urban "soft" amenities and FDI competitiveness; nevertheless, traditional "hard" qualities are leading factors in influencing FDI locations. In the neighborhood level analysis, the spatial unevenness of FDI and amenities leads to non-stationary impact. In Johannesburg, both FDI and amenities are clustered in the northern privileged districts, and recreational amenities are found to have significant positive effects on FDI density in these areas. In contrast, London has a concentration of FDI and amenities in the city center, and likewise, amenities have higher impact on FDI density in core than that in periphery.

Based on above findings, with comparison to London, this study proposed a balanced economic development strategy for city of Johannesburg. Firstly, the city should establish the strategy to attract investments and accomplish economic growth goals. Secondly, spatial inequalities issue, especially the amenity disparity between northern and southern neighborhoods, should be addressed to achieve sustainable development. Thirdly, cultural amenities, such as educational institutions, museums and art centers, should be introduced to facilitate high quality of life, and to attract and retain high-quality labor and investment in Johannesburg.

Keywords

Foreign Direct Investment, urban amenity, urban competitiveness, quality of life, firm locational factors

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Abbreviations

FDI	Foreign Direct Investment
GIS	Geographical Information System
Stata	Data Analysis and Statistical Software
OLS	Ordinary Least Square
DV	Dependent Variable
IV	Independent Variable
CBD	Central Business District
GWR	Geographically Weighted Regression
OSM	Open Street Maps
UC	Urban Competitiveness
MNE	Multi National Enterprises
GUCR	Global Urban Competitiveness Report
SSA	Sub-Saharan Africa
CEO	Chief Executive Officer
VIF	Variance Inflation Factors

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Chapter 1: Introduction

1.1 Background

Under globalization and localization, the development of urban regions has quickened its pace. Cities' roles have been enhanced with diminishing effects of national boundaries and geographical distances. In the contemporary world, cities, instead of nations, are powering global economic development (Ni, 2012). Cities are considered to be in constant competition since they are linked to other cities through major economic activities. Hence, cities strive to increase their 'competitiveness' or their ability to compete with other cities in attracting capitals and workers, so as to improve or maintain their positions within the global hierarchy (Wall, 2009).

The term "competitiveness" has gained its popularity over the past two decades, but its implication remains hard to grasp. There are many definitions of urban competitiveness found in literature; nonetheless, the general consensus is that urban competitiveness is "a city's ability to create an attractive environment so as to enhance the quality of living of its residents" (Ni, 2012, p.14). Creating high-quality environment also dependent on city's ability to grow its economy, by competing with other cities in order to attract people, trade and capital. Concerning the latter, a city's attractiveness to Foreign Direct Investment (FDI) is a critical (Burger, van der Knaap, et al., 2012). This is because foreign investments are key measure of how integrated a city is within the world economy (Wall and Stavropoulos, 2016). In this context, cities need to develop themselves into economically, socially, environmentally and spatially attractive environments, so as to attract investors in desired sectors, which if done properly, can lead to economic growth and improved wellbeing. In this plight, one important aspect needs to be considered is the development of urban amenities such as urban parks, public spaces, architecture, retail, restaurants and entertainment facilities etc. (Clark, Lloyd, et al., 2002). The *New Urban Agenda* launched at UN Habitat III conference in Quito also stressed the significance of urban amenities in building livable and attractive cities (UN Habitat III, 2017). However, it is of interest to what degree livable environments contribute to economic development and the attraction of FDI.

Various scholars have argued that urban amenities enhance quality of life and make cities appealing to talented people and managerial elite. Therefore, these amenities also attract firms, especially FDI firms with high mobility. The existence of these firms drive regional economic development and enhance wellbeing, which are the major pillars constituting competitiveness (Gottlieb, 1994, Clark, Lloyd, et al., 2002, Ni, 2012). In this regard, scholars have carried out surveys and interviews to Chief Executives Officers (CEOs) in finding out their locational motives. The results show that amenities are clearly an important locational factor, with the phrase "quality of life" ranked high (Gottlieb, 1994). However, few of them provide empirical and spatial assessment linking amenities with FDI--firms with highest mobility to locate. Therefore, my research intends to empirically evaluate the importance of urban amenities and facilities in attracting FDIs in general and FDI in different sectors, i.e. hi-tech, service, resource and manufacturing sectors.

In contemporary world, African nations are among the fastest growing economies. As cities in Africa are competing for FDI in key sectors, Johannesburg works as an important gateway for bridging world investment into southern Africa (Wall and Pajevic, 2013). The gateway function can be reflected from the fact that Johannesburg owns the most headquarters of inward FDI in Africa, and ranked first by total volume of FDI in Sub-Saharan African cities

(Wall, Maseland, et al., 2018). Therefore, an in-depth research of Johannesburg local factors and advantages can shed light for other emerging cities in Africa. Based on the Manhattan Distance Method, which is a network analysis method to calculate a city's competitors in terms of investments sectors, Bogota is Johannesburg's first competitor because this city has the most similar profile to Johannesburg in terms of the types of investment and the financial magnitude of these sectors. In contrast, London is the most complementary to Johannesburg because they attract investments from different sectors; London's sectoral profile of investment is completely different to Johannesburg and therefore, London is an ideal collaborator (Wall, Maseland, et al., 2018). Moreover, London ranks top in total inward FDI into Johannesburg. As the combination of dissimilarity and investment power, London is the ideal "aspirant" city of Johannesburg. Furthermore, Johannesburg's strongest cultural tradition is from British culture. As an established global city, London is more influential and higher-up the global city hierarchy; studying the strength of London and amenity sufficiency are of great value for policy-makers to enhance urban quality and competitiveness in Johannesburg and the rest of Southern African cities. Hence, London is selected as the geographical focus to compare with Johannesburg in this study.

The paper is structured as follows: Chapter one provides a brief introduction of the topic; define research questions and limitations of the research. Chapter two investigates the state of art literature on the topic. Based on theories of competitiveness and FDI, the competitiveness terminology and its various measurement methodologies are deliberated. Theories of urban amenities and its benefits are discussed in full, and the conceptual framework is presented to illustrate the relations among concepts. Chapter three describes the data and methodology used to answer the research questions, as well as the operationalization process. The analysis includes two parts. Firstly, a general study carried out on many global cities, to identify which urban amenities significantly attract different sectors of FDI. This is carried out at the city scale, and utilizes Ordinary Least Square (OLS) estimator. Secondly, a detailed analysis will be developed to test effects of urban amenities upon FDI densities in both Johannesburg and London. This is carried out at the district level of these cities, and employs Geographically Weighted Regression (GWR) methods. Chapter four presents the research findings; results on Johannesburg are compared with London in both general study and specific study, as Johannesburg is the focus of the study. Chapter five reports the conclusions, answers research questions, and derives policy recommendations for Johannesburg from theory and empirical analysis.

1.2 Problem statement

The impact of Multinational Enterprises (MNEs) on the world economy is paramount, and for emerging economies, FDI can serve as a catalyst to achieve faster economic growth. Therefore, cities are inevitably influenced by MNEs since they use FDI as with the intention of reducing production costs, acquiring physical and human capital, and gaining access to new markets. They utilize, operate and manage the resources and strengths of cities. In competitive advantage theory, locations are a top priority in corporate strategies. In fact, urban amenities and economic factors embedded in urban locations arguably constitute the competitiveness of cities (Diamond and Tolley, 2013). Local characteristics, or factor endowments, such as infrastructure, resources, amenities, social and institutional capitals, determine the flow of FDI to particular locations (Martin, Kitson, et al., 2012). Locations that have greater absorptive capacities are inclined to be more competitive in expanding market and production (Wall and Pajevic, 2013).

The term “competitiveness”, according to Storper (1997, p.20), is “the ability of an economy to attract and maintain firms with stable or rising market shares in an activity, while maintaining or increasing standards of living for those who participate in it”. It is increasingly recognized as a dynamic and multidimensional economic concept, which incorporates productivity, employment, standards of living and sustainability (Kitson, Martin, et al., 2004, Rogerson, 1999). There is also a growing tendency to emphasize “hard” as well as “soft” factors in explaining city growth. In particular, the quality and skills of labor force (human capital), the presence of an innovative and creative class (knowledge/creative capital), and the scale and quality of public infrastructure (infrastructural capital), as Martin and Sunley (2003) concluded below in Figure 1.1.

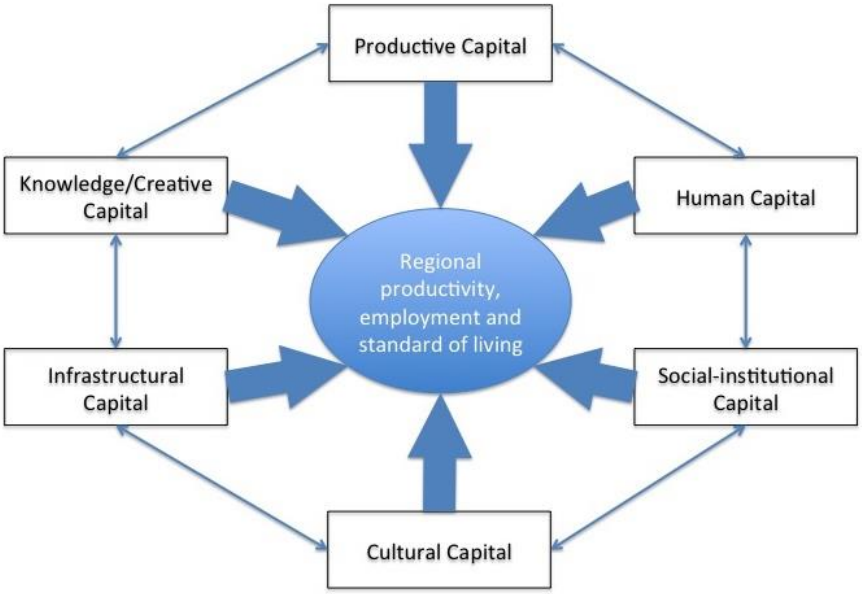

Figure 1. 1 Bases of Regional Competitive Advantage (based on Martin and Sunley, 2003)

Examining the factors that determine a city’s competitiveness involves a number of aspects, including factor competitiveness, efficiency competitiveness, innovation competitiveness and environmental competitiveness (Ni, 2012). Yet human factor is recognized as an important factor, the competitiveness to attract human talents is best associated with studies on “quality of life” within cities (Florida, 2003, Rogerson, 1999). Urban amenities are another important feature that links physical urban spaces to city economic development. For example, public spaces like park amenities provide space for interaction and events, which in turn supports cultural, social, and economic capital, hereby promoting the development of the creative industry (Florida, 2003).

Urban amenities sufficiency is essential to residents’ wellbeing; moreover, better infrastructures and living environments are increasingly recognized as critical factors for attracting investors and multinational firms. On the one hand, urban amenity sufficiency indicates regional stability and prosperity; furthermore, different types of amenities provision reflect various social and cultural characteristics of a region. These “city image” are bound to attract various types of creative class and firms in different sectors (Florida, 2003, Clark, Lloyd, et al., 2002). Therefore, it is of great interest for policy-makers to understand what types of amenities attract desired firms and people.

Although urban amenities constitute both hard economic and soft living qualities, this study intends to specifically explore the impact of soft urban amenities and their impact on attracting FDI into Johannesburg, as this remains a relatively unexplored area.

1.3 Research questions and objectives

In the dynamic world of globalization, the determinants of a city's attractiveness to firms have shift from traditional factors such as land, agglomeration to soft quality of life factors such as amenities and living standard (An, Kang, et al., 2014). The availability of urban amenities is recognised as a critical factor to understand the deficiencies in established theories of urban growth. As FDI are firms with highest mobility worldwide, and the attractiveness of FDI reflects urban competitiveness (Wall, Burger, et al., 2011), this study therefore poses questions on the competitive effect of urban amenities upon FDI, and how this can drive global city's economic growth. Therefore, the main research question is as follows:

To what extent do variations in the provision of urban amenities affect urban competitiveness in attracting FDI, with reference to Johannesburg and London?

To answer the main research question, the following sub-questions will be used.

General study:

1. Based on a large sample of global cities, does "soft" urban qualities significantly affect city's FDI competitiveness, while controlling for "hard" economic variables?

Specific study:

2. Based on detailed GIS data at the neighborhood level in Johannesburg and London, to what degree do soft urban amenities affect FDI density, while controlling for other community characteristics?

The study will involve descriptive and explanatory methodologies, but eventually, my research purpose is to explain. There are two main studies, and they are internally related. Firstly, a general study in 150 cities will be conducted to test how urban qualities influence the competitiveness to attract FDI. Secondly, a spatial analysis will be conducted to assess urban amenities within Johannesburg and London, and evaluate its influences on FDI density within neighborhoods. Based on the results, conclusions are drawn along with policy recommendations for city of Johannesburg.

1.4 Significance of the study

In the firm decision-making process, their locations of headquarters and subsidiaries are top influential in forming urban geography; therefore, it is important to look into the amenities that associated with the qualified location. Policy-makers from national to local level must understand amenity supply and demand imbalance in order to justify regulations and provide sufficient services (Diamond and Tolley, 2013). In this aspect, theorists have adequately discussed and debated the relationship of amenities and firm locations; however, little empirical research has been carried out to explain and test the relevancy and examined the amenities adequacy.

Various scholars have confirmed the link between quality of life and talent attractiveness, in which they empirically show that cities with rich amenities attract in-migrations and creative class, thereafter, firms investment and clusters (Florida, Mellander, et al., 2008, Wen, Lin, et al., 2016). From that, they argue that amenities pose impact on firm locations; qualitative and quantitative researches have been carried out and confirmed the link (Gottlieb, 1995, Wenting, Atzema, et al., 2011).

However, most competitiveness studies focus on the developed countries and global metropolitan centres. Little focus is given to the emerging economies and fast-changing cities in the global south—for example, in cities in Southern Africa—that are potential locations for future investment and important centres of international and regional politics, economic, and cultural activities. My geographical focus city is Johannesburg, which is one of the most fast-growing and promising cities in the region, and ranked top in receiving FDI and function as a decisive getaway for the rest of cities in the region. Furthermore, few of the existing researches take spatial variations into account when assessing the relationship. Whereas this research takes into account the geographical differences and spatial non-stationarity in modelling the impact of amenities on FDI.

The scientific significance of my research, therefore, would be to add knowledge to firm locations theories and urban amenity assessment. Moreover, the spatial analysis and comparisons of London and Johannesburg will further the understandings. The geographical focus and data analysing methods are unique. Maps along with explanations are shown to visualize the relationship. As Johannesburg is the gateway city of Africa, this research also aims to shed light for further research in emerging cities and economies.

The policy relevance of this research would be to help decision-makers understand the influence of insufficient and unmatched amenities on urban competitiveness, and therefore, to provide necessary services and regulations, and to enhance overall urban quality of life and competitiveness.

1.5 Scope and limitations

For general study, the scope will be 150 global cities in Global Urban Competitiveness Report. The general study analyses these cities' economic factor and "quality of life" environmental factors, and how these factors enhance urban competitiveness to attract FDI.

For the specific study, the geographic emphasis is on Johannesburg and London. This study focuses on inward FDI, and it is grouped into four sectors. The data used in this study are secondary data from reliable source, which could improve the reliability of the study.

However, the main limitations are the data unavailability. Some of the amenities data are unavailable such as the length of bikeway or sidewalk, which limit the scope of study and research findings. The missing data and information are to be fixed by introducing other available data source. The idea here is that the provided data have represented plenary and valid information in such a manner that results are reliable and valid.

Additionally, there exists a possible feedback-loop between cities' competitiveness and FDI inflow. It may be the case that more competitive cities attract more FDIs, but in return this may make them more competitive with respect to cities with less FDIs. This may raise endogeneity problems in empirical analysis, which needs to be carefully studied. Also, as our

dependent variable is urban competitiveness, which is proxied as FDI attraction, they are used interchangeably; simultaneity problem is also possible.

In the neighbourhood level analyses in London and Johannesburg, this research only limits at analysing neighbourhoods within the city boundary, and do not taken into consideration the surrounding neighbourhoods and its inter-city connections.

Another limitation is that this research only looks at urban competitiveness to attract FDI, and the other aspects of competitiveness is not covered, such as city's human capital competitiveness, the sustainability of city. These topics should be potential directions for future research.

Chapter 2: Literature Review

Overview

This chapter first discusses theories of urban competitiveness and its measurement indicators and methodology. Then presents the determinants of FDI locations and how FDI can work as an important proxy to urban competitiveness. Secondly, the definition of urban amenity and the demarcation will be given. Various classification and evaluation of urban amenities are provided based on a wide range of literatures. Thirdly, researches of the relationship between urban amenities and urban competitiveness to attract FDI will be presented and discussed. At the end of chapter, a conceptual framework incorporating relationships of concepts and theories will be given. Related concepts and theories are composed of the concept of urban competitiveness, FDI, urban amenities, quality of life and firm locations.

2.1 State of the art of theories/concepts

2.1.1 Urban competitiveness and its measurement

In the past two decades, urban competitiveness has been used to describe city's ability to leverage external economic advantages and internal organizational efficiency, to utilize resources to produce products and provide services, and to create the largest fortunes in an effective way and supply welfare to citizens in the process of competition, cooperation and development (Ni, 2012). Storper (1997) emphasizes the competitiveness as city's ability to attract firms and maintain quality of life for residents, in which he characterized as "place competitiveness". Based on that, Rogerson (1999) summarizes city competitiveness as a dynamic economic concept incorporating productivity, employment and standard of living. The definition of urban competitiveness is multidimensional, and it entails competition within different scales, either in city level, regional level or national scale (Wall, 2009). Therefore, urban competitiveness level can be used to explain why some cities are economically well off and more attractive to firms and people.

Traditionally, the notion of comparative advantage has been used rather than competitive advantage or competitiveness. Theories dates back to Ricardo (1817) and reframed by Heckscher (1919) and Ohlin (1924) stated that countries or regions with better factor endowments (land, labor, resource and capital) are advantaged comparing to those with less factors. The beginning incentives of trading profits are the relative difference of production technology and the resulted difference in relative cost. Therefore, nations should focus on producing and trading productions with comparative advantages to other nations, while importing the products of comparative disadvantage from other nations.

However, growing discussions have expressed the insufficient of comparative advantage theory to explain trade pattern, because factor endowments can be altered by governmental intervention (Kitson, Martin, et al., 2004). As the static implication behind the factor endowments argument is questioned, a new shifting paradigm of competitive advantage has therefore risen to mitigate (Martin, Kitson, et al., 2012). In competitive advantage theory, city's productivity and export-orientated firm agglomerations are key factors for urban competitiveness, and therefore export market share is used to measure competitiveness level. Michael Porter first initiates the study of competitiveness and puts forward the Diamond of National Advantage, which is a classic model for measuring competitiveness. Porter (1990)

argued that innovation and ability to absorb capacity are main determinants of national competitiveness. Furthermore, he summarized that national competitiveness is influenced by the four powers that encompass the "diamond system". As is shown in Figure 2.1, these four powers are firm strategy and rivalry, factor conditions, demand conditions, and related and supporting industries. Externally, governmental interventions indirectly affect national competitiveness through these four powers.

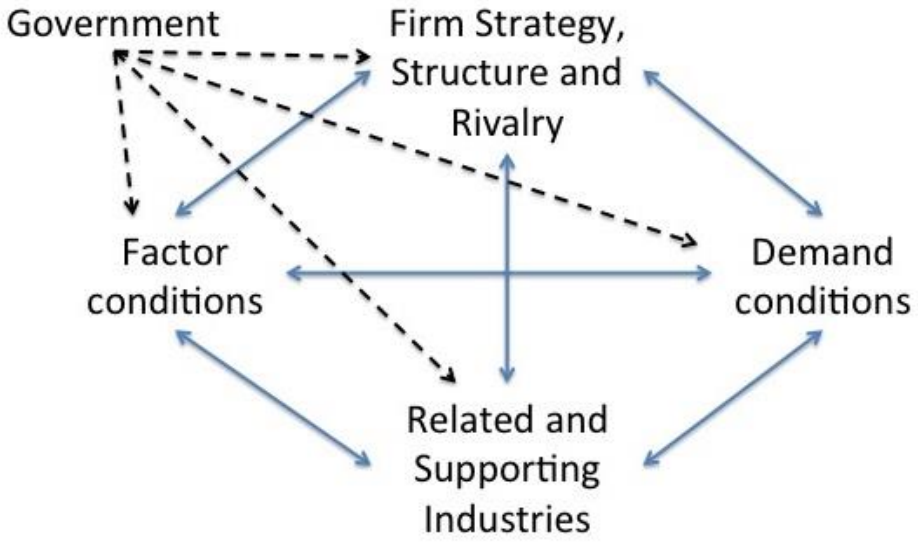

Figure 2. 1 Porter's Diamond Model for Competitive Advantage of Nations (based on Porter, 1990)

Based on Porter's competitive advantage theory, various scholars have built up econometric models to evaluate urban competitiveness. In literature, most scholars employ models based on weighted values of a number of economic and social indicators. Based on the growth of manufacturing value added, retail sales price, and business service sector salaries, Kresl and Singh (1995) introduced a model comprised of economic determinants and strategic determinants to calculate competitiveness rankings. The economic determinants are comprised of city's capacity of production, infrastructure, location, economic structure, and urban amenities. Whereas strategic determinants consist of governmental effectiveness, urban strategy, public-private sector cooperation, and institutional flexibility. Later Webster and Muller (2000) proposed four assessment categories to evaluate urban competitiveness. These four categories contain economic structure, territorial endowment, human resources, and institutional milieu. Notably, they take the effects of human resources and institutional setting into account. Later Martin and Sunley (2003) concluded the "hard" as well as "soft" urban qualities in explaining economic growth. They summarized six kinds of capitals that constitute the urban characteristics; they are productive capital, knowledge capital, infrastructural capital, cultural capital, human capital and social capital (see also Figure 1.1 in Chapter One). In particular, quality and skills of labor force (human capital), the presence of an innovative and creative class (knowledge/creative capital), and the scale and quality of public infrastructure (infrastructural capital) are emphasized. Similarly, Ni (2012) puts forward a model by utilizing data from 500 global cities to evaluate their competitiveness, and constructs the Urban Competitiveness Decision Mechanism, which consists of factor environment, industry system and value/profits analysis framework.

Most theoretical framework and indicator of competitiveness stress the importance of city's economic performance and living standard. Some indicators involve environmental

awareness and attractiveness to human capitals. However, there is no consistent established framework to measure city's competitiveness (Kitson, Martin, et al., 2004, Ni, 2012). Based on the perspective of global urban system and dynamic development, Ni (2012) emphasized the competitiveness as a relative concept and cities are competing in growth as well as trades efficiency. Measuring indicators have been developed from the output perspective including scale and efficiency of value creation, and growth speed. The following framework can be adopted when measuring comprehensive urban competitiveness:

$$UC=F\ (MS, ED, EE, TI, EG, DA)$$

In the above equation, UC stands for urban competitiveness, MS is the market share, ED refers to economic density, EE refers to economic efficiency, TI is technological innovation, EG refers to economic growth, and DA is the decision-making ability (Ni, 2012, p.22). Table 2.2 also summarizes the indicators utilized to assess comprehensive urban competitiveness level, these indicators reflect regional economic productivity and capacity of innovation and governance are critical factors for evaluating competitiveness.

Table 2. 1 Measuring Indicators for comprehensive competitiveness (based on Ni, 2012)

Objects	Indicators
Market share	GDP
Economic density	GDP per square kilometer
Economic efficiency	GDP per capita
Technological innovation	Patent applications per 10,000 people
Economic growth	Real GDP growth
Decision-making ability	Multinational Enterprise Index[1]

In the global urban competitiveness report of 2010, the individual city indicators are given (Ni and Kresl, 2010); Figure 2.2 summarizes the first-level indicators as the urban characteristics. *Enterprise quality* refers to the advantages and special nature of a city's wealth creators, the enterprises, and it incorporate aspects measuring enterprises' culture, management, operation and performance. *Industry structure* measures the ability for industrial structural adaptation and the level of specialization. *Human resources* attest the quality of workforce in terms of health, educational attainment, labor conditions and talents. *Hard environment* refers to factors of production such as natural resources, financial structure, technological infrastructure and market scale. *Soft environment* refers to legal system and culture, government regulation and supervision, planning and vision, policy and so on. *Living environment* is comprised of natural environment, residential quality, retail opportunities, culture and leisure, and safety. *Global connectivity* measures a city's participation in global competition, and its position among world cities, including locational conditions, transportation connectivity, information connectivity and enterprise connectivity (Ni and Kresl, 2010). In order to improve cities comprehensive competitiveness, policy-makers should focus on a sustainable and balanced development, and leverage their competitive advantages in all seven aspects. In applying these indicators to examine 500 global cities competitiveness, they found out that cities vary substantially in terms of growth rate, market structure and regulation. Western Europe and North American cities have highest

[1] Used to measure the city's force to control external factors and markets, counting the number of company headquarters in a city, its position within the global hierarchy and external connections.

competitiveness level while Chinese Cities are growing tremendously, however, some African cities continue to deteriorate.

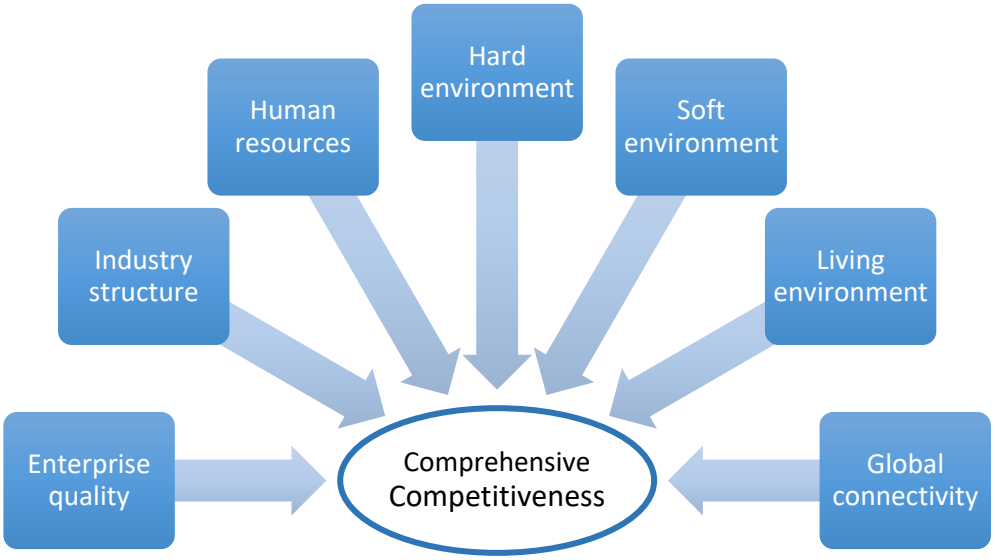

Figure 2. 2 Framework of the input of global urban competitiveness (based on Ni and Kresl, 2010)

In recent literature, scholars have shift from directly measuring competitiveness and urban factors to measuring the competition among various leagues of cities within the global city network. Wall (2009) viewed competitiveness measurement as analyzing the intensity of competition between cities based on inflows and outflows within the global city network. Based on the theoretical work by Gordon (1999), he introduced an indicator----urban niche, for estimating the degree of (economic) competition between cities, which is based on patterns of interaction (networks) between these cities. According to Wall (2009, pp.130-131), "the concept of the urban niche can be decomposed into two parts: 1) a geographic niche (its market area) and 2) a functional niche (its activities). When both the geographic and functional niches of cities overlap, cities are in competition because they have to share the same 'part of the pie.' " By utilizing relative Manhattan Distance method to measure distance or dissimilarity of cities, Wall (2009) measured the urban competition in advanced producer services in prominent global cities. He found out that cities are in competition to the extent that they are linked to the same other cities, pending similar functions. Later, Burger, v.d. Knaap and Wall (2012) developed the indicator to measure the competition between countries for investments based on the overlap of investment portfolios of regions, the overlapping aspects are constitute of: i) similar sectors of inward investment; ii) similar functions of inward investment and iii) overlap geographical origin of the investment. Using data in Greenfield investments between European regions, this revealed competition measurement method is applicable for measuring the intensity of competitions among cities and therefore, identifying city's competitors in attracting investment.

The competitiveness talk not only spurs tremendous research on factors influencing competition among cities, but also draws attentions from policy-makers worldwide since early 1990s, for example, U.S.A, U.K, Belgium, Italy, the Netherlands and Japan have set up national governmental affiliations targeting at enhancing overall competitiveness of their economy (Kitson, Martin, et al., 2004).

Nevertheless, urban and regional competitiveness has enjoyed its tremendous popularity from policy-makers, researchers and institutions, contemporary debates and doubts also questioned

its validity. Scholars argue that 'competitiveness' is an elusive concept with flawed indicators and over-prescribed policies. Moreover, there are both structural limits and negative consequences of excessive competition in limited adversarial market (Kitson, Martin, et al., 2004).

The urban competitiveness of attracting FDI

Since the trading era, cities are faced with multiple competitions, especially global cities, both externally (from other global cities) and internally (from domestic competitors). Cities enhance their competitiveness to attract firms, people, knowledge and investments; therefore, the attractiveness to FDI can be used to indicate urban competitiveness level. FDI is cross-border investment made by a firm to the receiver city or nation; it can work as a catalyst for economic growth as it brings in capital, jobs and knowledge (van't Hoff, 2013). The general incentives of FDI to locate in one specific place are to gain access to local markets, optimize production and maximize profits. A city's total FDI volume primarily indicates how integrated it is in the world economy (Wall, 2016).

There are mainly three types of FDI. First one is the green field FDI, which is the investments to build up new projects or subsidiary in receiver countries, and therefore has highest impact on urban regional development. Second type is the brown field investments, which is the redevelopment of existing locations, and the third one is the merger and acquisitions FDI, which consists of ownership transfers of existing facilities (Meyer and Estrin, 2001). The first two types of FDI involve capital investments, bring in new employment and knowledge for receiver countries, while the latter one only involves the change of owners within this location, therefore, its significance is less valuable (van't Hoff, 2013).

Multiple empirical studies have confirmed the positive relations between FDI and city competitiveness level. Using data on 500 global cities, Ni, Zhao and Wei (2013) confirmed that the degrees of connection with multinational companies and the number of patents are among the most influential factors to urban competitiveness. The empirical research proved strong positive correlation of FDI and innovation with city's competitiveness level. Therefore, it is crucial for countries and cities to foster innovation ability and seek for suitable foreign investments. Similarly, by using data of Chinese manufacturing from 2000 to 2014, the impact of FDI on international industrial competitiveness is analyzed by scholars. They adopt the co-integration test and error correction model, and the results show that FDI has a long-run equilibrium relationship with revealed comparative advantage index and international market share, and short-term change in FDI also has a significant impact on them. This indicates FDI is an important factor that affects the industrial international competitiveness (Yi and Bu, 2017).

Scholars also studied the urban characteristics that influences firm locations. There are basically four motives for FDI to locate. The first motive is to seek for access to natural resource; the second is seeking for new market; the third is seeking for maximizing efficiency and the fourth is seeking for strategic asset (Dunning, 1998). The strategic assets seeking motives are gaining more importance due to globalization and arise of new technology. Later the OLI paradigm was developed. This framework put forward that the internationalization and investments of an enterprise is out of: 1) Ownership advantages (O) in which firms exert market power based on transferable specific assets, for example, the ownership of products or production process; 2) Location advantages (L) in which firms value the non-transferable characteristics of a foreign location; 3) Internalization advantages (I) in which firms prioritize

to coordinate multiple economic activities internally rather than licensing or franchising (Dunning, 2001).

The ability of cities to attract FDI reflects local resource availability (Burger, van der Knaap, et al., 2012). Furthermore, different sectors of FDI locate themselves based on different local resources. Manufacturing sectors pre-dominantly seek for cheap labour and land. Resource extraction companies consider abundance of natural resources and convenient transportation as top preference, whereas hi-tech sector and R&D headquarters often requires agglomeration economies and specialized expertise. Therefore, regions should work on their resource specialty to attract targeted FDI.

The flow of FDI into Sub-Saharan Africa (SSA) grows tremendously in recent years as the MNEs seek to utilize the natural resources and expand their market shares. However, the FDI into poor countries are pre-dominantly resource-seeking and efficiency-seeking, in which MNEs relocate their production plants to the developing countries for reducing production costs and exporting to third markets (Wall, Burger, et al., 2011). In this context, it is notably that SSA is one of the developing regions highly attractive for manufacturing sectoral FDI, and only Johannesburg could be regarded as moderate contender to developed city in the world economy (Wall and Pajevic, 2013). Hence, Johannesburg is the focus or study, and the comparison with London leads to policy recommendations for future growth in Johannesburg.

2.1.2 Contemporary discourses surrounding urban amenities

2.1.2.1 The definition, benefits and evaluation of urban amenities

In urban economics, productivity and agglomeration economy are traditional focus when studying urban competitiveness. Economists have stressed the importance of locational factors such as firm clusters and infrastructure in production side of economy. However, the recent researches have shifted focus to people side. Cities are viewed as consumers' cities, and attractiveness for consumers to live and work is the key measurement in determining cities competitiveness (Glaeser, Kolko, et al., 2001). City growth depends not only on the agglomeration benefit and reduced production costs, but also upon urban amenities (Garretsen and Marlet, 2017). From the amenity literature, the flow of people is not decided by location of job opportunities, but it is instead the other way round, jobs are created in places with desired employees. Cities that provide superior natural amenities (like a pleasant climate or a livable physical environment) or high-quality man-made amenities (like a wide range of recreational goods and cultural services) are seen as amenity-rich cities (Glaeser, 2012). These cities offer high quality of life and often become the destinations of creative talents and hi-tech firms. Therefore, the relative importance of amenities should be recognized besides agglomeration effects in driving regional growth.

The term "urban amenities" is retrieved from economy studies, in which scholars view them as a special kind of goods. American geographer Ullman (1954) first proposes the idea that urban amenities are critical factor in driving regional growth, because amenities like climate and tourism sites attracts migrations, retirees, tourists, and footloose workers as well as firms and investments. From his observations in California, the influx of population and industry brought by amenities help boost local consumption and regional growth (Ullman, 1954). Urban amenity is a location-specific good, in which the consumptions of goods vary among different locations or "markets", hence, the provision of amenity is spatially diverse to meet

local needs (Diamond and Tolley, 2013). These location-specific amenities contain environmental goods such as public service, air quality, and streetscape. Moreover, ordinary goods such as restaurants can be incorporated into amenities when they are location-bound. Therefore, the access to location-specific goods should be conceptualized as an amenity. Table 2.2 summarized the urban amenities that have been discussed in general.

Table 2. 2 Summary of urban amenities (based on Clark, Lloyd, et.al., 2002)

Categories	Contents	
Natural Ambient Amenities	Climate, weather, humidity, temperature, water access, overall natural attractiveness.	
Environmental Resources	Rivers, lakes, wetlands, forests	
Human-Constructed Amenities	Cultural facilities	Cinemas, concert halls, libraries, museums, galleries, art center, research institutes, educational facilities etc.
	Recreational amenities	Restaurant, hotel, café, shopping centers, urban public parks, sports playgrounds, bicycle lanes, swimming pools etc.

Urban amenities can be classified into natural amenities and constructed amenities. Natural amenities such as air, weather, natural water that can be consumed by all, which has the characteristics of pure public goods. However, very few urban amenities are pure public goods, most of them are semi-public, for example, museums (Diamond and Tolley, 2013). Scholars also argue that public amenities are congestible public goods—that is, non-exclusive, but competitive after reaching a certain level of use (Iveson, 2007). As a public resource, there is scarcity when reaching public demands. The quality of urban public amenities actually represents the overall interests of the city. All types of urban activities are based on the use of urban public space resources, and inevitably result in infringement and pollution (Ren, 2007, Hewko, Smoyer-Tomic, et al., 2002).

Urban amenities are increasing recognized as determinants of residents' well being. Amenity sufficiency within a certain space is independent off the control from any individual choice, but there is always a human agent, i.e. governments, to supply the amenities in a given location. Enhancing the lives of citizens, via better infrastructures and living environments are increasingly recognized as critical factors in making cities attractive not only to citizens, but to investors and multinational firms (Florida, 2003, Clark, Lloyd, et al., 2002). Urban public amenities, such as public parks, are the main physical spaces where people experience the city. In accordance with the living needs of residents, various activities such as transportation, commercial transactions, performances, exhibitions, sports competitions, sports and fitness, leisure activities, sightseeing tours, holiday gatherings, and interpersonal interactions can be conducted using urban public amenities (Wu, Z. and Li, D., 2010). Urban amenities not only provide physical facilities for commuting, learning, interaction and relaxation in urban area, it helps prevent crime and mitigate segregation. Furthermore, the provision of sufficient amenities promote well being, enhance growth in social capital and revitalize the community, create sense of belonging within the community through either daily interactions or participating special events (Gaffikin, Mceldowney, et al., 2010, Mitchell, 1995).

General principles for analyzing urban amenities have not yet been formulated, and it is hard to measure urban amenities using single economic tools. Firstly, it is multi-dimensioned without the observable prices in the usual way. Secondly, it varied spatially in terms of both facilities and activities (Diamond and Tolley, 2013). Hence, the analysis should be incorporated into the larger urban setting with combining spatial dimension and dynamic evaluations.

Various scholars have evaluated the urban amenities from the user's perspective, for example, in order to assess the serviceability of the amenities, Oh and Jeong (2007) used the network analysis method of GIS, and analyzed the actual accessibility of pedestrians to urban parks in Seoul and the resulting rate of usages to them. Often a simply aggregated urban-level analysis is carried out to evaluate the amenities level; statistical methods include factor analysis and cluster analysis using software programs (Liu, 2008, Dong and Zhang, 2012). Since each individual weights urban amenities differently, a simply aggregated urban-level analysis only captures total effects shared among classes of individuals and firms (Clark, 2003). In the research of Leyden (2011) in assessing urban amenities and residents' wellbeing, the following indicators are taken into account:
1. Availability of public transportation;
2. Adequacy of shops, supermarkets, and department stores;
3. Accessibility of parks and sport facilities;
4. Accessibility to cultural and leisure activities such as movies, theaters, concert halls;
5. Availability of libraries, museums and other educational facilities.

In constructing indicator system to measure urban amenities, scholars generally focus on the following aspects (Ma, Li, et al., 2018, Wen, Cai, et al., 2014):
1) Natural amenities: average temperature in January and July; forest coverage and water body; greenery coverage and air quality.
2) Cultural amenities: number of museums, libraries, theaters, heritages, school and so on.
3) Service amenities: number of hotel, restaurant, café, shopping centers and so on.
4) Social amenities: average resident income, resident educational level, multi-ethnicity, percentage of gay couples and so on.

As discussed before, urban amenities are congestible public good with location-specificity; the modeling of those goods should take into account the spatial variation and accessibility. Gottlieb (1995) tests firm location using a sample of municipalities in northern New Jersey, and he grouped the independent variable into business variable and amenities variables. In the amenity side, however, the per capita governmental expenditures are employed to represent the amenity level, instead of the amenities numbers.

2.1.3 Urban amenities influence on city's competitiveness

Urban amenities to attract FDI

In firm location theory, the motto is still "location matters" in this current globalizing world. However, firms and investors are not only searching for the most effective location to their spring forth their production process, lower transport costs, or enlarge their input and output market. Firms are seeking for qualified business environment that enhances their global connectivity, their company image, the productivity of their employees, and the possible knowledge spill-overs and innovation with other firms (van't Hoff, 2013).

Traditionally, the determinants of firm location consist of factors such as land cost, transportation cost, natural resources, and proximity to product market or human resources. However, with the shift of post-industrialization and technology-oriented development path, modern firms in certain sectors are more footloose and indifferent to these traditional determinants. Industries with a wide range of profitable locations tend to seek out high-amenity areas in an attempt to recruit and retain creative workforce (Gottlieb, 1994). However, in the new technology era, urban amenities are a new driving force because high-quality amenities attract talents and firms. Meanwhile, high-quality amenities can be strategic assets for city marketing, and therefore enhance city competitiveness to attract FDI (Wen, Lin, et al., 2016). As amenities are defined as location-specific, non-exportable goods or services, urban amenities benefit enterprises employees in their role as residents or commuters, their families alike. Therefore, the impacts from amenities to investment locations are indirect; the amenities impact on the agglomeration of creative talents and managerial elite directly and affect the decision for firms to locate (Gottlieb, 1994, Florida, 2003). Gottlieb (1995) argues that amenities influence firm locations and he tests this reduced form of firm location using a sample of municipalities in northern New Jersey. The spatial weight of amenities and employee residency is taken into account, and the results show that firms value certain amenities with respect to the residential locations of their employees.

Scale of economy is frequently used to explain firm location, however, for emerging new industries such as urban cultural industries and innovative industries, the theory of agglomeration economy has been challenged. In an industrial cluster, companies bring in innovation through cooperation and competition, and realize scale of economy. It is generally believed to be the main reason for urban industrial agglomeration (Gordon, 1999). However, this view is based on the traditional manufacturing industry, with the emerging cultural industries and innovative industries, quality of life factors such as amenities has gained importance. Florida (2003) believes that the reason for industrial agglomeration is that urban amenity attracts clusters of innovative people. Wenting et al. (2011) further validated Florida's theory by studying the Dutch fashion design enterprise cluster. In their study, based on questionnaire and interviews conducted to CEOs of Amsterdam fashion companies, they found that fashion design impresarios weigh urban amenities more important than agglomeration economies for their location decision.

Economists and urban policy analysts have started to recognize the importance of amenities as a major cause of urban economic development and population growth in urban life. For example, Clark and co-authors (2002) employed city of Chicago as an example to illustrate how the political structure and consumption pattern have led the production and management of cities to fit into the globalization needs. They argue the urban amenities are becoming driving forces to urban growth. The post-industrial city should go beyond economic objective, but extend to make a city a livable and pleasant place by enhance a distinctive urban life style and improve neighborhood amenities. The implication here is to encourage spending rather than merely earning. Glaeser (2000a) stresses non-market transactions like crime, education, and beautification. Other research seeks to measure these processes using national urban data and analysts report substantial impacts of many different amenities from high quality restaurants to bicycle paths on development, population growth, and high-tech jobs (Florida, 2000, 2002; Glaeser et al., 2000).

At the heart of amenity literature is the spatial equilibrium condition, in which firms decide their locations by minimizing a unit cost function. In choosing their optimal location,

minimize their cost and if the cost of location *j* is lower than that to be gained at their present location *i*, these firms locate from *i* to *j*. A spatial equilibrium is reached, when firms have become indifferent between locations in terms of the cost by each location(Glaeser and Gottlieb, 2009). In that, Glaeser and Gottlieb (2009) stipulate two major elements for firms to make locational decision, one is the urban productivity premium, and the second is the urban amenity premium. The urban productivity premium incorporate ideas of agglomeration economy and knowledge spillover effects, it looks at city's economic characteristics that influencing productivity. Whereas the amenity premium capture the utility of amenities, which can be positive or negative as there could be high/low crime rate or good/bad public services (Garretsen and Marlet, 2017).

Quality of life has become part of the city's competitiveness pillars. It has become important factors for firms to consider locating their business (Gottlieb, 1994). According to Abarabanel (2000, p. 45), "people can live and work almost anywhere, as communications technology increases the capacity to connect. A place to live is no longer driven by the headquarters of a company. So, quality of life and creating a high-quality environment in which to live, work, and raise a family increasingly is a key competitive issue in attracting people to the city." Using data in manufacturing and service sectors in Seoul Metropolitan Area, scholars studies the traditional factors and quality of life factors in firms relocation decision. It turns out that, quality of life factors such as access to cultural experiences; leisure facilities have become important factors influencing firm relocation, especially in service sector (An, Kang, et al., 2014). The reasons behind are suggested as growing service-oriented economies, an increasing number of employees with higher degrees, and a huge influence of these employees in the firm location decision process. Yet, amenity is a key factor to affect quality of life because they are what make some places attractive or not for living and working.

Urban amenities to attract talents

Many researches demonstrated that urban amenities have been increasingly emerging as a new key factor, replacing income disparity, for attracting populations over the past few decades. Clark, Lloyd and Wong (2002) argue that the role of public facilities including schools, church, and social organizations are becoming less important while consumption amenities such as entertainment and recreational facilities are gaining importance. Provision of lifestyle amenities has become a key feature of urban development that we must recognize conceptually. Chinese scholars led by Wen also argue urban amenities as a new strategy to explain urban competitiveness (Wen, Cai, et al., 2014, Wen, Lin, et al., 2016, Zhang, 2017, Ma, Li, et al., 2018). They evaluate the urban amenity of major cities in China, and analyze the correlation between urban amenity and net migration as well as talents migration. The results show that while there is a strong positive correlation between urban amenity and migration in general, the correlation between urban amenity and talent in-migration is stronger. Therefore, amenity is a critical factor for cities to attract talents, and thereafter affect cities innovation capacity and overall competitiveness (Wen, Lin, et al., 2016).

In cities' attempts to attract higher-income residents, tourists, capital, and businesses, having a number of remarkable buildings and events is not sufficient, the public facilities which facilitates these building spaces and activities are also important in the decisions of the creative people (Florida, 2003). The spatial clustering of firms, meanwhile, is the result of amenities that attract creative people, as these amenities create a tolerant social atmosphere and enhance ethic and cultural diversity. Cities invest in public amenities to enhance their

city's 'look and feel', which can play a significant role in city marketing by constructing a positive image of the city and the lifestyle within it that is being promoted. The public realm is thus increasingly seen as a weapon in the arsenal of urban competition for human and capitals (De Magalha˜es & Carmona, 2006). More recently, Garretsen and Marlet (2017) use an extensive set of amenity data on neighbourhood level of Dutch cities, and try to find out if amenity level significantly affect households decision to migrate. This empirical study takes into account the quality and proximity of amenities into account, and found out that Dutch cities with a favourable distance to work and a variety of urban amenities appear to be the most attractive locations for people to live in.

Ni and Kamiya, et al.(2017) advance that in the firms' decision making process, the crucial elements are to attract and retain labour. Especially workers in hi-tech sector, they have more discretionary time to devote into work or leisure. Therefore, the need for sufficient amenities is relatively huge; these amenities include urban recreation sites, cultural and educational facilities, urban parks, health care, pleasant housing, and public transportation. Not only the workers, but also their families, need the amenities. Hence, firms in these sectors establish facilities or head-offices in these amenity-rich cities. According to Shapiro (2006, p. 330), "cities with greater concentrations of human capital experience more rapid growth in employment". Therefore, the growth effects from amenities to urban competitiveness are indirect but is sufficient supported by scholars and their researches.

2.2 Summary of literature review

In a fast-developing world with cities competing for desired capital and people, the concept of urban competitiveness best highlights region's ability to compete with others in efficiently capturing the market value, create profits, as well as supplying welfare to citizens. In the process, firms and their activities pose huge impact on city and its demographics. Firms locate in pursuit of minimizing cost and maximizing profits. Traditionally, factors influencing firm locations are more of hard urban qualities such as land rents and transportations. However, with the rise of service-oriented sectors and highly educated workforce, the soft location factors such as quality of life and rich amenities are gaining importance.

As firms are seeking for qualified locations to invest, cities are working on their competitiveness by enhancing a set of urban qualities. While some researchers measure urban competitiveness by assessing city's economic performance, innovation capacity and social-institutional quality (Ni and Kresl, 2010, Ni, 2012, Martin and Sunley, 2003, Martin, Kitson, et al., 2012), others shift from measuring urban factors to measuring the competition among various leagues of cities within the global city network (Wall, 2009, Wall and Knaap, 2011, Burger, van der Knaap, et al., 2012). Most theoretical frameworks and indicators of competitiveness stress the importance of city's economic performance and quality of life, these two qualities are in line with what investors seek for locating their firms. On the one hand, firms seek for locations with better urban qualities and high competitiveness, on the other hand, cities strive for enhance their competitiveness in attracting investments in desired sectors. Therefore, as FDI is firms with highest mobility, and based on Wall (2009), (2012) and Yi and Bu (2017) recent empirical research on the impact of FDI on industrial competitiveness, the city's ability to attract FDI can act as a reliable reflection on region competitiveness. Therefore, the research will use inward FDI counts and values as dependent variable in reflecting urban competitiveness level.

Scholars have researched on factors driving urban growth, and Figure 2.3 summarized three models successively in explaining urban growth. The first traditional model are based on theorists from neoliberalism perspective, the traditional factor endowment leads to agglomeration and economic growth, therefore people follow jobs and population increase in cities. However, the second model emphasize on the importance of human capital since highly trained workforce are key for innovation, and hi-tech and service sector are the oriented trend for urban sustainable development. The third model, led by Glaeser (2009, 2012, 2001), Clark (2003, 2002, 2001) and Florida (2008, 2003), puts urban amenity in critical position in driving urban growth. As the city is becoming consumer-centered, the service-oriented economy is expanding; therefore rich amenities are necessary for future growth. Moreover, amenity-rich cities with high quality of life is the destination for creative class and talent people, which is the pre-condition for the second human capital growth model. Hence, urban amenities are a critical yet under-recognized factor in attracting talents, investors and firms.

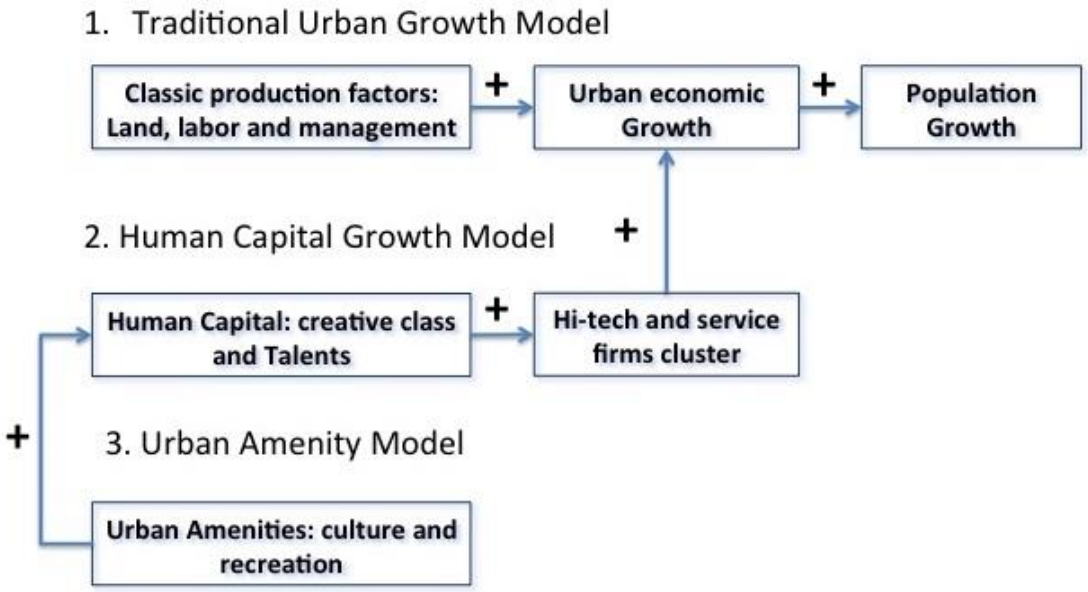

Figure 2. 3 Three successive models of urban growth (based on Wen, Lin, et al., 2016, Florida, Mellander, et al., 2008)

2.3 Conceptual framework

The conceptual framework incorporates the main research concepts and relations in this study. The main independent variable is the soft urban amenity that represents city's quality of life, and the dependent variable is the city's competitiveness to attract FDI as indicated in the framework below. The urban amenities consist of natural amenities, environmental resources and human-constructed amenity. The human-constructed urban amenity is grouped into cultural amenities and recreational amenities based on literature review (see also Table 2.3). All of these amenities level reflect the liveability of the city, and influence quality of life for employees and their family as the residents. Therefore, the effects are direct from urban amenities to attract people, especially talents. Urban amenities to attract firms are indirect through many mediating factors such as city marketing. The debate of whether people follow jobs (firms), or firms follow people has not yet reached a consensus. Based on literature, the effects are either way. Nevertheless, firms and people together constitutes the essential component of the "urban competitiveness" concept, as Storper (1997, p.20) summarized urban competitiveness is "the ability of an economy to attract and maintain firms with stable or rising market shares in an activity while maintaining or increasing standards of living for those who participate in it". In reflecting competitiveness level, the ability to attract FDI is employed to measure it based on literature. Moreover, FDI are categorized into four different sectors so as to better capture the sectoral differences and spatial variation of amenity influence. The conceptual framework of this study is shown as in Figure 2.4 below.

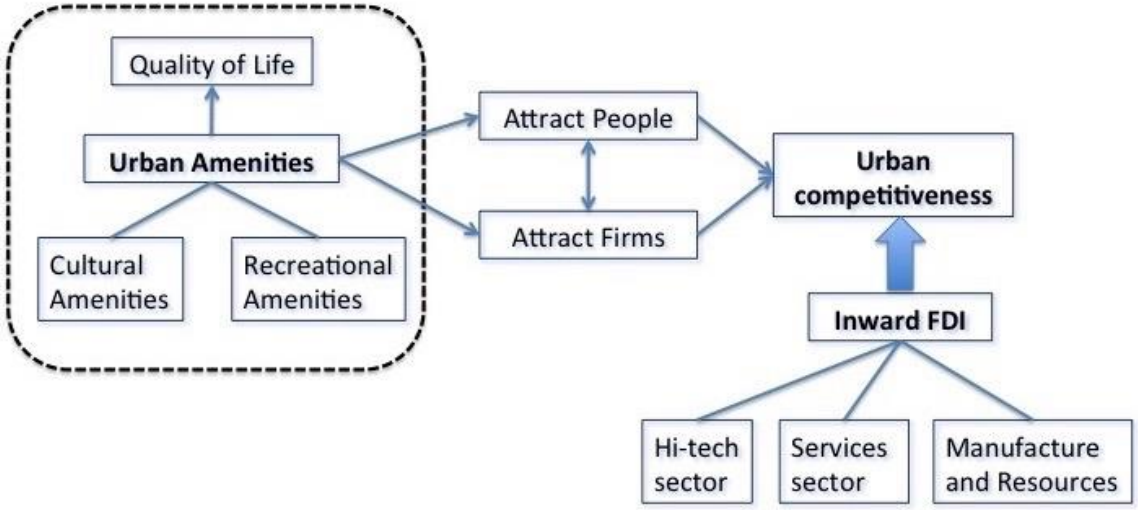

Figure 2. 4 Conceptual Framework (Source: Author, 2018)

Chapter 3: Research Design and Methods

3.1 Revised research question

After the completion of the literature review and theoretical framework, my research aims to determine the relationship of urban amenities and city's competitiveness in attracting FDIs, therefore, the research question can be reformulated as:

To what extent do variations in the provision of urban amenities affect urban competitiveness in attracting FDI, with reference to Johannesburg and London?

To answer the main research question, the following sub-questions will be used.

General study:

1. Based on a large sample of global cities, does "soft" urban qualities significantly affect city's FDI competitiveness, while controlling for "hard" economic variables?

Specific study:

2. Based on detailed GIS data at the neighborhood level in Johannesburg and London, to what degree do soft urban amenities affect FDI density, while controlling for other community characteristics?

3.2 Operationalization: variables and indicators

The dependent Y-variable in the research is the amount of inward FDI. To make the research and forthcoming policy recommendations more specific and feasible, the FDI are grouped into four sectors, they are: resources, manufacturing, services and hi-tech. Inward FDI is investment from multinational companies to the receiver country for building up a new subsidiary or redevelopment of existing locations.

The urban amenity level is the focused X variable; however, there are other factors that could affect firm location and inward FDIs, and these factors should be included as control variables in the regression model. Based on Martin and Sunley's (2003) framework on "hard" and "soft" urban qualities, related variables and indicators will be operationalized.

This research entails a general study and an in-depth spatial study on Johannesburg to answer research questions. The general research will be based on 150 global cities in Global Urban Competitiveness report. The general study aims at testing how "quality of life" amenities attract FDI values. The 150 cities are all global cities with high competitiveness level and can show differences across countries and continents. The specific analysis will look into amenities and other urban characteristics on neighborhood level in Johannesburg and London, and analyze relationship between amenities and FDI attractiveness. Accordingly, the operationalization contains two parts.

3.2.1 General city-level analysis

Cross-sectional analysis of 150 global cities

For this part of analysis, the research is carried out in city level and will operationalize variables based on previous studies (An, Kang, et al., 2014, Ni, 2012, Martin and Sunley, 2003).

The independent variables would be divided into "hard" location factor and "soft" quality of life amenities. Based on the Martin and Sunley's (2003) framework on "hard" and "soft" urban qualities (see Figure 1.1 in Chapter 1), the "hard" locational factors include productivity capital, infrastructural capital, human capital and knowledge capital. Data for these indicators come from Global Urban Competitiveness Report (GUCR) by Ni and Kresl (2010). Although these data are published in 2010, we perceive the urban characteristics are held to be constant in certain period of time and can influence the FDI before and after one certain year. Also, a traditional trade to GDP ratio is included to reflect trade openness factor. The data for this indicator is acquired from World Bank database, and it only contains country level data, therefore, cities are assigned with country level value for trade openness indicator. In line with GUCR indicators, trade openness value is also taken from 2010 for valid estimation.

Dependent variable is the average FDI values from 2006-2016, as the data used for independent variables are from the year 2010. The detailed operationalization of variables and indicators are included in Table 3.1 and Table 3.2.

Table 3. 1 Dependent variables for cross-sectional analysis

Name	Description	Source
FDI values	Average FDI values from 2006-2016	FDI markets

Table 3. 2 Independent variables for cross-sectional analysis

Categories	Dimensions	Indicators	Description	Source
Traditional "Hard" locational factors	Productivity capital	- Total GDP - Real Economic Growth Rate (5 Years) - Industry Structure	Real values and index score	GUCR
	Infrastructural capital	- Transportation (land, air and water)	Index score	GUCR
	Human capital	- Employment Rate - Status of talents	Real values and index score	GUCR
	Knowledge capital	- Ability for Innovation	Index score	GUCR
	Trade openness (country)	- The ratio of trade to GDP	Real values	World Bank Data
"Soft" quality of life factors	Natural and environmental	- Natural Environment	Index score	GUCR

	amenities			
	Cultural and recreational facilities	- Shopping environment - Dining and restaurant - Culture and entertainment	Index score	GUCR
	Social institutional capital	- Social management	Index score	GUCR

3.2.2 Neighbourhood level analysis on Johannesburg and London

The main objective for this part is to assess how urban amenities level influences inward FDI in city of Johannesburg and London, taking into consideration the spatial heterogeneity. The dependent variables are FDI density within each neighborhood (see also Table 3.3). The FDI density is calculated via ArcGIS, which divides the total number of existing FDI by the area of the neighborhood. Higher FDI density represents higher neighborhoods' FDI competitiveness.

The urban amenity as the main independent variable is divided into two types according to literature review (see Table 3.4). Due to data unavailability, only two sorts of cultural amenities are analysed, whereas six of recreational amenities can be fully studied. Either number or Density of the amenity is included in regression. The size of urban parks is also included to capture the impact of public space as a recreational amenity.

Table 3. 3 Dependent variables for neighbourhood level analysis

Name	Source	Explanation	Data type
Total FDI density	FDI market	Total existing FDI number from 2003-2016 divided by the area of the neighborhood	Number

Table 3. 4 Independent variable - Urban amenity

Concept	Indicators	Source
Cultural amenities	-Number of education facilities: university, school, library -Number of art centres and museums	OSM
Recreational amenities	-Density of amusement project: zoo, theme parks, cinemas, and so on. -Density of shops: mall, supermarket, electronics, bakery etc. -Number of playgrounds -Density of lodging facilities: motels, hotels and etc. -Density of eatery facilities: restaurant, kiosk, café, bar, fast-food etc. -Size of urban parks	OSM

As urban amenity is the main independent variable that being analysed in this research, there are other variables that could affect urban competitiveness to attract FDI. Based on literature, these variables related to local infrastructure and economic productivity (An, Kang, et al., 2014, Ni and Kresl, 2010), they should be included in the regression model as control variables. The control variables are summarized in Table 3-5.

Table 3. 5 Neighbourhood-level control variables

Name	Indicator	Source
Other Neighbourhood characteristics	- Population density - Annual income - Percentage of bachelor degree holders	Eurostat
Local competition	- Number of local companies - Local company turnover	Orbis
Infrastructure	- Road length - Number of banks - Density of bus stops	OSM (Calculated by ArcGIS)

3.3 Research strategy

This research uses secondary data that contain information to analyse and answer the research questions; desk research is an efficient and cost-effective strategy without interfering the research objects. The units and variables to study are massive. Therefore, desk research will be my main research strategy. Primarily, three software programs are involved, they are: statistical analysis using Stata, spatial analysis using ArcGIS. Table 3.6 summarizes the specific types of analysis, involved software programs, preliminary results for each research question.

Table 3. 6 Summary of desk research strategy

Research questions	Type	Software program	Results
General study and	Descriptive analysis	Excel	Statistical graphs
	Explanatory analysis	Stata	Statistical graphs and Stata outputs
Specific study	Explanatory analysis	Stata, ArcGIS	Statistical graphs, Stata outputs and maps
	Spatial descriptive analysis	ArcGIS	Maps

3.4 Data collection methods

The data analyzed in this study are primarily secondary data that come from various authorized databases. The FDI data are mainly from financial times FDI markets data, and the Greenfield FDI is the main research focus. The city-level indicators come from Global Urban Competitiveness Report (Ni and Kresl, 2010); they are all index scores for 150 major global cities, calculated using multiple sub-indicators. Apart from that, the trade openness data comes from World Bank. As for the neighborhood level analysis on Johannesburg and London, their urban amenities data are mostly downloaded from Open Street Maps (OSM). It contains substantive information in regards to urban physical amenities. The amenities data are taken from the year 2016, and they are all cross-sectional data. The data sources mentioned above are reliable and have been tested in many previous researches.

3.5 Data analysis methods

Part A City-level regression analysis

For this cross-sectional analysis, the Ordinary Least Square (OLS) estimation will be adopted to identify significant urban qualities influencing FDI attractions. As the dependent variable is continuous data, using OLS in a linear regression framework to estimate is adequate for answering the research question, the following regression equation can illustrate the model:

$$y_i = \beta_0 + \sum_k \beta_\kappa x_{ik} + \varepsilon_i$$

Where y_i is the estimated value of the dependent variable for city i, β_0 is the intercept, β_k is the parameter estimate for variable k, x_{ik} is the value of the k^{th} variable for i, and ε_i is the error term.

The main concern is to check all the pre-conditions for OLS model, including multi-collinearity, normality of residuals, Heteroskedasticity test and so on. OLS without assumptions test could lead to unreliable and invalid results, and therefore, these tests should be carefully addressed and reported in the analysis.

Part B Descriptive analysis on spatial distribution of urban amenities and FDI

For specific study in Johannesburg and London, descriptive analysis of urban amenities and FDI distribution is required to better understand the spatial variations before inferential analysis.

Results: **1) Spatial distribution of productivity and recreational amenities in Johannesburg and London;** **2) Statistical characteristics and spatial distribution of total FDI and sectoral FDI.**			
Subject	Software	Method	Results
Spatial distribution of amenities	ArcGIS	Classified symbology; Kernel density	Variation of provision of amenities
Statistical characteristics of FDI	Excel	Trend analysis	Percentage of FDI in different sectors by city
Spatial distribution of FDI	ArcGIS	Classified symbology; Kernel density	Cluster of FDI in various sectors by city

The simple classified symbology method will be used to illustrate the distribution variations. Using distinctive colours or differentiated symbols, the spatial differences can be presented at length.

The ArcGIS Spatial Analyst extension offers rich methods for analyzing spatial characteristics. The density analysis shows spatial concentration or dispersion. The kernel density tool calculates the density of features in a neighbourhood around those features. The algorithm used to determine the default search radius, also known as the bandwidth, is as follows:

$$Search\ Radius = 0.9 * min(SD, \sqrt{\frac{1}{ln(2)}} * D_m) * n^{-0.2}$$

where *SD* is the standard distance, D_m is the median distance, *n* is the number of points if no population field is used, or if a population field is supplied, *n* is the sum of the population field values (Esri, 2018a). Theoretically, a smoothly curved surface is fitted over each point. The surface value is highest at the location of the point and diminishes when distances increase from the point, reaching zero at the Search radius distance from the point. Calculating a default radius generally avoids the "ring around the points" phenomenon that often resulted from sparse datasets.

In this research, kernel density tools are employed to illustrate the distribution pattern of FDI count and values. For FDI count, each point is viewed as equal value; therefore, the population field should be set as NONE. For FDI value, each point is weighted with FDI capital, so the population field will be FDI value. Kernel Density tool can calculate the density of FDI count and value in each output raster cell (Silverman, 2018).

Part C Neighbourhood level analysis on Johannesburg and London

For neighbourhood level analysis within one city, the geographically weighted regression (GWR) will be employed to assess spatial non-stationarity. Different types of urban amenities can have various level of influence on the FDI locations; therefore, GWR is the ideal model to capture spatial heterogeneity. Unlike OLS, which generate one global regression equation to summarize relationships between the explanatory and dependent variables, GWR "generates spatial data that express the spatial variation in the relationships among variables", namely, it generates one local equation for a certain observation based on the estimation in a certain bandwidth range (Mennis, 2006, pp. 171-172). Using GWR estimator allows for the variation of dependence over space to be reflected in the variation of local parameters. It addresses the problem of heterogeneity of the model parameters by running regressions based on their location. GWR results are estimations in one point and are determined by other observations based on the location in the geographic space (Chrostek and Kopczewska, 2013). Each GWR equation can be formulated as:

$$y_i = \beta_0 (u_i, v_i) + \sum_k \beta_k (u_i, v_i) x_{ik} + \varepsilon_i$$

where (u_i, v_i) represents the coordinate location of *i*, therefore, captures the spatial dimension. The parameters β are as follows (Fotheringham and Brunsdon, 1999):

Since the regression equation is calculated separately for each neighborhood in this research, a separate parameter estimate, t-value, and goodness-of-fit is calculated for each as well.

Hence, we can map the different level of influence spatially, as Mennis (2006, p.172) summarize, "allowing the analyst to visually interpret the spatial distribution of the nature and strength of the relationships among explanatory and dependent variables". With GWR, the last research question can be answered at length.

Global Moran's Index tool is used to assess overall patterns of clustering or dispersion processes based on feature locations and attribute values nearby. It evaluates whether the input pattern is clustered, dispersed, or random. Moran's Index will be calculated as well as the *z* score and p-value to assess the significance of that Index (Esri, 2018a). The Moran's Index statistic for spatial autocorrelation is as follows:

$$I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{m} W_{ij}\ (X_i-\bar{X})\ \ (X_j-\bar{X})}{S^2 \sum_{i=1}^{n}\sum_{j=1}^{m} W_{ij}}$$

Where: X_i, X_j signify the investment number received by neighbourhood *i* and *j*. W_{ij} denotes the weight between feature *i* and *j; n* equals to the total number of observations, and S^2 is the aggregate spatial weights (Esri, 2018a, Jiang, 2014).

In this research, Global Moran's Index tool is deployed for testing the distribution of residuals in both OLS and GWR estimations. The desired distribution of residuals is random or dispersed, which will be elaborated more in Chapter 4.

3.6 Validity and reliability

The data all come from reliable source, which can greatly enhance the reliability of results. Since those are all secondary data collected for different research purposes, therefore, the data will be cleaned as well as examined carefully, and remove outliers where necessary. As illustrated in data analysis methods section, multiple indicators will be employed to capture a certain variable.

For analysis using OLS models, the several tests will be carried out to ensure valid results:
1) Skewness of dependent variable;
2) Remove significant outliers;
3) Test for multi-collinearity and drop similar independent variables;
4) Check for heteroskedasticity of the residuals;
5) Check for omitted variables bias.

For analysis using GWR models, a conventional OLS model will be constructed first, and the above tests will be carried out to ensure the validity. Meanwhile, statistical diagnostics and estimated parameters of OLS and GWR models will be compared to choose proper model with better performance.

Finally, relevant reports on Johannesburg will be used for data triangulation purposes. To ensure the policy recommendations for Johannesburg is valid and feasible, not only the analysis results but also cities' broader socio-economic conditions would be studied and related.

Chapter 4 Research Findings

4.1 General city-level analysis

The sampled 150 cities are derived from the Global Urban Competitiveness Report (GUCR), and are selected based on a number of criteria. Firstly, these cities are prestigious and influential with extensive human resource, capital and technology capabilities. Secondly, these cities are economic, political and cultural centers in their respective countries and regions, with the most dynamic business activities, information flows and knowledge-based innovations. Thirdly, the economic and social development paths of these cities are typical and representative. And most importantly, the chosen cities have reliable and detailed data available, as well as relevant citing studies for referencing (Ni and Kresl, 2010). The list of all the 150 cities will be displayed in Annex 2. The data are index scores calculated by GUCR, therefore, most of them are standardized from 0-1 with high validity and reliability.

4.1.1 Descriptive features of FDI values and amenities in sampled cities

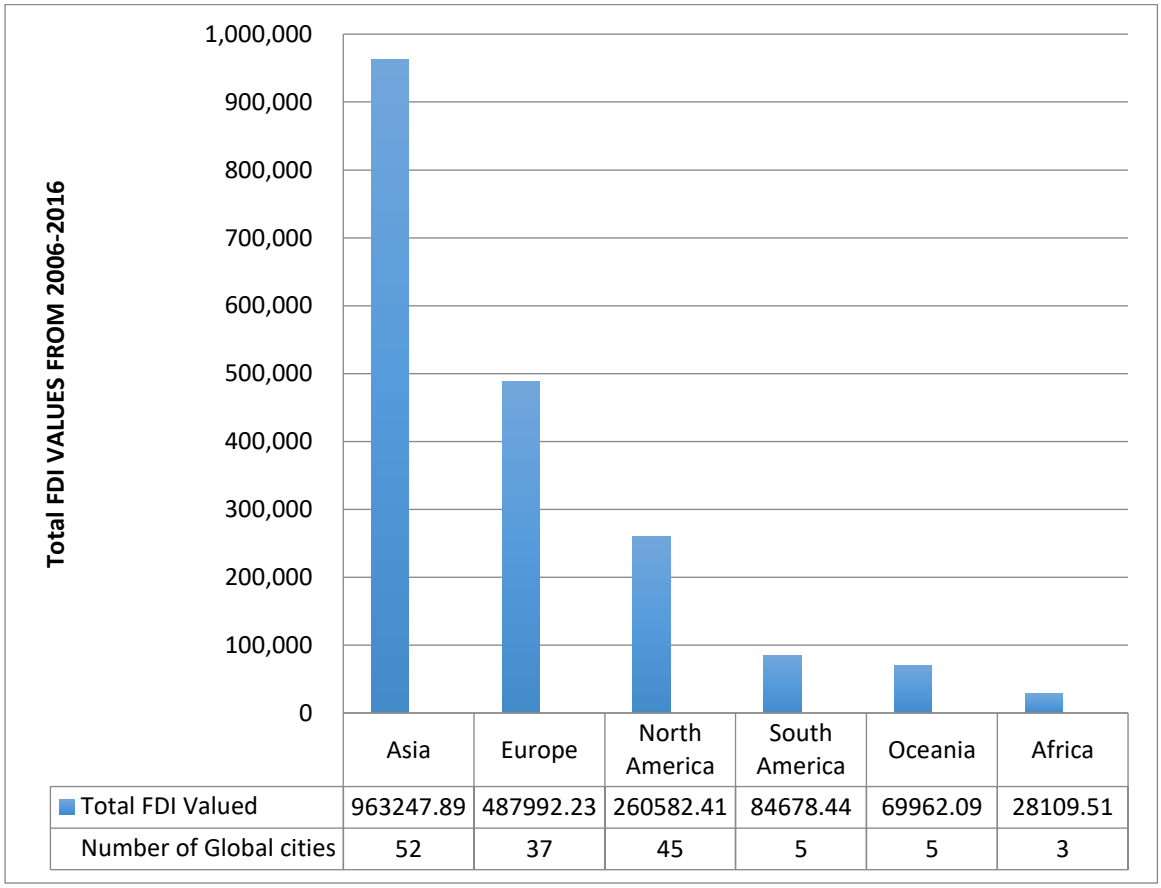

Chart 4. 1 Total FDI values by continent from 2006-2016 (US Dollar)
(Source: author elaborated based on FDI market data)

Overall, more than 90% of the GUCR global cities are in Asian, Europe and North America, and these three continents constitutes almost 90% of FDI values. The divide between global north and global south is evident where 90% of the competitive cities are situated in the global north. Asia is growing fast, with the largest number of competitive global cities, which attract FDI values almost twice as much as the global cities in Europe, as seen in Chart 4.1.

On the contrary, South America, Oceania and Africa had only 13 top global cities that were recognized in GUCR. In Africa, the three cities are Cairo, Johannesburg and Cape Town, they altogether occupy small portion of global inward FDI in the past eleven years. Given their relative lower position in global economic hierarchy, these cities need to enhance their competitiveness performance. All in all, these 150 cities are representative for inferential analysis.

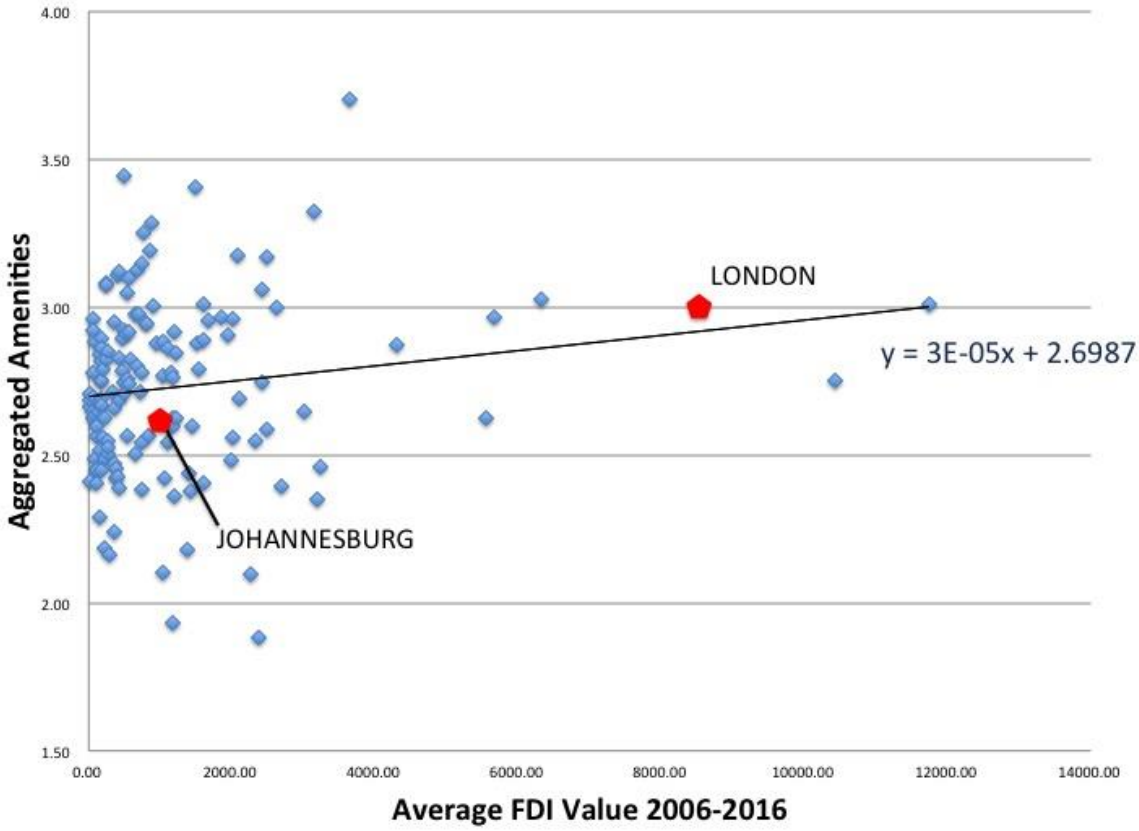

Chart 4. 2 Scatterplot of aggregated amenities and average FDI value of 150 cities
(Source: author elaborated based on FDI market data)

The amenity levels and FDI values in 150 cities are plotted in Chart 4.2. The scatters of FDI values indicate that most cities have an average FDI value less than $3000, and only a few cities such as London and New York possess extremely high FDI values. A pyramidal distribution of world cities is evident on the Chart, where majority of cities are clustered at the bottom and only a small number of cities at the top with exceptional resources and power. The amenities levels are aggregated from four GUCR indices, i.e. Natural Environment, Shopping Environment, Dining and Restaurant, Cultural and Entertainment. The trend line and estimated formula in the chart shows a strong positive relationship between the FDI value and the amenity level.

London is higher up the curve with remarkably larger average FDI value ($8522) and a higher amenity level, compared to Johannesburg ($1034). As Johannesburg's largest FDI source city, London is clearly more competitive and developed in amenity provision. Hence, London sets as a good role model for city of Johannesburg; and therefore, the focus will be on a comparison of these two cities in the following studies.

4.1.2 Correlation and assumption tests for OLS estimations

Before conducting analysis in econometrics model, the distribution of variables and correlation coefficients are explored. As mentioned before, most indicators in GUCR are indexed from 0 to 1, therefore, the Pearson correlation coefficients column reveal that the correlation relationship is not that for amenities (see Table 4.1). Nevertheless, the correlations are strong for the traditional "hard" factors and FDI value, such as GDP, trade openness, real economic growth rate. For OLS, several tests need to be carried out to enhance validity and reliability of the result; the detailed graphs are shown in Annex 3.

Table 4. 1 Descriptive statistics and correlation coefficients of variables

Descriptive statistics	Variable	Observations	Correlation Coefficient	Mean	Standard Deviation	Min	Max
Traditional "hard" factors	GDP	150	0.366	0.093	0.147	0.004	1
	Trade to GDP ratio (Country)	145	0.345	60.336	50.725	24.574	371.71
	Real Economic growth rate	150	0.342	0.291	0.170	0.121	0.767
	Industry Structure	150	0.307	0.518	0.125	0.302	1
	Water Transportation	150	0.245	0.197	0.233	0	1
	Airtransport (log)	140	0.206	-2.239	1.066	-6.215	0
	Employment rate	150	0.119	0.907	0.059	0.591	1
	Status of Talent	150	-0.065	0.387	0.201	0.043	1
	Ability for innovation	150	0.043	0.517	0.150	0.282	1
	Social Management	150	0.043	0.731	0.170	0.4	1
"Soft" amenity factors	Natural Environment	150	0.172	0.722	0.139	0.359	1
	Shopping Environment	150	0.084	0.749	0.118	0.239	1
	Dining and Restaurant	150	0	0.804	0.104	0.435	1
	Culture Entertainment	150	0.1070	0.461	0.118	0.19	1
Dependent Variables	Average FDI value 2006-2016 (Log)	144	1.00	6.340	1.331	1.907	9.371

Skewness of the dependent variable. For dependent variables, the average FDI from 2006-2016 is highly skewed to the right, indicating a larger number of sampled cities have lower average FDI value, therefore, the logarithm has been taken for this variable; from which the

data is more normally distributed. The situation is the same for the variable “Air transportation”.

Remove outliers in the model. In Stata, the Cook’s distance command can be applied to measure distances of real value to fitted value, therefore, it can be used to remove significant outliers that may bias the results. In the model, after computing the command, 8 cities are removed from the sample. Including previous 17 cities that contain missing values, the sample size is reduced to 125 cities.

Multicollinearity test. After fitting a linear regression model, the variance-inflation factors (VIF) are calculated to quantify the severity of multicollinearity. Large VIF value (>7.5) indicates redundancy among explanatory variables(Esri, 2018a). As summarized in Table 4.2, the VIF of variables shows no significant multicollinearity issue among variables.

Heteroscedasticity test. One of the assumptions of OLS estimation requires that the error term should be homoscedastic. After running the regression, the Stata command of Breusch-Pagan/Cook-Weisberg test is employed. The null hypothesis is that the residuals (representative of error term) hold constant variance. The results indicate that null hypothesis cannot be rejected; therefore, the model is homoscedastic (see Annex 3).

Normality of residuals. Using the Stata, the residuals are predicted, graphed and compared with the normal distribution. In this OLS model, the normality of residuals is evident so OLS model is appropriate for modeling the desired relationship (see Figure 4.1).

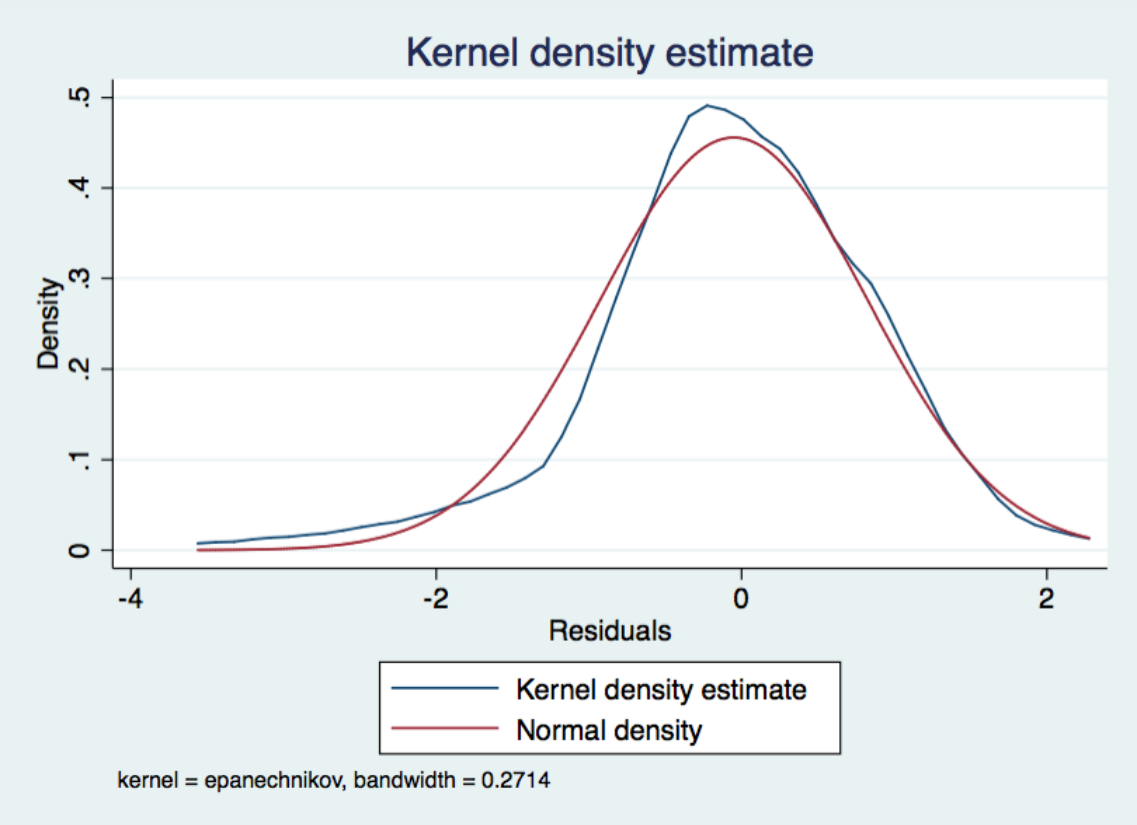

Figure 4. 1 Kernel density estimates of residuals in OLS estimation

Omitted variables issues. In this analysis, Ramsey RESET test is employed to test if model has omitted variables, the null hypothesis is that model has no omitted variables. However,

the result shows that the probability (F value) is 0.0096, by which the null hypothesis is not rejected. In future research, we need to mitigate for this omitted variable limitation.

Brief discussions on possible endogeneity. The endogeneity test is to check the direction of causality between independent and dependent variables. As is discussed before in Chapter One, one of the limitations of this research is the possible simultaneity issue. As the data are cross-sectional, the proposed specification exists a possible feedback-loop between cities' qualities and FDI inflow. For example, the city's GDP and innovation ability might be developing simultaneously. This may raise endogeneity in statistical analysis, which needs to be addressed in future research. Possible solutions could be to add a lagged explanatory variable as additional regressor to eliminate simultaneity. When this autoregressive of lagged variable is put in the regression, it often has large significant coefficient and improves the model. However, including this regressor could lead to insignificancy of the remaining variables, or their coefficients collapse to implausibly small. Occasionally, wrong sign of coefficients could occur for some substantive variables (Achen, 2000). Nevertheless, this research aims at determining the relationship between FDI attractiveness and "hard" and "soft" urban qualities. The interpretations of OLS results express more of correlation rather than causality due to the above unresolved simultaneity issue. Moreover, the later GWR estimation in detailed neighbourhood level would reveal more information and characteristics to explain the variations.

4.1.3 Results of OLS analysis

Table 4. 2 Summary of OLS model

Dependent Variable	Average FDI values 2006-2016	Coef.	T-statistics	VIF
"Hard" locational factors	Real Economic Growth Rate	4.753***	7.07	2.73
	GDP	1.167*	1.69	2.61
	Industry Structure	3.655***	2.87	5.49
	Water Transportation	0.817***	2.40	1.39
	Air transportation	0.239**	2.47	2.35
	Employment Rate	-0.795	-0.62	1.22
	Status of Talent	-0.236	-0.43	2.54
	Trade to GDP ratio (country)	0.008***	4.12	1.74
	Ability for Innovation	0.164	0.20	3.41
	Social Management	-0.832	-1.22	3.04
"Soft" amenities factors	Natural Environment	0.472	0.85	1.32
	Shopping Environment	1.359*	1.85	1.66
	Dining and Restaurant	-0.336	-0.45	1.28
	Culture and Entertainment	0.851	1.34	1.34
No. of Obs =125	125			

F(14, 110)	13.68	
Prob > F	0.0000***	
R-squared	0.6352	
Adj R-squared	0.5888	

*** p<0.01, ** p<0.05, * p<0.1

After performing assumption tests, the final model summary is presented in Table 4.2. The Joint-F statistics is significant at 0.01 confidence level; therefore, the overall modelled relationship has statistical significance. R-square is 0.6352, indicating that 63.52% of the variation in dependent variable can be explained by the model. Therefore, the model has high explanatory power. The adjusted R-square is 0.5888. Seven variables are significant at a minimum of 0.1 significance level.

Traditional "hard" factors, such as industry structure, infrastructure, trade openness, are still leading factors for FDI competitiveness. The variables *Real Economic Growth Rate, Industry Structure, Water Transportation, Trade openness (country)* are significant at 0.01 significance level. They represent the productivity capital, infrastructural capital, and trade openness dimension of cities, which are all conventional "hard" qualities identified by previous studies(Martin and Sunley, 2003, Ni and Kresl, 2010, Martin, Kitson, et al., 2012). Their coefficients are all positive, indicating a progressive relationship among these factors and FDI competitiveness. The variable with highest coefficient is the Real economic growth rate, indicating it has strongest impact in this model. Its coefficient is 4.753, which means that 1 unit rise of real economic growth rate could result in 4.753% rise in city's average FDI value. Therefore, traditional "hard" factors are still dominant factors in attracting FDI.

Besides traditional "hard" factors, "soft" amenity factors are also affecting FDI attractiveness. As the variable *Shopping Environment* is significant at a 0.1 significance level, and the coefficient is positive, which indicates that shopping amenities in the city has significant positive effect on inward FDI value. Although other "soft" amenity variables, such as *Culture and Entertainment*, are not significant in this model, their coefficients are positive, indicating their emerging positive influence on FDI competitiveness. Overall, the relationships of urban amenities and FDI attractiveness are visible in city level; therefore, it is necessary to analyse in depth to further identify the relationship.

4.2 In-depth neighbourhood level analysis

4.2.1 Descriptive analysis on urban amenities and FDIs

4.2.1.1 FDI spatial distributions in Johannesburg and London

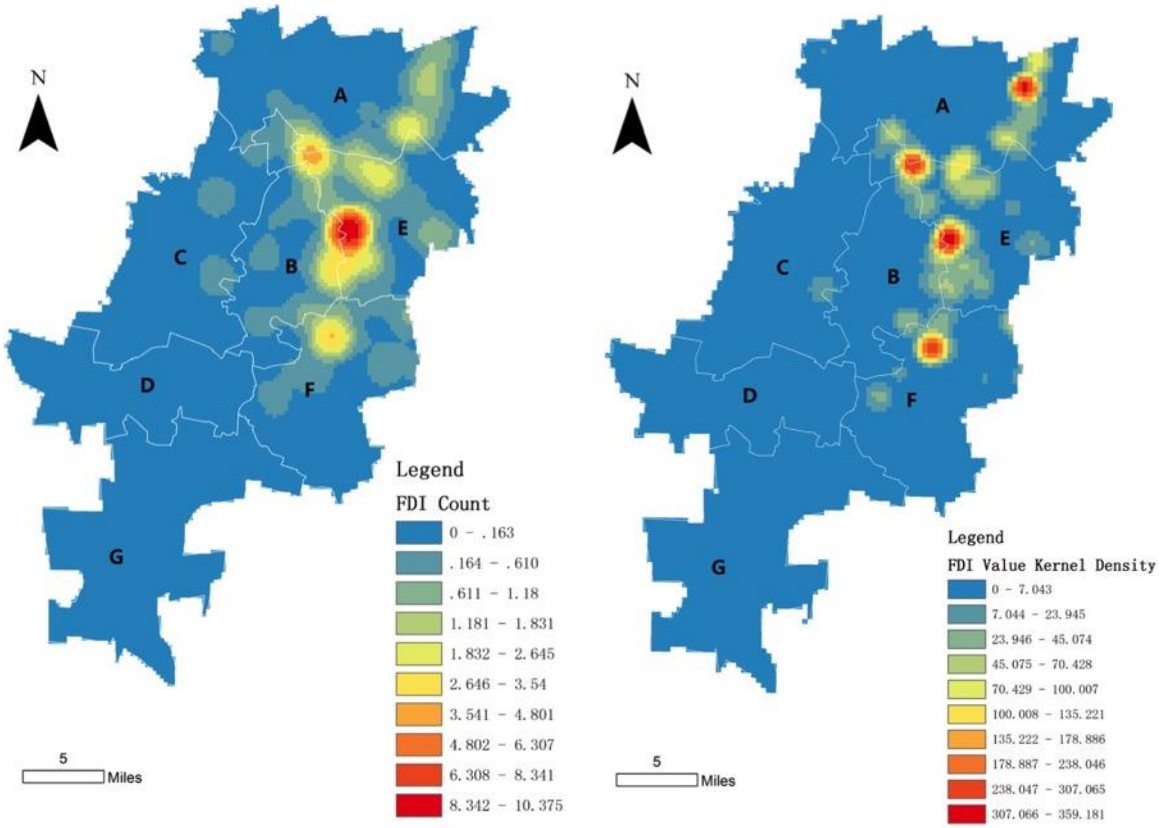

Figure 4. 2 Kernel Density maps of FDI count (left) and FDI value (right) in Johannesburg
Red: Most FDI density Blue: Least FDI density

The kernel density maps are calculated by weighing the distances of all the data points. The maps above display the weighted density, and demonstrate the 'hottest' or densest to 'coolest' or least dense regions for FDI count and value (Figure 4.2) The blue represents low density for FDI count and values, while red areas are where FDI count and values are highly clustered. The FDI distributions are highly uneven in Johannesburg, because 90 out of 135 neighborhoods have zero FDI.

From the maps, the spatial pattern of FDI count and values demonstrate the spatial disparity of northern and southern neighborhoods in Johannesburg. The total FDI count in Johannesburg is 462, with the most concentrated area in Johannesburg northern neighborhoods. The agglomeration of FDI count is evident in the left map, while FDI values forms several investment concentrations. From south to north, these concentrations are Johannesburg Central Business District (CBD), Rosebank, Sandton and Midrand. They form an investment corridor in the northern affluent district. However, the poor neighborhoods in the south, such as Soweto, receive zero FDI. It is evident that FDI locates unevenly not only in global and national scale, but also within city level.

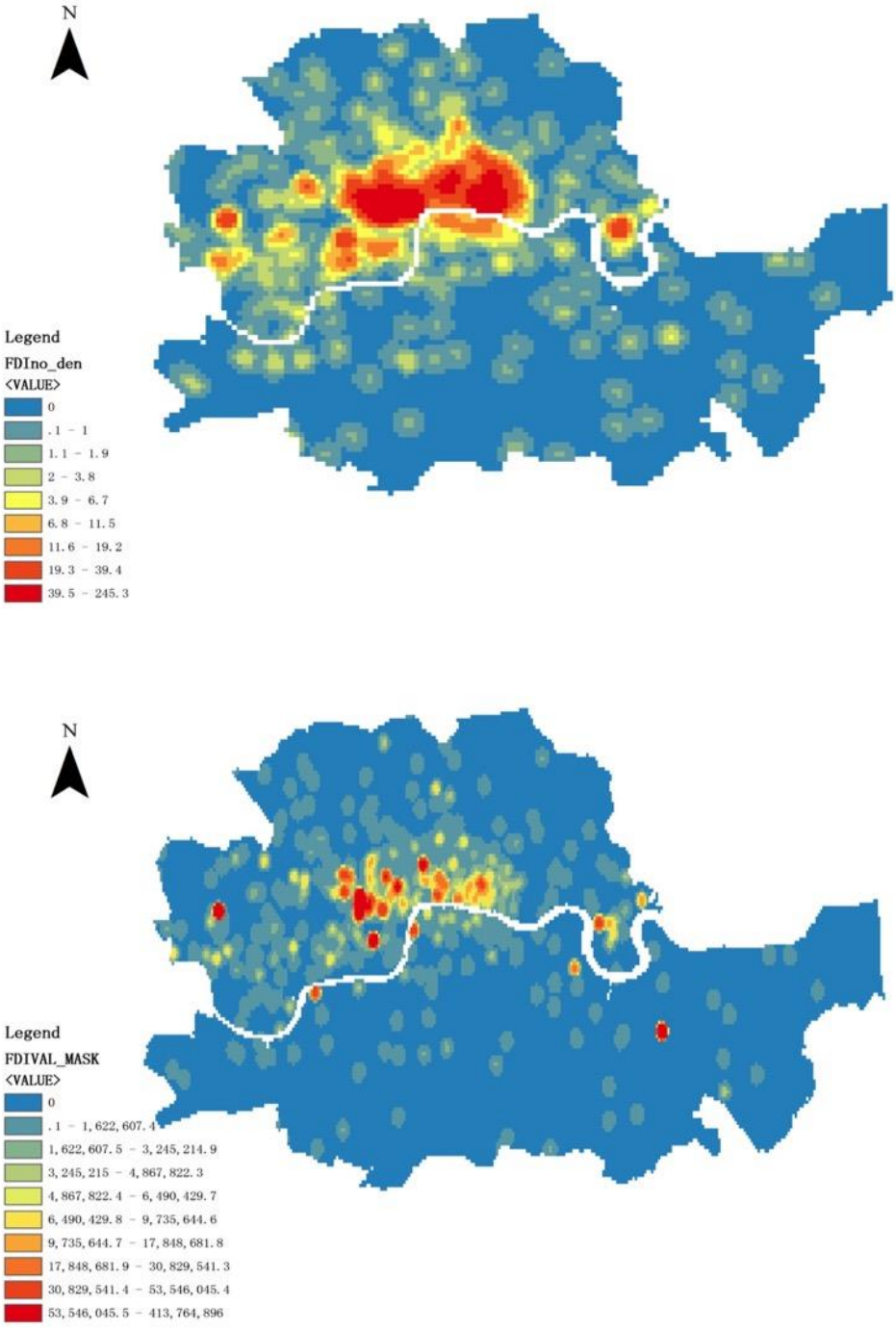

Figure 4. 3 Kernel Density maps of FDI count (above) and FDI value (below) in London

In London, FDI spreads unevenly throughout the city. Similar to Johannesburg, the red areas in the maps are concentrations of FDI count and value. In London, 181 out of 356 neighborhoods have zero FDI. However, London has a total of 2295 FDI, nearly five times higher than Johannesburg; this reveals the significant FDI competitiveness gap between both cities. Spatially, FDI are more clustered and have evident red peaks in London. These red peaks are FDI concentrated in the downtown area, especially around River Thames and Hyde Park (see Figure 4.3), whereas city periphery has low or even zero FDI.

4.2.1.2 FDI in different sectors

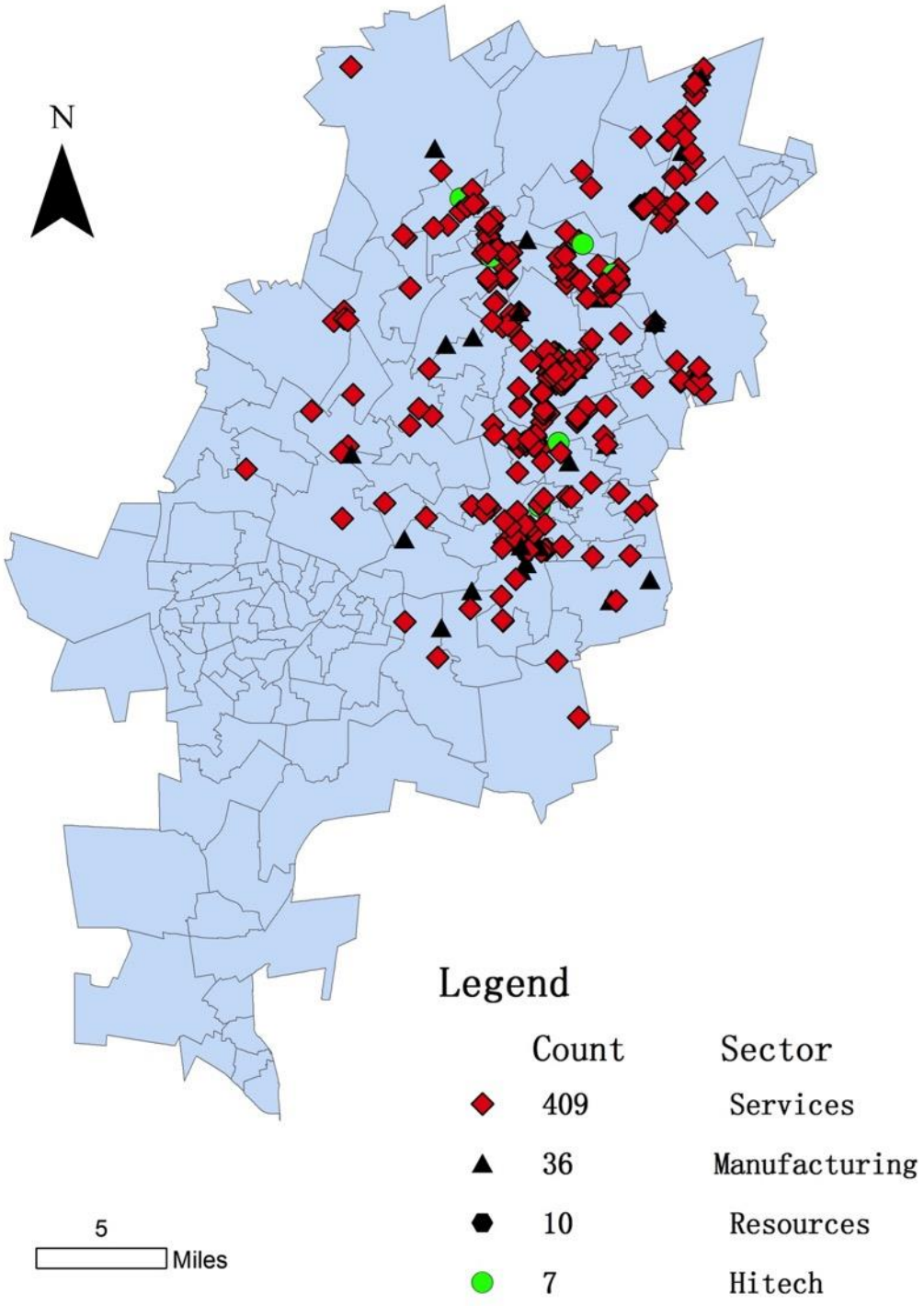

Figure 4. 4 Sectoral FDI distribution

In ArcGIS, the different symbols are created to distinguish sectoral FDI (see Figure 4.4). According to the legend, service FDI accounts for 88.5% of total FDI (409 out of 463). The manufacturing and resource FDIs are mainly situated outside CBD or main business district. And only 7 FDI companies are in hi-tech sector. As service and hi-tech are two important sectors for sustainable development, they occupy the main business district with well-connected transportation and form complementary corridors with each other. Nevertheless, the investment is diverse in Johannesburg, and characterized as a strong modern services sector economy, especially in finance and business services industry.

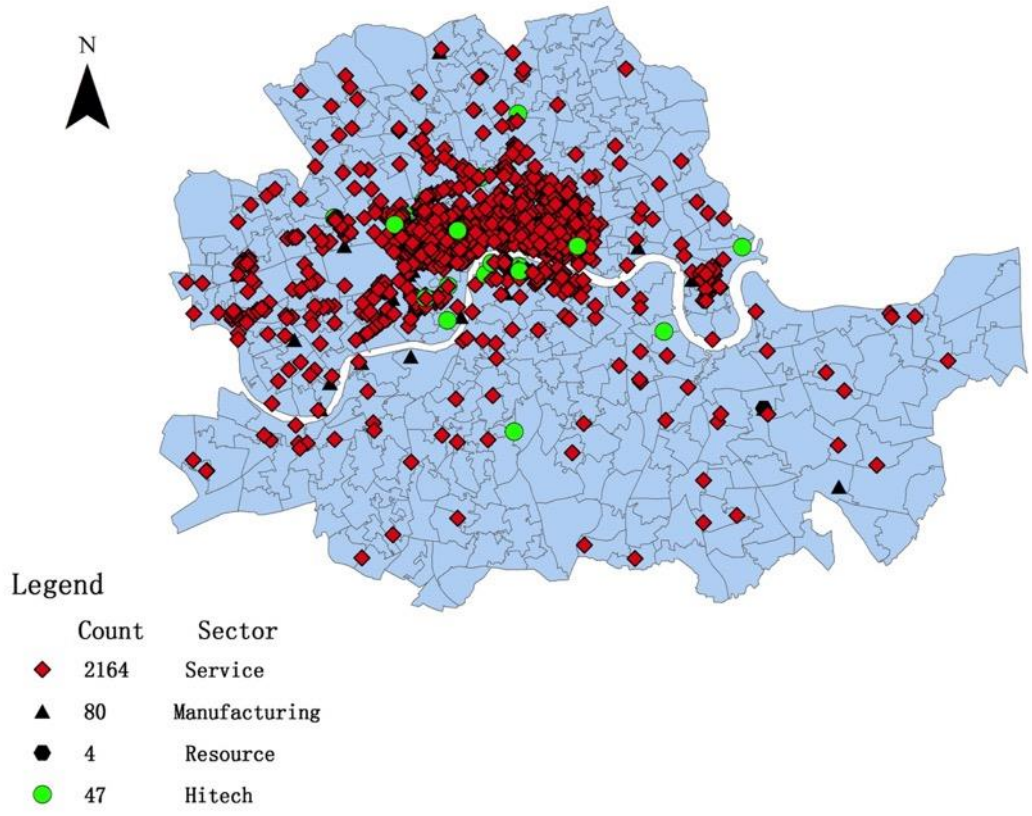

Figure 4. 5 Sectoral FDI in London

In London, service FDI is the dominant sector accounting for nearly 95% of the total FDI count (see Figure 4.5). Comparing to Johannesburg, hi-tech FDI count is notably higher in London, indicating London's high competitiveness to attract knowledge-intensive industry. Only 4 FDI companies are in resource extraction sector. Service FDIs are unevenly spreading all around the city; the main concentrations are in the northern bank of River Thames. The distributions of hi-tech FDI are more dispersed, as they are foot-loose when locating firms. As a mono-centric city, London's city core and periphery are highly unequally developed, whereas in Johannesburg, the outstanding development disparity is between the north and the south.

4.2.1.3 Urban amenities provision in two cities

This section describes the numbers of cultural and recreational amenities and their spatial distribution pattern in Johannesburg and London. Cultural amenities include arts center, museums, schools and library. Recreational amenities include playgrounds, shops, amusement parks, restaurants, zoos and so on. The maps break in quantiles methods in ArcGIS, therefore, we can distinguish the top 20% neighborhoods that are in high-amenities areas (red) and least 20% neighborhoods with lower-amenities or even zero-amenities (blue).

In Johannesburg, the amenities distribution shows evident inequality, where northern neighborhoods have twice the number of amenities than that in the southern neighborhoods (see Figure 4.6). Some neighborhoods in the south have little amenities. This pattern

resembles the FDI distribution; therefore, the economic activity and urban amenities are highly uneven but spatially associated across the city.

Comparing with the population density map (see Figure 4.7), the southwestern area is the most populated area with some areas having more than 10,000 people per square kilometer. However, the amenities level in these areas is relative lower than average; the spatial mismatch of amenities and population are identified in the region. The spatial concentration of deprivation needs to be corrected for sustainable future development.

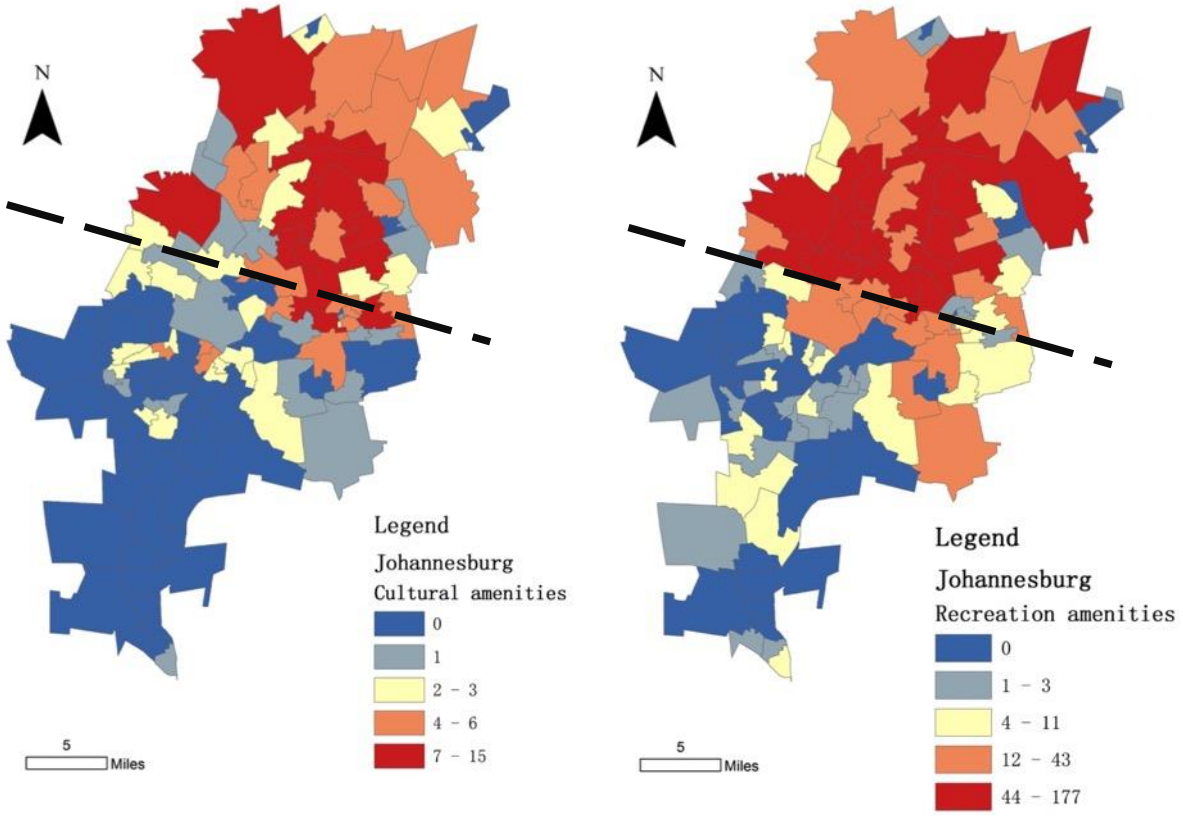

Figure 4. 6 Distribution of Cultural (left) and Recreational (right) amenities

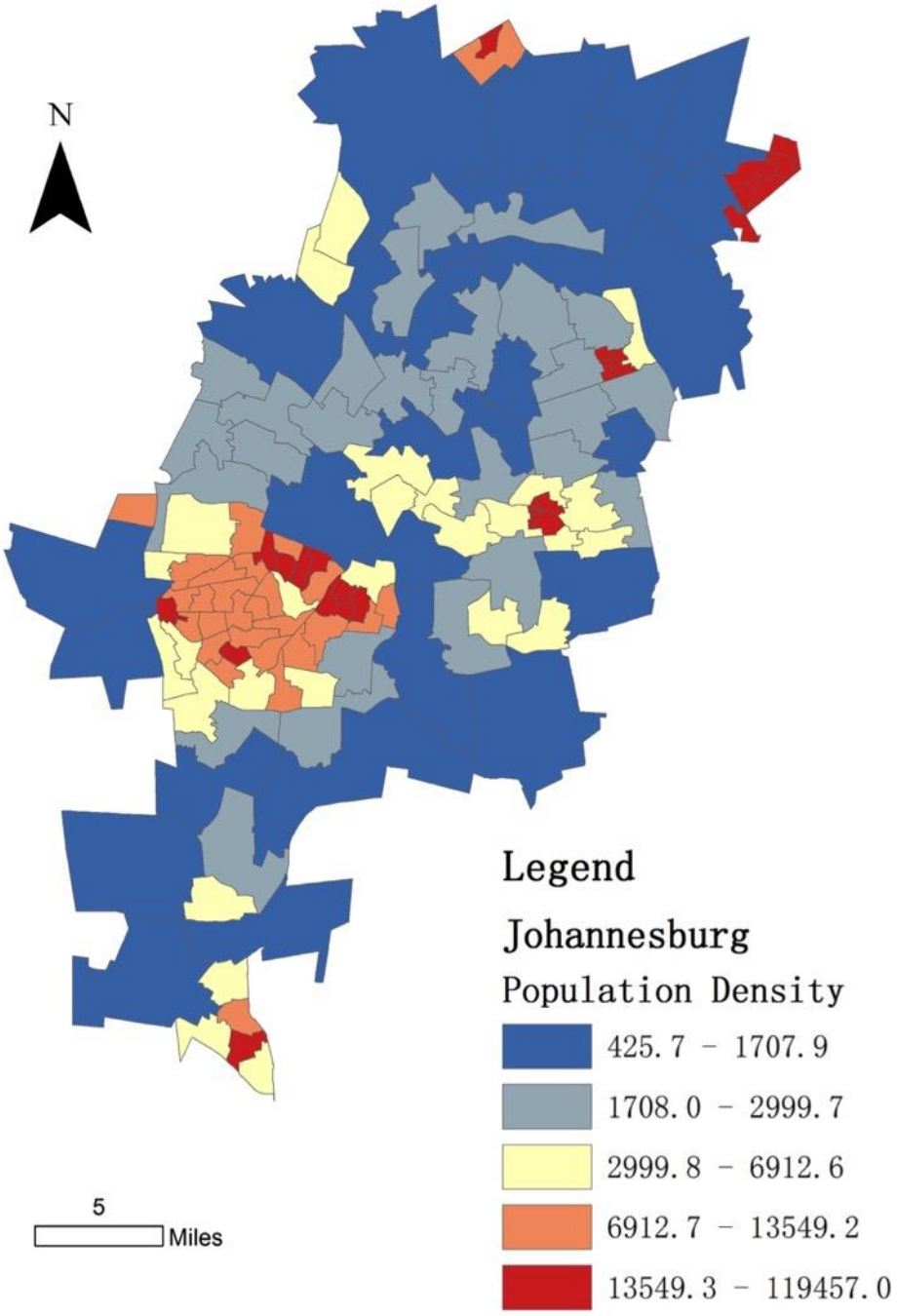

Figure 4. 7 Population Density in Johannesburg

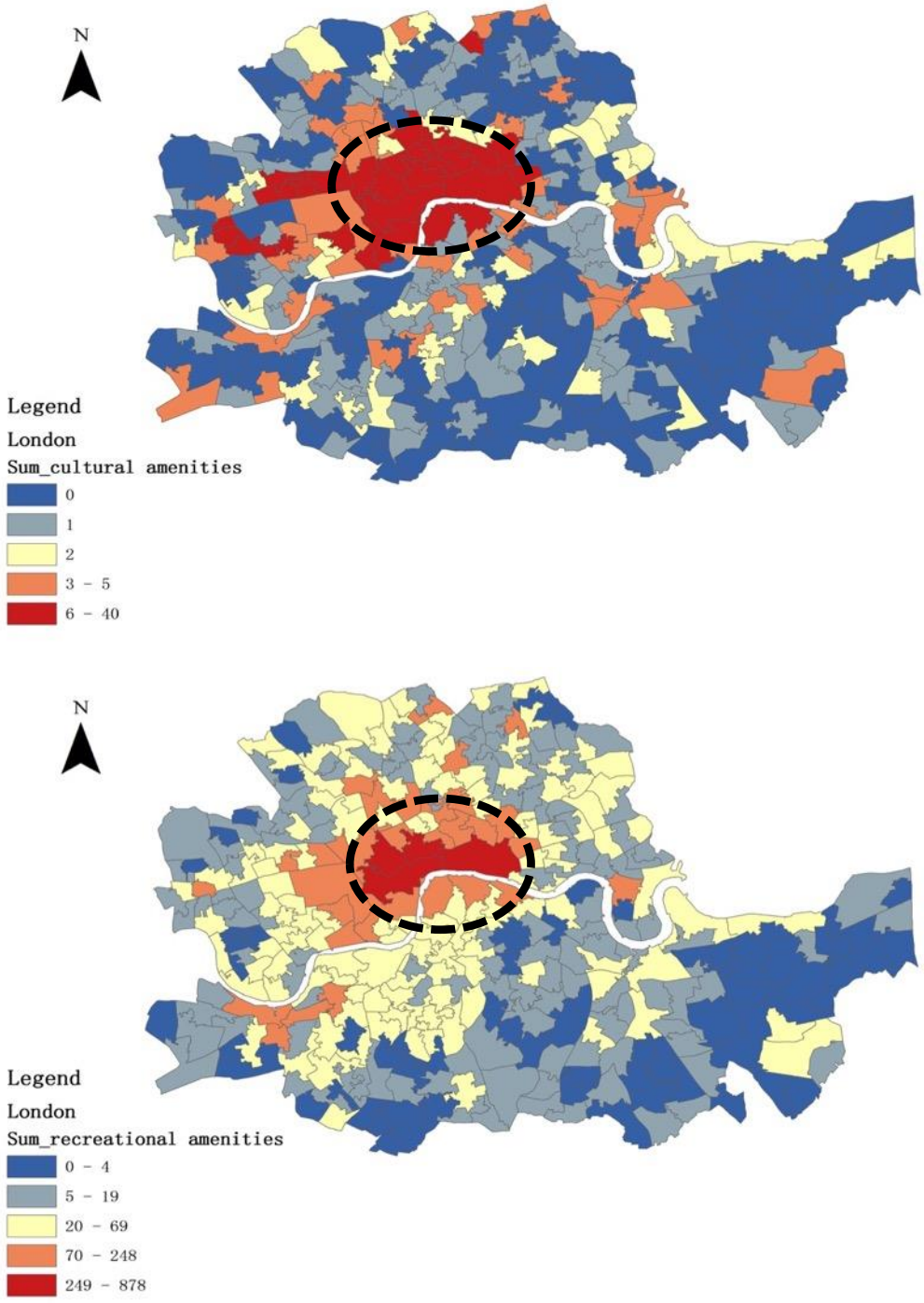

Figure 4. 8 Distribution of cultural (above) and recreational (below) amenities in London

In London, the numbers of recreational amenities are outstandingly higher than cultural amenities according to the map legends (see Figure 4.7). The distribution patterns of cultural and recreational amenities are similar with one single core at the city center (indicated by the black circle on maps) and decreases gradually away from the city center. The distribution of amenities is uneven and resembles the distribution of FDI; presumably, companies are attracted by not only agglomeration economy, but also sufficient amenities in order to support their economic activities and retain employees.

Comparing with the population density maps of London (see Figure 4.8), the densest areas are not in the city center, but the outer circle that are adjacent to it. Therefore, people reside in these neighborhoods with acceptable commuting distance to work and relatively adequate amenities. By contrast, the neighborhoods in Southeastern London are less populated with fewer amenities. Therefore, the spatial alignment of amenities and people is observable in London.

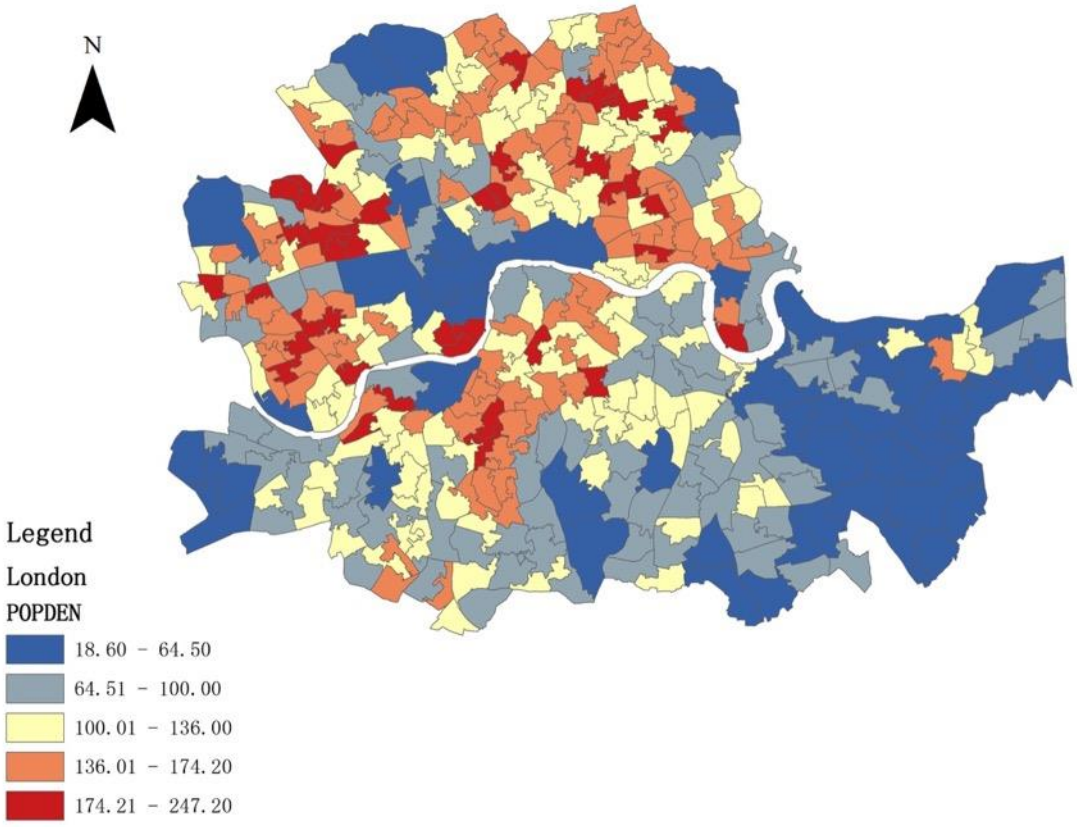

Figure 4. 9 Population Density in London

4.2.2 Geographically weighted regression (GWR)

As previous studies tend to assume stationery relationship between urban amenities and FDI attractiveness, this section goes in depth to explore the non-stationery influences of various amenities in attracting FDI, taking the geographical locations into account by using GWR.

Before carrying out GWR analysis, conventional OLS estimations are constructed for both cities so as to compare with the GWR results in terms of R square, residual randomness and AICc. Either number or density of amenities within each neighbourhood is deployed as targeted independent variables.

To enhance overall validity, the models also include a range of control variables. Firstly, economic factors, such as the number of local company and local company turnover, are included; secondly, infrastructure factors, such as road length, density of bus stops, are contained. The control variables in Johannesburg are slightly different from those in London mostly because of data unavailability; for example, the percentage of bachelor degree holders

and average annual income is available for Johannesburg in neighbourhood level, but not for London. Nevertheless, the focused amenities variables are comparable for both cities.

4.2.2.1 Johannesburg

The summary of OLS estimations can be found in Table 4.3 below. The model is significant with F statistics, R-square is 0.7573, which means 75.73% of variations in dependent variables can be explained by independent variables. The adjusted R-square is 0.7267 and therefore, the model has high explanatory power. Seven of targeted independent variables are significant at 95% confidence level, and the VIF values indicate that there is no multicollinearity in the model. However, Koenker (BP) Statistic is significant, indicating that relationships modeled are not consistent (either due to non-stationarity or heteroskedasticity). We should rely on the Robust Probabilities (Robust_Pr) to determine coefficient significance and on the Wald Statistic to determine overall model significance(Esri, 2018b)(see Table 4.3). After the robustness correction, the variables targeted are still significant and the Wald Statistics is significant, implying the model is significant overall.

Table 4. 3 Summary of global OLS model for Johannesburg

Variables	DV: FDI density	Coefficient	T-Statistic	Robust_t	Robust_Pr	VIF
	Intercept	-0.059	-0.704	-1.255	0.212	--------
Cultural Amenities	Number of art centres and museums	-0.092	-1.003	-0.502	0.617	1.839
	Number of educational amenities	-0.009	-0.416	-0.408	0.684	1.638
Recreational Amenities	Density of amusement projects	0.296***	2.662	2.009	0.047**	1.719
	Number of eatery facilities	0.033***	7.165	4.016	0.0001***	5.617
	Park size	0**	-2.509	-1.679	0.096*	1.584
	Density of lodging facilities	-0.196***	-3.242	-2.39	0.018**	4.272
	Number of playgrounds	-0.041	-0.926	-0.632	0.529	1.676
	Density of shops	-0.023	-0.669	-0.396	0.692	3.886
Control Variables	Number of local company	-0.0001***	-3.655	-2.243	0.027**	2.974
	Number of local company turnover	0***	6.535	3.318	0.001***	2.417
	Density of banks	-0.103	-1.923	-2.383	0.019**	1.777
	Density of bus stops	0.459***	4.841	3.978	0.0001***	4.631
	Total population	0	0.040	0.115	0.908	1.112
	Average annual income	0.000	0.877	1.188	0.237	1.468
	Percentage of bachelor degree holders	0.697	1.004	0.975	0.331	3.969

Number of obs	=	135
F(15,102)	=	24.749870
Prob>F	=	0.000***
R-squared	=	0.757266
Adj R-squared	=	0.726669
Joint Wald Statisitic	=	274.430407
Pron>(chi-squared)	=	0.000***
Koenker (BP) Statistic	=	83.498987
Prob(>chi-squared)	=	0.000***

*** p<0.01, ** p<0.05, * p<0.1

The models residuals are not normally distributed for OLS requirements (see Figure 4.10). Therefore, in ArcGIS, we generated the spatial autocorrelation report using Global Moran's Index for residuals（see Figure 4.11）, and they are spatially clustered. This is due to non-stationarity, therefore, we need to take into account the spatial heterogeneity, previously described as the spatial unevenness of FDI and amenities.

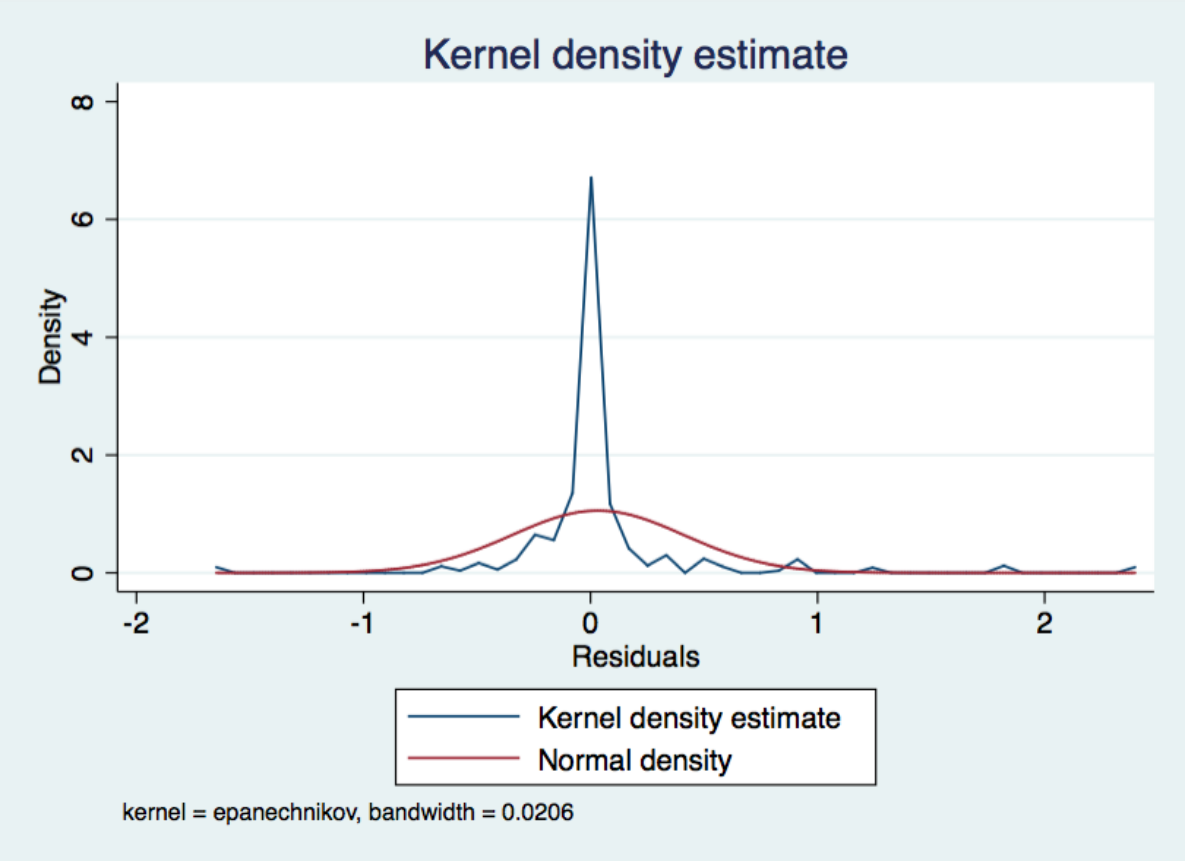

Figure 4. 10 Kernel density estimate of OLS residuals

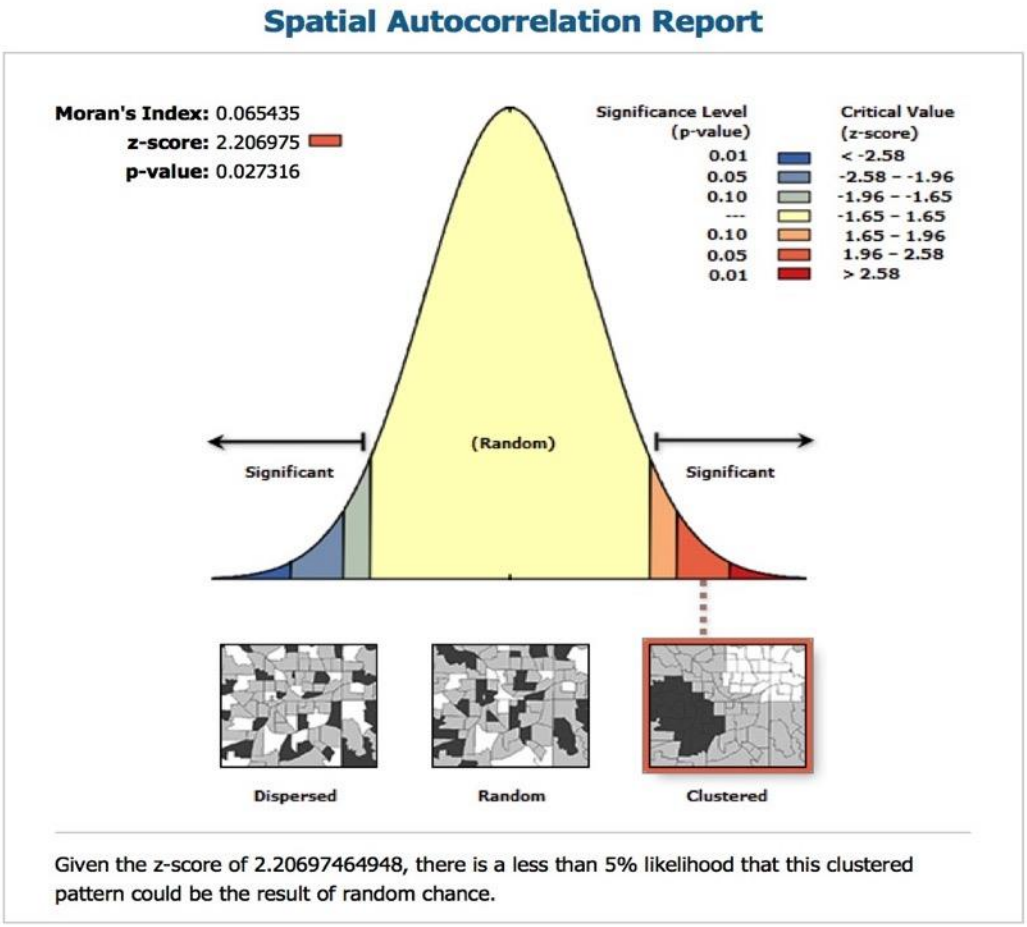

Figure 4. 11 Global Moran' s Index of OLS model residuals

The performance of the OLS and GWR estimations are compared by the following three indicators: improvement of adjusted R^2; reduction of AICc value for at least three points as previously established by scholars (Brunsdon, Fotheringham, et al., 1998, Hu, Yang, et al., 2016); the randomness distribution of residuals of the two models (implied by Moran's Index).

The diagnostic statistics results show that the AICc value is greatly reduced from 77.57 from a global model (OLS) to 39.68 in local regression model (GWR), indicating the model performs remarkably better in GWR. Also, the adjusted R-square is raised by 6.7% in GWR than that in OLS (from 0.794 to 0.726), indicating the GWR models has higher goodness-of-fit than OLS. The GWR model residual's Moran Index indicates that the residuals are randomly distributed, which fixed the spatial autocorrelation issues of residuals in OLS (see Figure 4.12). Overall, GWR model better predicts the local relationships of amenities and FDI density.

Table 4. 4 Estimate Parameters and Diagnostic Statistics in OLS and GWR models

Variables	GWR Results			OLS Results
	β Mean	β Min	β Max	β
Number of eatery Facilities	0.02395	0	0.0406	0.0332*
Density of amusement projects	0.335	-2	3.611	0.2965*
Size of urban parks	0.000	0.000	0.000	-0.0000*
Number of local companies	-0.0001	-0.0003	0.000021	-0.000111*
Sum of local company turnover	0.0000	0.0000	0.0000	0.0000*
Density of bus stops	0.2743	0	0.9117	0.4594*
R-squared	0.83473			0.7573
Adjusted R-squared	0.79427			0.7267
AICc	39.689			77.5775
Residuals Moran's Index	0.0267			0.0654

β： Standardized Regression Coefficient

* : p-value<0.05

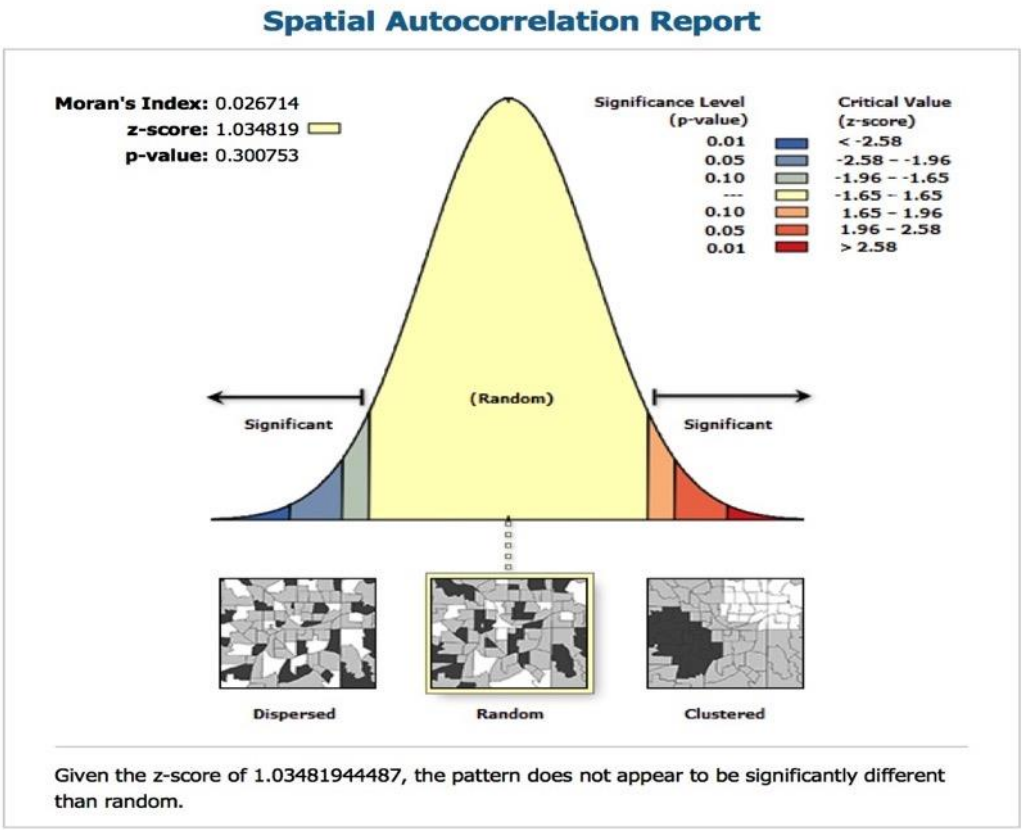

Figure 4. 12 Spatial Autocorrelation Report of residuals in GWR model

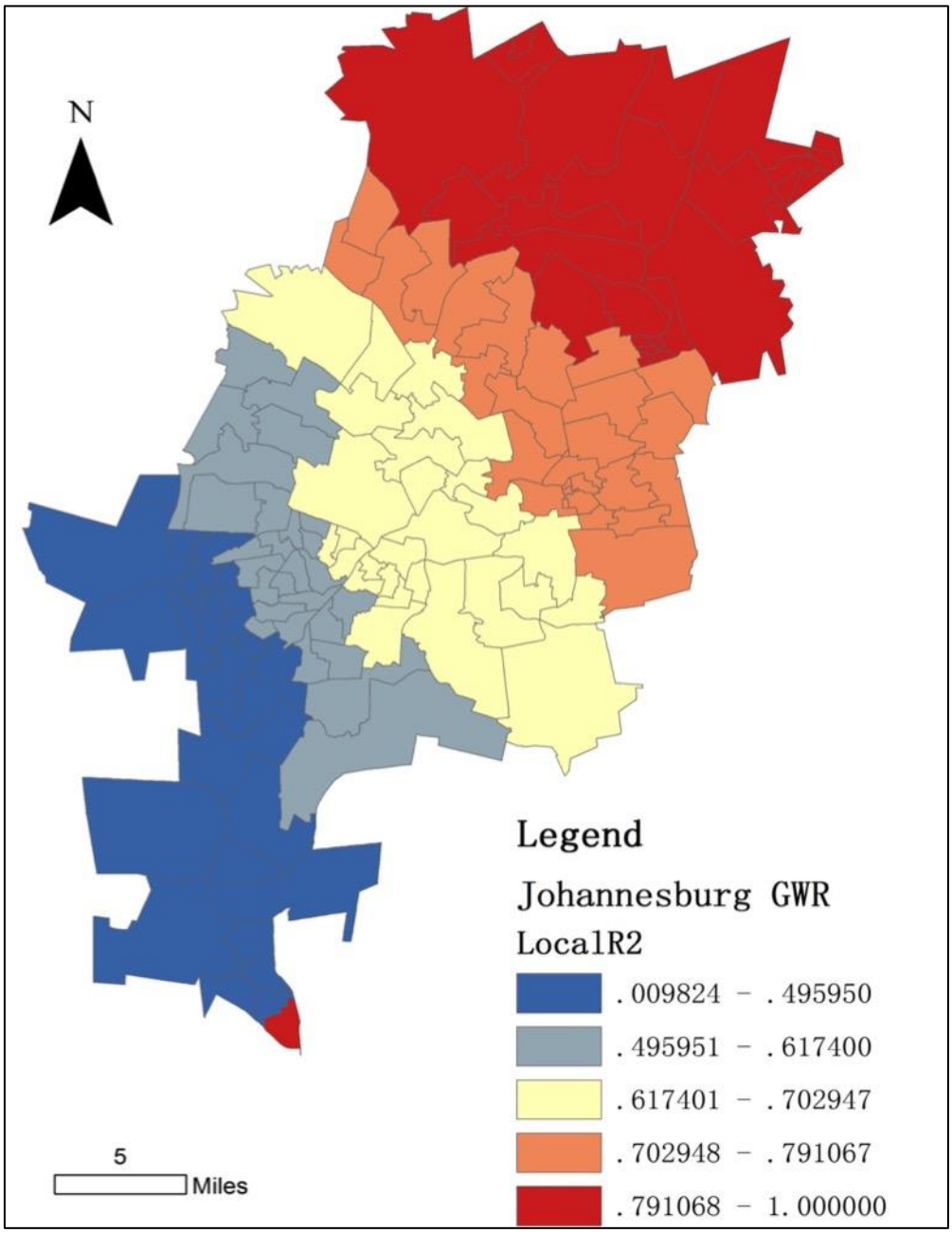

Figure 4. 13 GWR Local R Square distribution

Since GWR predicts single equation for each observation independently, there are independent parameter estimates, t-values, and goodness-of-fit for all observations. These values can be mapped, allowing visual classifications of the performance of models and variables influences(Esri, 2018b). Figure 4.13 displays the GWR local R-square distribution, the map breaks in quantile method, and therefore, we can identify top 20% neighborhoods that are better predicted by GWR models (colored with red). From the legend, northern neighborhoods have more than 60% goodness-of-fit for models predicted. Hence, the southern neighborhoods (colored with darkest blue) have R-square less than 50%, indicating, the predictions for them have weak explanatory power. This is due to the uneven distributions of variables. Vast southern neighborhoods have zero FDI and little amenity; the variations of variables are not enough to predict the relationships for southern Johannesburg.

The significant amenities variables are reported. Three independent variables are significant in Johannesburg, they are: number of eatery facilities, density of amusement projects, and park size (see Table 4.4). Although park size is a significant variable, its coefficient is very close to zero, which is relatively trivial to report.

In northern Johannesburg, urban amenities have higher impact on FDI densities than in southern Johannesburg. As T-statistics are indicators for significance of variables, the distribution of T-statistics is presented with coefficient distribution. If the absolute T-statistics are higher than 1.96 (colored other than blue in T-statistics maps), the significance level is 0.05, we have 95% confidence not accepting the hypothesis that amenities have no relationship with FDI density. Therefore, the results on the northern district are more reliable than those in the south.

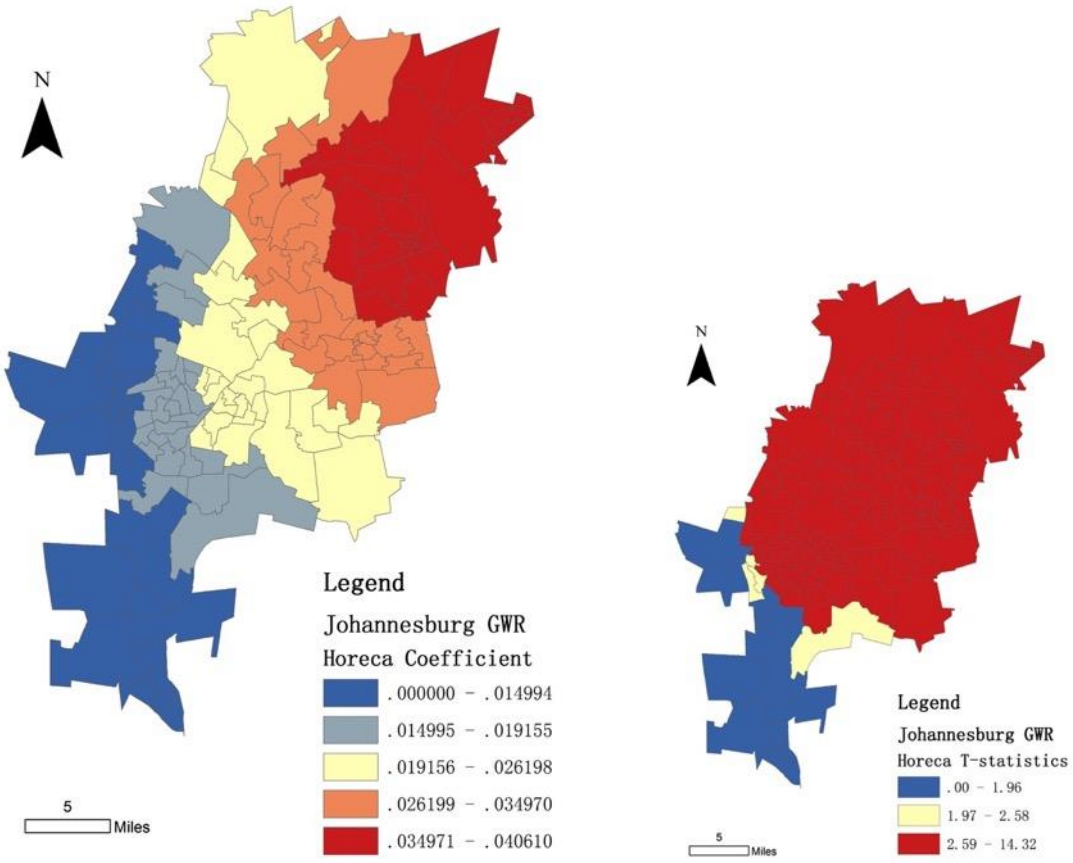

Figure 4. 14 Distribution of coefficients (left) and T-statistics (right) for eatery facilities

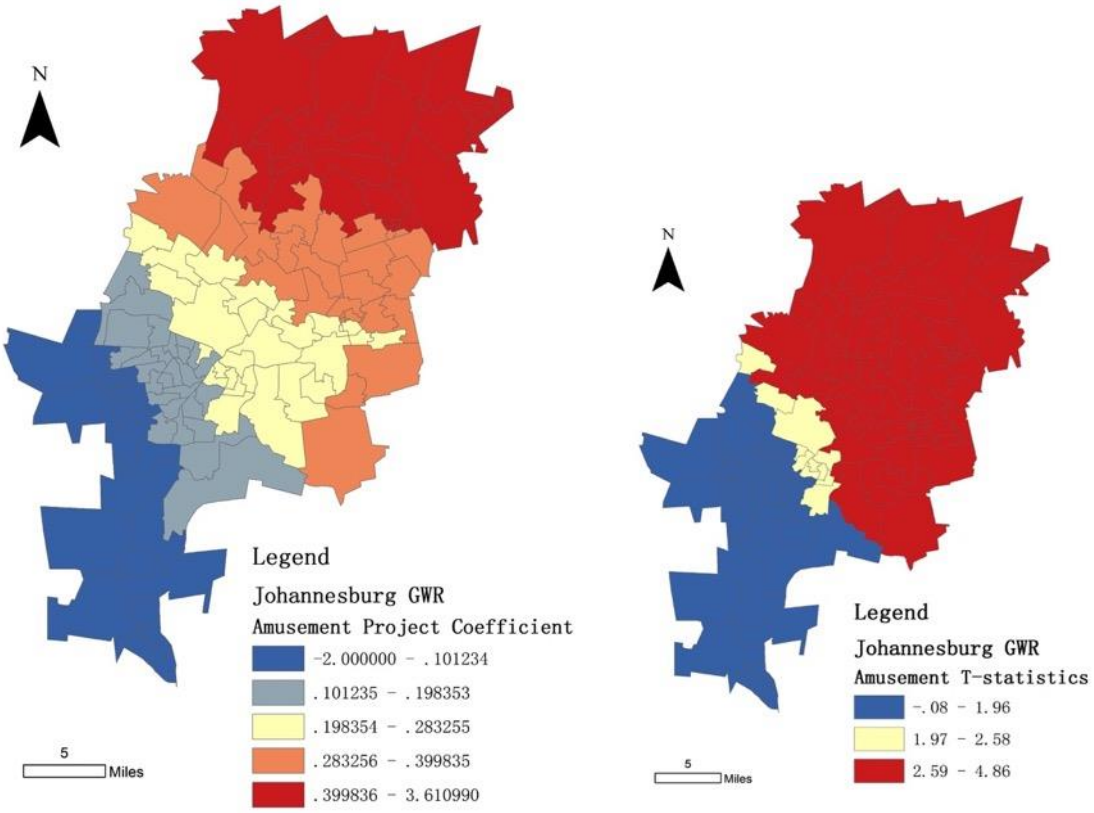

Figure 4. 15 Distribution of coefficients (left) and T-statistics (right) for amusement projects

Both the amusement project and eatery facilities have positive influence on FDI density in Johannesburg, although the coefficients are minor, but the relationships are significant and the impact increases from south to north gradually, holding other conditions constant. The coefficients are break in five quantiles, therefore, we can identify the top 20% high-impact neighborhoods that locates in the northern part. Increasing one amenity in these areas could help increase FDI density higher than building amenities elsewhere while holding other variables constant. In other words, building amenities in northern district could significantly attract more FDI and thus increase urban competitiveness than adding amenities in southern neighborhoods.

However, as we have identified, northern neighborhoods are privileged with superior amenities and good quality of life. The goodness-of-fit in southern Johannesburg is the lowest within the city. Presumably, the latent variables, such as path dependency of regional development pattern, have a strong effect on FDI densities. As Johannesburg is one of the most unequal cities in the world due to historically apartheid planning policy (Wall, Maseland, et al., 2018), it is necessary to analyze cities with more advanced development level such as London, and draw conclusions based on their comparisons.

4.2.2.2 London

In London, data on similar variables are collected, cleaned, and modeled through Stata and ArcGIS. According to the summary of OLS, overall model is significant based on the F statistics, the R-square is 0.7391, indicating that 73.91% of the variation in dependent variable (Y) can be explained by independent variables (X). The adjusted R-square is 0.7284,

so the model has high explanatory power. Six of targeted independent variables are significant at 0.05 significance level, and the VIF values indicate that there is no multicollinearity among variables. However, Koenker (BP) Statistic is significant, indicating that relationships modeled are not consistent in London, also due to spatial non-stationarity. The Robust Probabilities (Robust_Pr) are applied to determine coefficient significance and Wald Statistic is used to determine overall model significance (see Table 4.5). The five variables significant in OLS models are: 1) number of artery facilities, 2) number of education facilities, 3) density of amusement projects, 4) density of shops, and 5) density of eatery facilities (see colored cells in Table 4.5). After the robustness correction, the variables targeted are still significant but the significance level is decreased and the Wald Statistics is significant, implying the model is significant overall. However, based on global Moran's Index, the residuals are not randomly distributed, they are clustered at a significant level (see Figure 4.16), the spatial non-stationarity issue is also recognized in London, therefore, GWR is employed for correction.

Table 4. 5 Summary of global OLS model for London

Variables	DV: FDI Density	Coefficient	t-Statistic	Robust_t	Robust_Pr	VIF
	Intercept	-0.655	-0.597	-0.880	0.379	1.684
Cultural Amenities	Number of art centres and museums	1.409***	2.432	1.708	0.089*	2.177
	Number of educational amenities	1.733***	6.873	1.890	0.060*	2.414
Recreational Amenities	Density of amusement projects	-2.011***	-3.975	-1.420	0.157	1.151
	Density of shops	0.301***	5.870	3.439	0.001***	2.354
	Density of eatery facilities	0.203***	4.380	1.748	0.081*	1.400
	Density of playgrounds	-0.078	-0.151	-0.167	0.868	3.403
	Density of lodging facilities	0.081	0.946	0.636	0.525	1.400
	Park size	0	-0.721	-1.327	0.185	2.177
Control Variables	Density of local company turnover	0	1.938	1.116	0.265	2.141
	Density of bus stops	-0.157	-1.915	-1.540	0.125	6.483
	Total road length	0.077	1.425	1.665	0.097*	2.057
	Population density	-0.011	-1.606	-1.682	0.093*	2.112
	Number of local companies	0.001***	3.156	1.062	0.289	2.896
	Density of banks	-0.256	-1.261	-0.790	0.430	1.533
Number of obs = 356						
F(15,102) = 69. 029						
Prob>F = 0.000***						
R-squared = 0.739						
Adj R-squared = 0.728						
Joint Wald statisitics = 208.438						
Prob(>chi-squared) = 0.0000*						
Koenker (BP) Statistic = 159.257						
Prob(>chi-squared) = 0.000000***						

*** p<0.01, ** p<0.05, * p<0.1

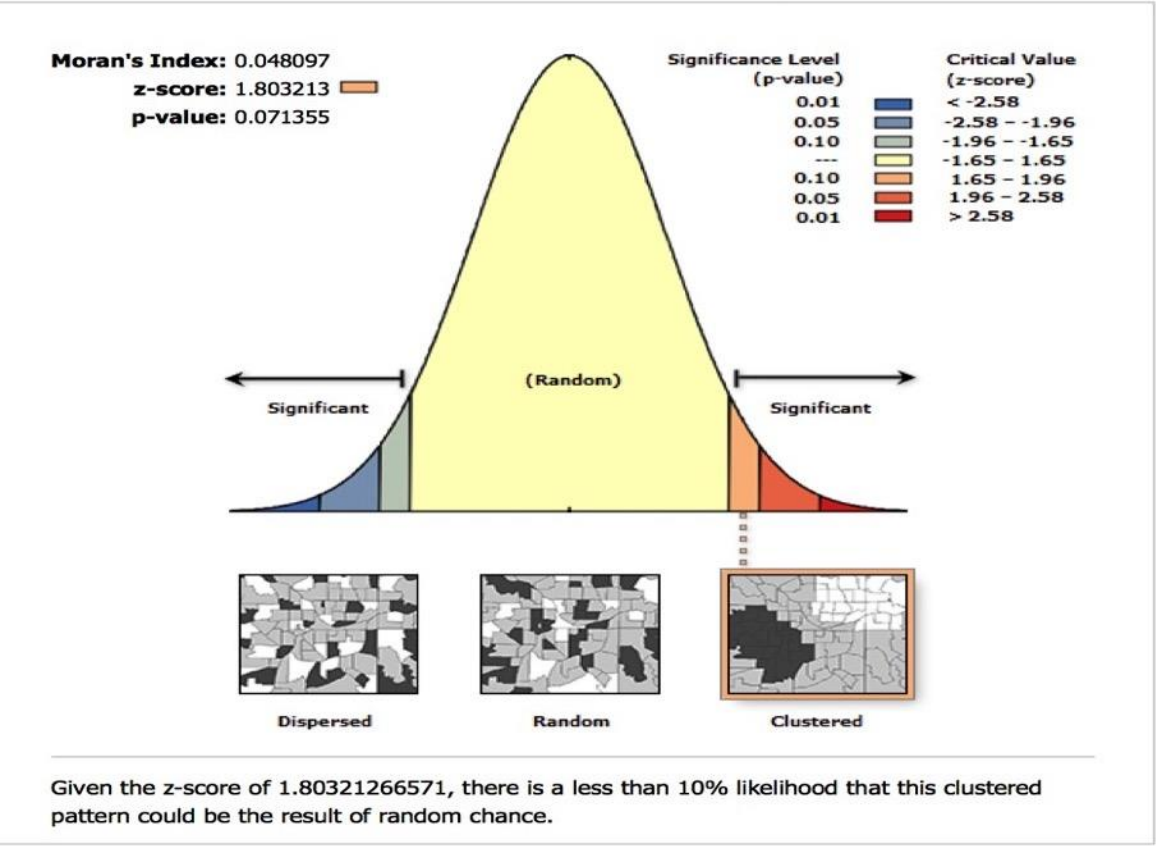

Figure 4. 16 Spatial Autocorrelation report for OLS model residuals

Similar to analysis on Johannesburg, the performances of OLS and GWR estimators are compared by the following three indicators: improvement of adjusted R2; reduction of AICc and the randomness distribution of residuals in Table 4.6.

In OLS model, the AICc is 2110.193, while in GWR it is remarkably reduced to 2048.42. AICc measures model performance and is helpful for comparing different regression models. The model with the lower AICc value provides a better goodness-of-fit to the observed value by taking the complexity of model into account (Esri, 2018b). Therefore, in London, GWR performs significantly better comparing to its OLS estimation. Moreover, the adjusted R-square is raised from 0.7285 to 0.8212 from GWR to OLS, the model's explanatory power is increased. Furthermore, the Moran's Index for the residuals in GWR estimation is -0.085, indicating that the residuals are dispersedly distributed, which not only fixed the spatial autocorrelation issues of residuals in OLS but also improve the model robustness (see Figure 4.17). Overall, GWR models improve the conventional OLS model in simulating the local relationships of amenities and FDI density.

Table 4. 6 Estimate Parameters and Diagnostic Statistics in OLS and GWR models

Variables	GWR Results				OLS Results
	β Mean	β Min	β Max		β
Number of education amenities	0.753	-0.395	3.661		1.733*
Density of eatery facilities	0.087	-0.097	0.365		0.2033*
Density of shops	0.108	-0.347	0.549		0.301*

Density of amusement projects	-0.311	-5.257	4.747		-2.011*
Number of art centres and museums	0.16	-3.431	3.096		1.4086*
Number of local companies	0.005	-0.002	0.019		0.0008*
R-squared	0.8828				0.7391
Adjusted R-squared	0.8212				0.7285
AICc	2048.42				2110.293
Residuals Moran's Index	-0.085				0.048

β： Standardized Regression Coefficient

* : p-value<0.05

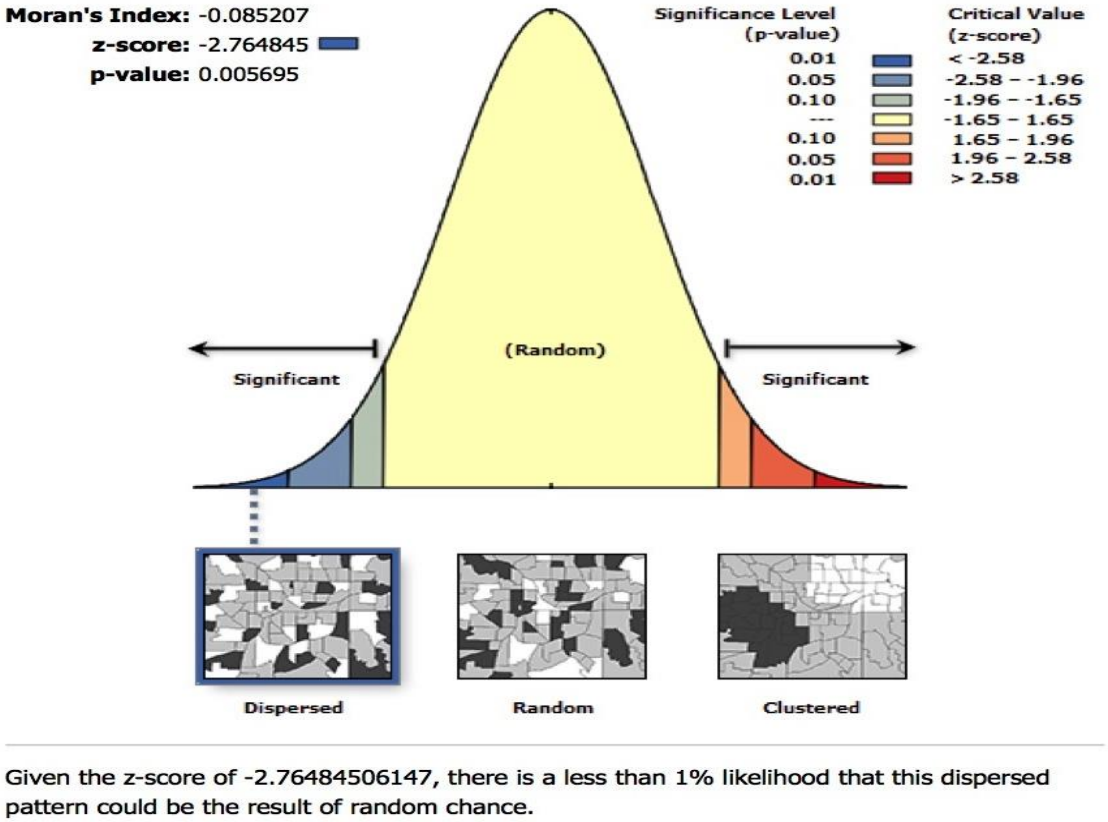

Figure 4. 17 Moran's Index of GWR models

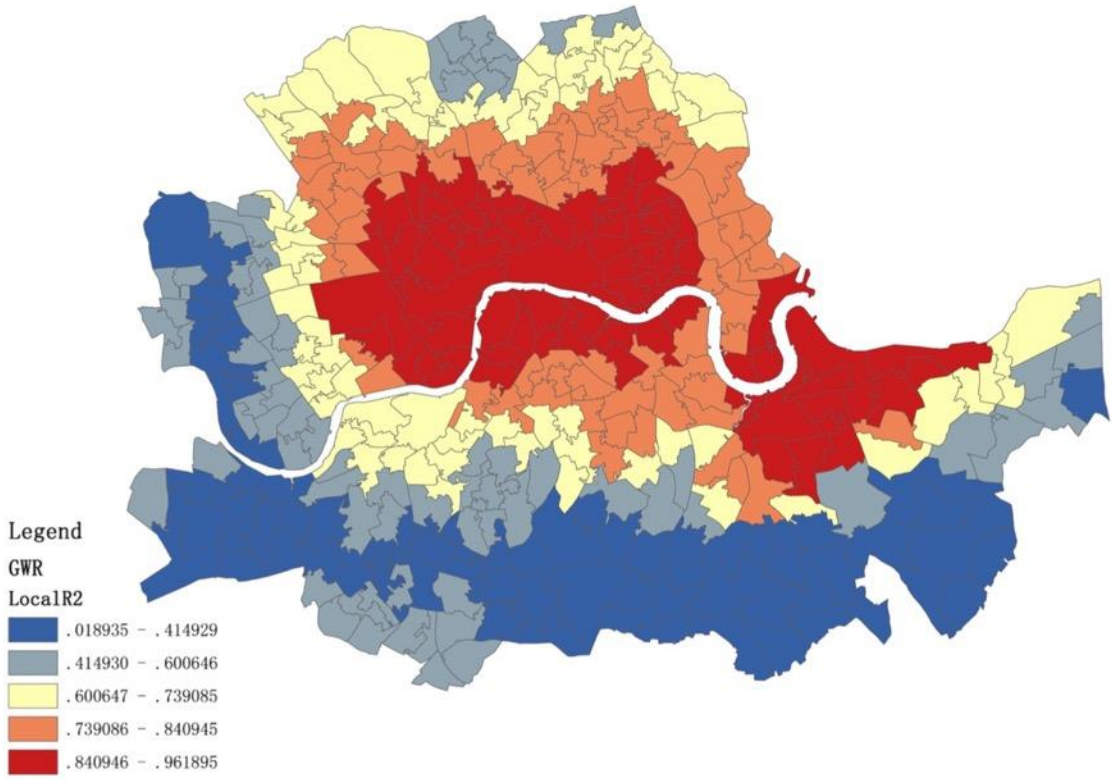

Figure 4. 18 Local R-square distribution of GWR models

As previously elaborated, the local R-square indicates the goodness-of-fit for each local equation predicted. The maps use quantile method to break the local R^2 into five categories. In London, the top 20% neighborhoods have R-square higher than 84.09% (red areas), they located in the city center and eastern part; by contrast, the outskirts of cities have R-square value lower than 50% (blue areas), the equations GWR generated have lower explanatory power. The R-square are descending from northern city center to southern city boundaries, forming concentric circles outward.

As is shown in Table 4.4, five of the targeted variables are significant in 95% confidence level. The coefficients created by GWR model are mapped, along with local t-statistics distribution to indicate significance of variables spatially.

According to the T-statistics maps, both number of education and number of art centers are significant in city center district (red area in Figure 4.19 and Figure 4.20), and it is located in the high impact area as the coefficient is colored with red. Based on the operationalization, these two constitute as cultural facilities. Therefore, the number of cultural amenities will positively impact on FDI density in London's city center, holding other conditions constant.

The other three significant variables are the density of eatery facilities, the density of shops and the density of amusement projects. They are categorized as recreational facilities. Based on the T-statistics distribution maps, neighborhoods in the city center are in 95% confidence level, the prediction of relationships in outskirts all have t-statistics lower than 1.96 (see Figure 4.21, 4.22 and 4.23). Therefore, combined with local R-square map, the results in the city center are more reliable than periphery.

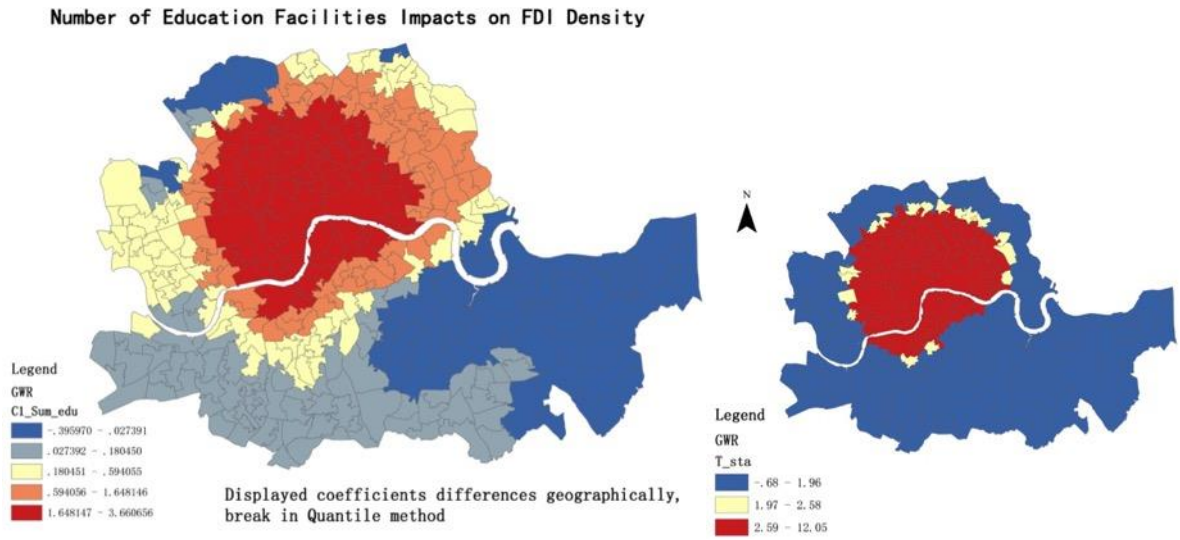

Figure 4. 19 Distribution of coefficients (left) and T-statistics (right) for education facilities

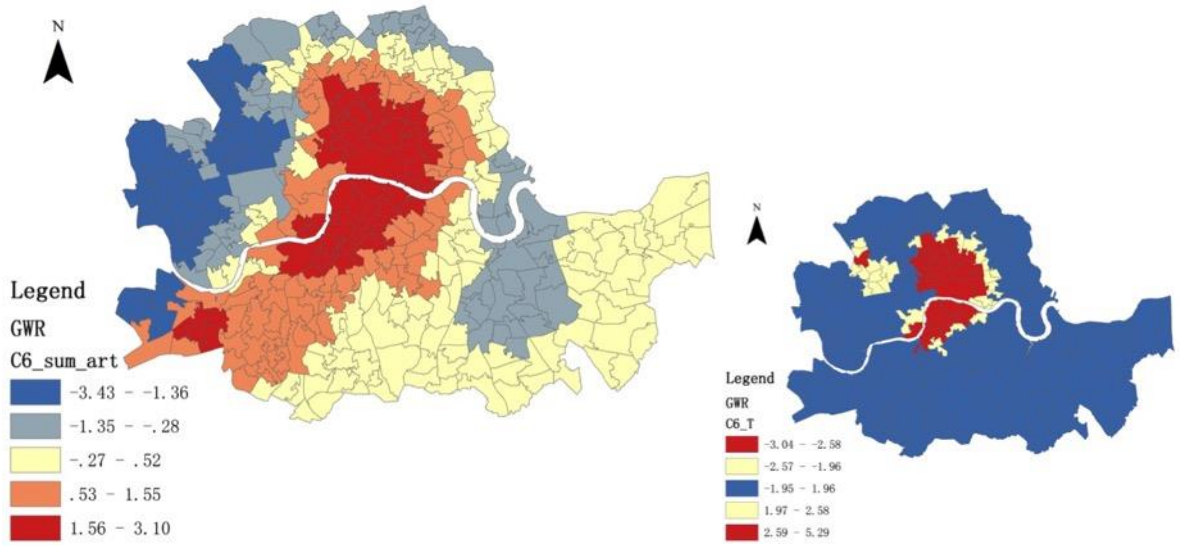

Figure 4. 20 Distribution of coefficients (left) and T-statistics (right) for number of art centers and museums

Both the density of eatery facilities and the density of shops have high positive impact on enhancing FDI attractiveness in London's city center (see Figure 4.21 and 4.22). As the coefficients are classified in quantile method, it is evident that the high impact areas (colored with red) are spatially coincided with the significant areas for both variables. And they are positively influencing city's FDI attractiveness. In other words, creating higher density of shops and restaurants can greatly enhance neighborhoods' competitiveness to attract FDI, especially in London's city center.

However, the amusement projects density and FDI density shows different impact pattern. As in Figure 4.23, the city center as well as several neighborhoods in the west, have absolute t-statistics value higher than 1.96 for density of amusement projects. However, in the city center, the coefficient is negative, whereas in the west periphery, it is positive. This indicates that building amusement project in city center deteriorate the FDI competitiveness, whereas building them in west periphery helps increase FDI density. There are a couple of reasons. Amusement projects include zoos, theme parks, cinemas and theaters. These projects often need large areas to build on and could occur massive transportation for users, so logically,

they are not suitable to be built in city center. As in the case of London, the city center serve as its main business district, political and cultural center, adding amusement projects would impact on the city image and make the city less attractive to investors. However, adding on cultural facilities such as schools and libraries will have positive effects, as the coefficients are constantly positive for cultural amenities.

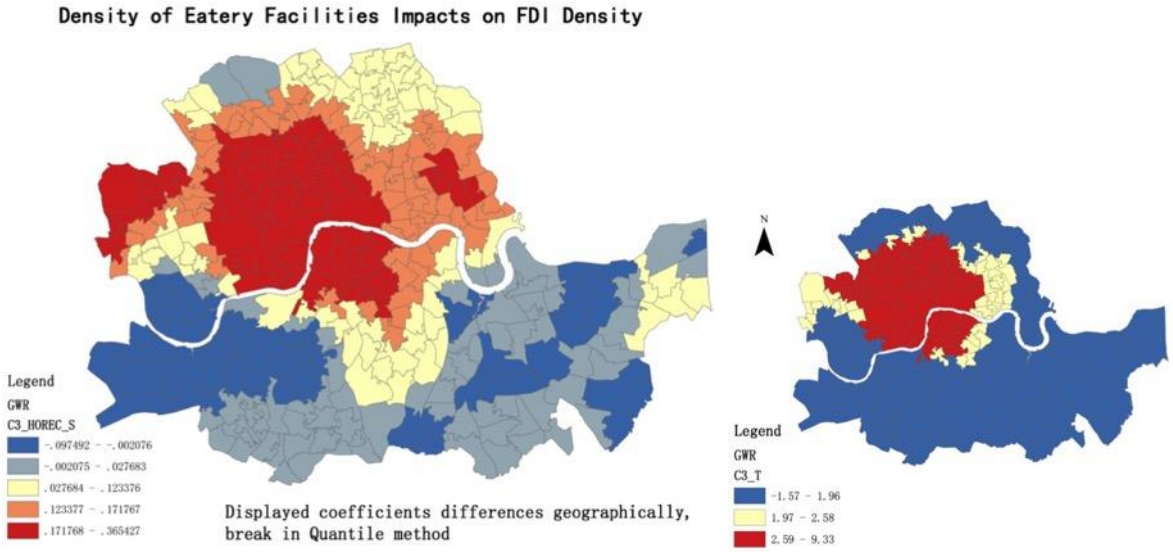

Figure 4. 21 Distribution of coefficients (left) and T-statistics (right) for eatery facilities

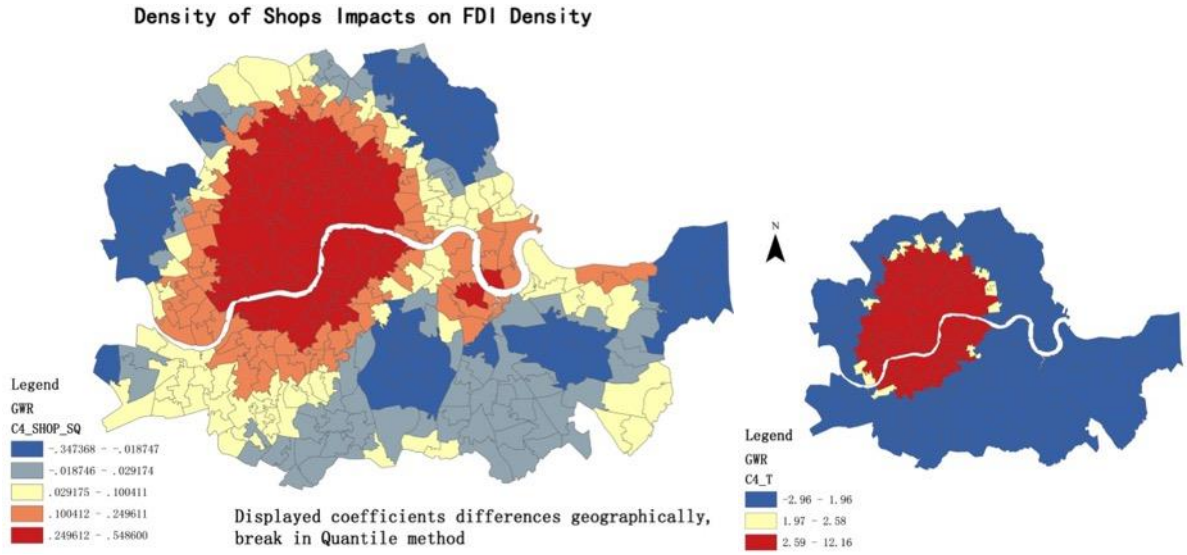

Figure 4. 22 Distribution of coefficients (left) and T-statistics (right) for shop density

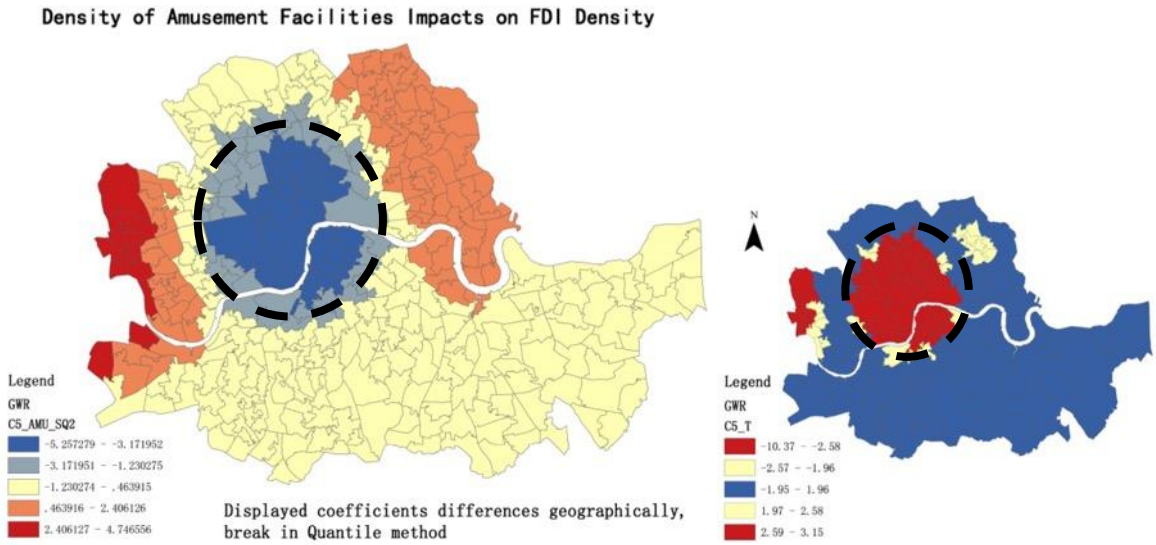

Figure 4. 23 Distribution of coefficients (left) and T-statistics (right) for amusement projects

4.3 Comparisons on Johannesburg and London

The neighbourhood level analysis has revealed some key characteristics for both cities. Firstly, service FDI is the dominant FDI sector in both cities. More than 90% of inward FDI is in service sector, providing business service, financial service and so on. Therefore, tertiary industry accounts for large proportions in economic structure in both cities'. However, London's total FDI largely outnumbers that in Johannesburg, also London attracts more hi-tech FDI than Johannesburg. Apparently, London is more competitiveness in terms of attracting total FDI and FDI in innovation sector, which place London higher up the world city hierarchy.

Both amenities and FDI are unevenly distributed in London and Johannesburg; the corresponding spatial non-stationarity will result in bias for global OLS estimator. The GWR methods predict the relationships better than conventional OLS model in both cities, judging from three diagnostics statistics: AICc, adjusted R square, and residual distribution.

In Johannesburg, spatial inequality in FDI and urban amenities is evident. Northern areas are privileged with high level of amenity and high economic vitality, whereas southern district is underdeveloped with even zero amenities in several adjacent neighbourhoods. Majorities of the Johannesburg neighbourhoods have no inward FDI. Therefore, it could be described as a "divided" city in between the northern and southern district. Also, spatial mismatch between people and amenity is also identified in Johannesburg, where highly populated neighbourhoods have relatively low amenities provision. Amenities have significant positive impacts on FDI density in northern areas, where it is more developed and privileged. Cultural amenities are not significantly affecting FDI density, but several recreational amenities are significant, indicating a lower demand for cultural amenities in Johannesburg.

In London, the division is clearly set between city core and periphery area. Both FDI and amenities are clustered in downtown district. Amenities have significant positive effect for FDI attractiveness. Cultural amenities including educational and art amenities are significant, indicating a higher cultural demand in London. Most recreational amenities are positively affecting FDI competitiveness, especially in the city center. However, amusement projects

densities have negative impact on FDI density in the city center, but the relationship is positive in the periphery, holding others variables constant. Therefore, in enhancing FDI attractiveness, it is advisable to locate large amusement projects, such as zoos and theme parks, in the periphery area than in the city center, where it is business oriented.

Overall, London is an established global city with advanced demand for cultural facilities, while Johannesburg is an emerging new global city that needs to deal with the spatial mismatch of people and amenities, and towards a sustainable way to enhance urban competitiveness.

Chapter 5 Conclusions and Policy Recommendations

5.1 Introduction

In the contemporary world, cities are seen as economic engines for a region or country. The urban competitiveness studies have spurred tremendous attention in both academic world and public sector. As FDI is key measurement of how integrated a city is within the world economy, this paper looks into city's FDI attractiveness and its determinants. For enhancing urban competitiveness, there are traditional "hard" factors such as productivity, infrastructure, innovation and so on. Nonetheless, "soft" factors including urban amenities and social management are increasingly important for they enhance the quality of life, which is valued by talented people and managerial elite.

This research links the urban competitiveness in attracting FDI with urban amenities provision level, and carried out the analysis on two different levels. First, the city-level analysis aims at empirically confirming the relationship between amenities and FDI attractiveness. Secondly, the neighborhood level analysis intends to further investigate the relationships by taking the geographical differences and spatial non-stationarity into account.

5.2 Retrospect

As the main research emphasis is to explain how "soft" amenity level influencing on urban competitiveness in attracting FDI, the previous studies have established comprehensive theories and frameworks on firm location determinants and factors driving urban growth. Traditionally, in a neoliberal perspective, "hard" production factors such as land and transportation lead to agglomeration economy and regional growth. More recent studies focus on human capital as driving force for key sectors such as hi-tech and service. However, as cities are increasingly consumer-oriented, scholars developed a new paradigm putting urban amenities as a critical factor for urban competitiveness (Clark, 2003, Glaeser and Gottlieb, 2009, Florida, Mellander, et al., 2008). Various scholars have confirmed the link between quality of life and urban competitiveness. As urban amenities level best reflects the living quality, therefore, these "soft" amenities levels have an impact on urban competitiveness in terms of FDI attractiveness.

Previous studies theoretically established the link, however, most researches focus on global north, and moreover, few of them take spatial variances into account. This research adds knowledge to the existing body and further to explore spatial variation of effects.

5.3 Conclusions and discussions

5.3.1 "Hard" and "soft" qualities that determine FDI competitiveness

Based on the sampled 150 cities and GUCR indices data, the OLS modelled the determinants of FDI competitiveness. The results reveal that traditional "hard" qualities continue to have strong positive impacts on city's ability to attract FDI. Productivity capitals like real economic growth rate and industry structure, and infrastructural capital like water and air transportation, they have significant positive influences on city's FDI level. Consequently, city should value these traditional factors and work on enhancing the hard qualities.

Apart from the "hard" economical factor, the "soft" social and amenity factors are emerging to impact city's FDI competitiveness. High quality of life is increasingly valued as one aspect for firms to locate. Empirically, in the linear equation conducted by the OLS estimation, the variable Shopping Environment has a significant positive effect on their FDI levels. The positive effects of amenities on urban competitiveness are confirmed for global cities. The results are in line with theory that firms seek for qualified business environment to locate, and amenity-rich region are ideal for investments with high mobility like FDI.

5.3.2 FDI distribution characteristics

As FDI brings in capital, job opportunity and knowledge to its receivers, it works as a catalyst for regional economic growth. However, the local ability to attract FDI also reflects local resource availability. These resources, such as access to local market and high-quality labours, are what FDI desires. Like other firms, FDI occupy the most advantageous locations worldwide. They are highly unevenly distributed across the globe.

On a global level, the global north and global south divide is evident. In the GUCR 150 cities, around 90% FDIs are investments happened in global north. Moreover, the hierarchy of world cities is visible through FDI distribution, where majority of cities are clustered at the bottom level and only a small number of cities at the top with exceptional high average FDI values. Comparing to Johannesburg, London is clearly more competitive and developed as a mature world-class city whereas Johannesburg is an emerging global city that requires long-term efforts on developing its competitiveness.

On a local level, Johannesburg's FDI clustered and formed several cores where FDI are highly concentrated; they are major business district for Johannesburg. In London, FDI are clustered in the city center, especially around the northern bank of River Thames. FDI in both cities are highly unevenly distributed, 67% neighbourhoods in Johannesburg have zero FDI whereas the figure is 51% in London. As is concluded in *The State of African Cities Report 2018* (Wall, Maseland, et al., 2018, p. 99), "the uneven distribution of FDI seen at the global and regional scales, appears to be found at the city level too".

5.3.3 Spatial inequality and amenity mismatch in Johannesburg

In Johannesburg, spatial disparity and inequality is evident. On the one hand, investments are concentrated in northern richer neighborhoods; by contrast, southern poor neighborhoods receive zero FDI, which reinforces spatial segregation and increases income inequality. On the other hand, southern neighborhoods have little amenities whereas northern districts are endowed with rich cultural and recreational amenities. The living qualities in the southern communities are significantly lower than the northern residents, which further increases the disparity between the north and the south.

Amenity mismatch issue is identified across the city of Johannesburg as well. Southern Johannesburg is highly populated, however, the amenity provision is lower than city average level. In contrast, northern neighborhoods are amenity-rich regions with low population density. It is obvious that urban amenities are reserved for affluent northern Johannesburg. For a more balanced development strategy, the amenity insufficiency issue should be tackled.

5.3.4 Spatial disparity between city centre and periphery in London

In London, huge socio-spatial difference is recognized between city centre and periphery area. Both FDI and amenities are clustered in city centre. London receives huge amount of FDI capital and also has high level of urban amenities comparing to Johannesburg. Moreover, the amenities in London are well-planned, and taken into account the population density across the city. For example, eastern London have relatively low population density, the numbers of amenities are small accordingly.

5.4 Interpretation of main questions

Urban amenities have positive influence on city's FDI competitiveness. The cross-sectional analysis results show that city's FDI competitiveness is influenced by both traditional "hard" factors and "soft" city amenity. Similarly, controlling for a vector of economic factors, urban amenities are found to be significantly affecting FDI density in city's neighborhood level. Based on tested statistical models, improving urban amenities levels could significantly increase FDI attractiveness, i.e. the influence is positive. Future research could land on testing urban amenities direct effects on immigration of talented people, and therefore, amplify the existing knowledge.

The uneven spatial distribution patterns of urban amenities lead to non-stationary impacts on FDI competitiveness within one city. London and Johannesburg have uneven spatial distributions of FDI and amenity across the city, conventional global OLS model have biased results; therefore, the relationships should be modeled through local GWR methods. Spatial heterogeneity is evident in both cities, and amenity impacts are varied across different regions. High-impact areas are those with high economic vitality, for example, in London's city center and Johannesburg's northern neighborhoods, amenities provision has higher impact on FDI competitiveness than the rest of the city. Therefore, adding respective amenities in these districts could maximum the output.

Recreational amenities are significantly influencing FDI density in Johannesburg and London, but cultural amenities are significant only in London. London is an established global city with developed economic structure and geography, floods of FDI locates around the city, especially service FDI and hi-tech FDI. Employees for these firms are well educated and characterized as "creative class" described by Florida(2003). These creative class demands for sufficient amenities for their discretionary time, especially cultural amenities including art center and museums, to satisfy their needs for creativity and diversity. Therefore, both recreational and cultural amenities are positive influencing FDI competitiveness in London. However, comparing to London, Johannesburg attracts less FDI in creative industry, although effects of recreational amenities are significant, the needs for cultural amenities are not emerging yet.

5.5 Policy recommendations for Johannesburg

Historically known as city of gold, Johannesburg is the provincial capital of Gauteng, the smallest but wealthiest province in South Africa. In African cities, Johannesburg ranks top in outward FDI and maintains a positive exponential growth rate of 4% over the period 2010-

2016. This secured its position as a true global city, and arguably the most developed one in Africa (Wall, Maseland, et al., 2018).

However, based on our analysis, several problems are identified in Johannesburg. Firstly, its ability to attract FDI is relatively low comparing to London, where the FDI numbers are five times higher than that in Johannesburg. Secondly, spatial inequalities in terms of amenity provision are severe between the affluent north and the marginalized south. Thirdly, the cultural amenities are insufficient comparing to London, where cultural amenities are highly developed to enhance the quality of life, thereafter, attract high-quality labor and investment.

As recognized with the above development issues, a more balanced strategy should be adopted by Johannesburg in order to become a world-class city. In facilitating economic growth and creates jobs, the emphasis should be on sustainable and inclusive urban development and on reducing poverty and inequality. Economic development policies must mitigate these spatial inequalities through developing mixed-use corridors that provide employment and residential opportunities for previously marginalized communities.

Firstly, for accomplishing economic growth goals, the city should establish the strategy to attract, expand and retain investments. Based on the general analysis of 150 global cities, Johannesburg should improve its "hard" qualities as well as providing sufficient "soft" amenity to enhance overall FDI competitiveness. In competing with other global cities, Johannesburg is in dire need for FDI and local investment. Traditional "hard" qualities should be enhanced through promoting productivity and bettering infrastructure. In the meantime, for long-term growth to a global city like London, Johannesburg should also focus on "soft" amenities provision. As the amenity-driven development mode suggests, adequate amenity provision drives urban growth by enhancing quality of life and thereafter, attracting talented people and high-quality investment.

Secondly, Johannesburg should deal with the issue of spatial mismatch of amenity and people, and the inequality between affluent north and marginalized south. As spatial disparity is recognized in this study, future development policies must address these spatial inequalities and provide employment opportunities and adequate amenities for previously marginalized communities.

Thirdly, cultural amenities, such as educational facilities and museums, should be delivered to enhance quality of life and to attract and retain high-quality labour and investment in Johannesburg. Comparing to London, cultural amenities in Johannesburg are in a low development state currently. In the future, Johannesburg need to deliver sufficient amenities, especially cultural amenities, that matches a city's local needs along with attracting creative talents and creative industry. From that, a balanced and sustainable economy is forthcoming, which has high resiliency and facilitates the changing demand of global economy.

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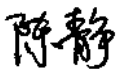

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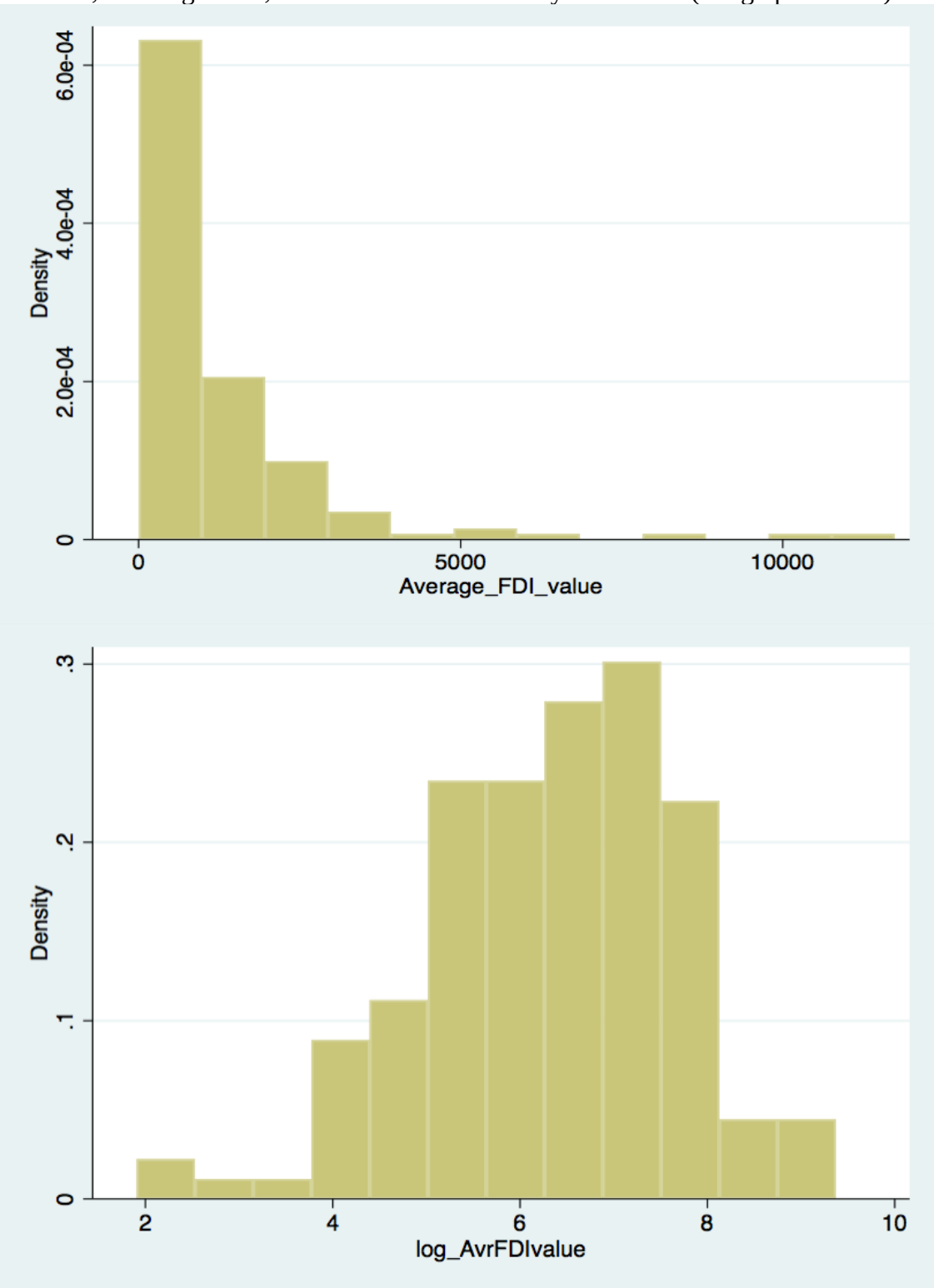
Annex 2 List of 150 global cities in GUCR for general study

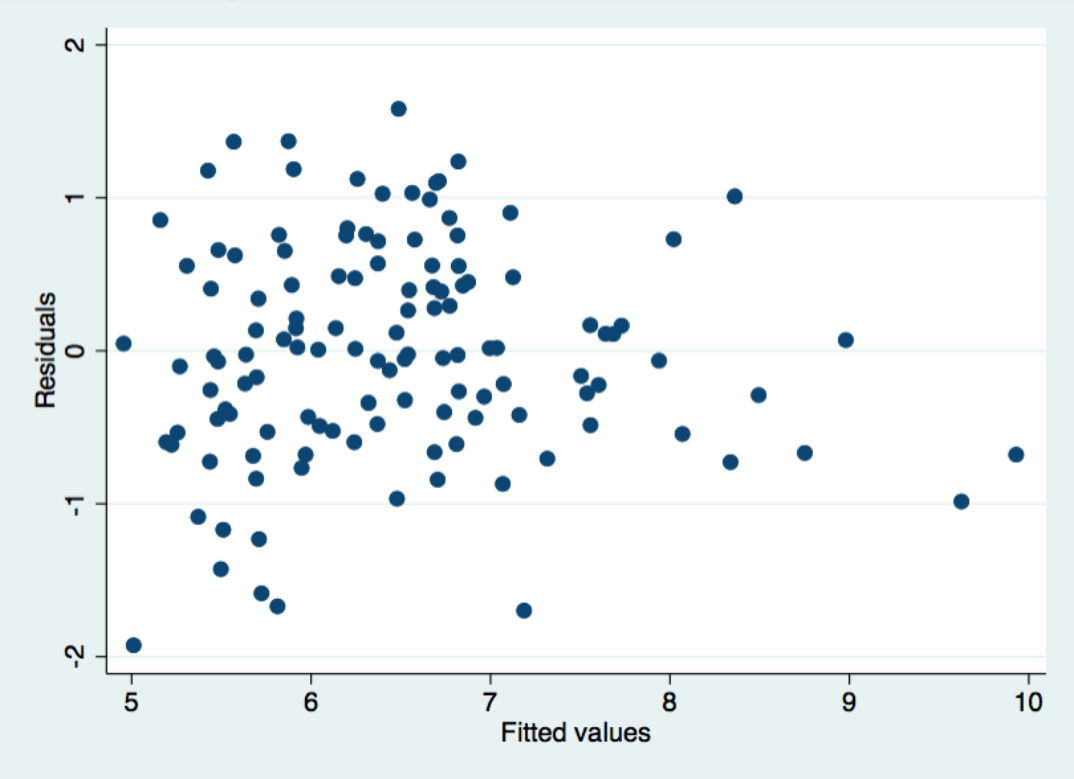
AMSTERDAM	DALLAS	KOBE	NASHVILLE	SEOUL
ATHENS	DELHI	KOLKATA	NEW YORK	SHANGHAI
ATLANTA	DENVER	KUALA LUMPUR	NINGBO	SHENYANG
AUCKLAND	DETROIT	KYOTO	NURNBERG	SHENZHEN
AUSTIN	DONGGUAN	LAS VEGAS	OSAKA	SINGAPORE
BALTIMORE	DUBAI	LISBON	OSLO	ST. LOUIS
BANGALORE	DUBLIN	LIVERPOOL	OTTAWA	STOCKHOLM
BANGKOK	EDMONTON	LONDON	PANAMA city	SUZHOU
BARCELONA	FRANKFURT	LOS ANGELES	PARIS	SYDNEY
BEIJING	FUZHOU	LYON	PHILADELPHIA	TAIPEI
BERLIN	GENEVA	MACAO	PHOENIX	TEL AVIV-Yafo
BOGOTA	GLASGOW	MADRID	PITTSBURGH	THE HAGUE
BOSTON	Göteborg	MANILA	PORTLAND	TIANJIN
BRISBANE	GUADALAJARA	MELBOURNE	PRAGUE	TOKYO
BRUSSELS	GUANGZHOU	MEMPHIS	PUEBLA	TORINO
BUDAPEST	HAMBURG	MEXICO city	QINGDAO	TORONTO
BUENOS AIRES	HANGZHOU	MIAMI	RIO DE JANEIRO	ULSAN
BUSAN	HEFEI	MILAN	ROME	VANCOUVER
CAIRO	HELSINKI	MILWAUKEE	ROTTERDAM	VIENNA
CALGARY	HO CHI MINH CITY	MINNEAPOLIS	SACRAMENTO	WARSAW
CAPE TOWN	HONG KONG	MINSK	Saint Petersburg	WASHINGTON
CHARLOTTE	HOUSTON	MONTERREY	SAN ANTONIO	WELLINGTON
CHENGDU	HSINCHU	Montréal	SAN DIEGO	WENZHOU
CHICAGO	INDIANAPOLIS	MOSCOW	SAN FRANCISCO	WINNIPEG
CHONGQING	ISTANBUL	MUMBAI	SAN JOSE	WUHAN
CINCINNATI	JAKARTA	MUNICH	SANTIAGO	XIAMEN
CLEVELAND	JERUSALEM	NAGOYA	São Paulo	XI'AN
COLUMBUS	JOHANNESBURG	NANCHANG	SAPPORO	YANGZHOU
COPENHAGEN	KAOHSIUNG	NANJING	SEATTLE	YOKOHAMA
DALIAN	KAWASAKI	NAPLES	SENDAI	ZURICH

Annex 3 General study OLS Assumption tests graphs

1. Skewness of dependent variable. The average FDI value is highly skewed to the right, however, after logarithm, the value is more normally distributed (see graphs below).



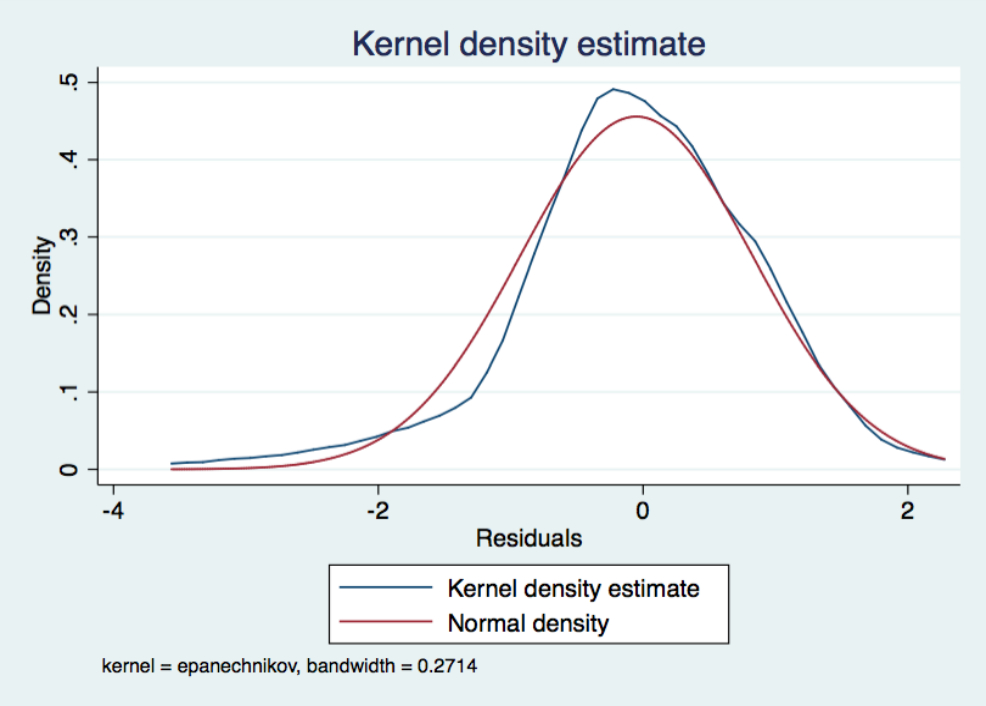
2. Heteroscedasticity test. The residuals are heteroscedastic based on the graph and Breusch-Pagan / Cook-Weisberg test.



Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of log_AvrFDIvalue

chi2(1) = 2.31
Prob > chi2 = 0.1285

3. Normality of residuals.

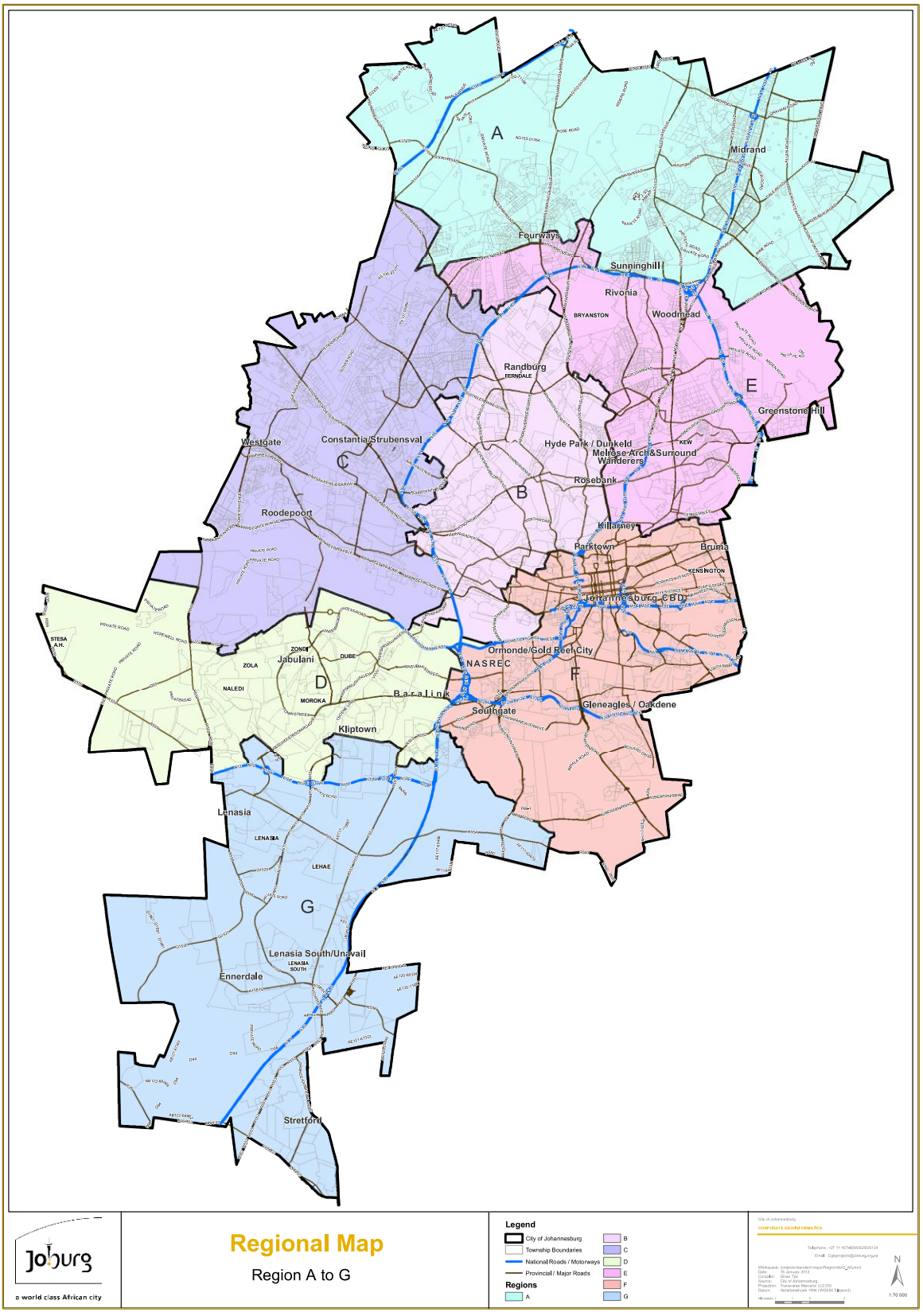


4. Summary of results using “outreg2” command

VARIABLES	(1) log_AvrFDIvalue
GDP	1.167*
	(0.69)
RealEconomicGrowthRate5Yea	4.753***
	(0.67)
IndustryStructure	3.655***
	(1.27)
WaterTransportation	0.817**
	(0.34)
logairtransport	0.239**
	(0.10)
EmploymentRate	-0.795
	(1.28)
StatusofTalent	-0.236
	(0.55)
Tradeopen_ctry	0.00812***
	(0.00)
AbilityforInnovation	0.164
	(0.81)
SocialManagement	-0.832
	(0.68)
NaturalEnvironment	0.472
	(0.55)
ShoppingEnvironment	1.359*
	(0.73)
DiningRestaurant	-0.336
	(0.75)
CultureEntertainment	0.851
	(0.63)
Constant	2.785*
	(1.51)
Observations	125
R-squared	0.635

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Annex 4 Regional map of Johannesburg



(Source: City of Joburg, available at: https://www.joburg.org.za/about_/regions/Pages/City-of-Johannesburg-regions.aspx, accessed on 26-08-2018)