Quantifying Urban Inequality: An Investigation of the Wicked Problems of Gentrification

Kate Trigg
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Abstract:

Gentrification, a process conceived to result in displacement of lower-income urban residents, is difficult to measure quantitatively due to its qualitative, social impacts. Additionally, the phenomenon is a wicked problem, with no decisive definition or a set list of causes. Whereas researchers have instigated attempts to numerically measure gentrification, there is a lack of a systematic and universal approach to evaluate the concept. To investigate this issue, an iterative process took place using gentrification theory and explorative work. A test index was created using the inner boroughs of the UK’s capital, London, aiming to use data which should be available within all cities. Indicators for the index based on the two main theories of gentrification were attained for three different time periods from governmental and census records, creating a longitudinal study to establish how an area has changed, and whether gentrification has occurred. The technique presents evidence of increasing socio-economic status within many of London’s inner boroughs, with evidence of rising employment rates, house prices and managerial role residents. The highest scoring boroughs were areas considered to be undergoing super-gentrification. From the index, the next borough to super-gentrify will be Hammersmith & Fulham. For first time gentrifying boroughs, their index changes sit within the middle of the borough rankings. It is believed that further analysis and advancements are required on the index to ensure prevention of data misuse, conclusive results, and further consideration of cultural, political or social changes, however new contributions have been made within this topic from considering gentrification from a wicked problem viewpoint.

Keywords: Sustainable Development; Urban Planning; Gentrification; London; Urban Inequality; Data Visualisation;

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Summary:

With the rapid rise of global urbanisation, the well-being of all city residents is more important than ever. One form of urban inequality present in many developed cities is gentrification, briefly defined as the displacement of lower-income residents. This concept is difficult to analyse as it falls into the group of wicked problems, which do not have a simple definition or solution. Whilst gentrification in numerous cities globally has been investigated, a universal approach to quantify the changes cities face is not yet present. This study aimed to investigate whether further insights can be provided with numerical data by creating an index combining information collected based on social and economic factors. The inner boroughs of London, UK were chosen for the test city. Evidence was found that many neighbourhoods are undergoing socioeconomic change, including the first-time gentrifying boroughs, but also the super-gentrifying boroughs which was an unexpected finding. Many of these boroughs are experiencing increasing employment rates, house prices and managerial role residents. However, the index requires further investigations to ensure that such a tool can be used to ensure that cities are accessible and liveable for all residents.

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1. Introduction

1.1. Urban Development and Inequality

In the era of urbanization, the dynamics of our cities and the health of their rapidly increasing inhabitants is more important than ever. In 2008, 54% of the world’s population were living in urban environments, with the quantity expected to rise to 66% by the halfway point of this century (Department of Economic and Social Affairs 2014), causing strains upon a range of sectors, including land use management, infrastructure, economics and public health.

In regard of these issues, and in preparation for last year’s third United Nations Conference on Housing and Sustainable Urban Development (Habitat III), the UN-Habitat created their 2016 World Cities Report. The report highlighted the issues and challenges that still face our urban environments, which are represented within the New Urban Agenda (hereafter NUA), with associated actions and efforts. As stated by the agency’s Under-Secretary-General Joan Clos, “The New Urban Agenda should adopt a city-wide approach to development with concrete actions, setting out clear funding mechanisms and effective means of implementation and monitoring” (UN-Habitat 2016d p.v).

Of the numerous and varied problems cities face in the upcoming decades, the widening divide of resident equality within cities has become an emerging challenge (UN-Habitat 2016d p.5). The exclusion and displacement of people is a main concern, relating to access to services, jobs, public space and available opportunities. In particular, an issue that is universally troublesome to cities is the increase of income inequality, where two thirds of the world’s cities are now less equal than in 1980 (UN-Habitat & CAF 2014). Whereas many examples of inequality originate from the developing world, the rich/poor divide is also present in many Western regions. For OECD countries, the average Gini coefficient (a method of representing the distribution of income within a nation) increased by 0.02 to 0.316 in 2010 over a 25-year time span (OECD 2014). Inequality issues were raised within the draft NUA as the first shared vision, stating:

“11. We share a vision of cities for all, referring to the equal use and enjoyment of cities and human settlements, seeking to promote inclusivity and ensure that all inhabitants, of present and future generations, without discrimination of any kind, are able to inhabit and produce just, safe, healthy, accessible, affordable, resilient and sustainable cities and human settlements to foster prosperity and quality of life for all.” (United Nations 2016, p.3)

From an urban context, these aspects can be related to the Sustainable Development Goals 10 (Reduce inequality within and among countries) and 11 (Make cities and human settlements inclusive, safe, resilient and sustainable), which were adopted by all UN Nations in September 2015 (United Nations, 2015).

In addition to widening income inequality, citizens of our global cities are also burdened by segregated access to amenities within the city. The urban processes that today dominate much of our worldwide cities focus on boosting economic fortune and creating an attractive city, however many services and opportunities are inaccessible to those within lower-income groups. There are mandatory elements that are necessary for a city to be liveable, including adequate housing, public space, infrastructure and positive social interrelationships (Wheeler 2013). On a fundamental level, the first element of shelter is considered a core, physiological requirement for human survival on this planet, along with nutrition and air (Maslow 1943). Whereas these necessities should always be considered in city-wide plans, they have often been excluded for the gains of those in power, whether this may be governmental stakeholders or wealthy investors (Flyvbjerg 2002; UN-Habitat 2016c). This imbalance often causes exponential inequalities, which is leading to spatial and socioeconomic exclusion represented with poorer education accessibility, lower wages and increasing house prices and rents (UN-Habitat 2016b). These inequalities are often observed in the form of gentrification displacement.
Concepts related to gentrification have been documented over the past 100 years, however the term was coined by sociologist Ruth Glass when documenting the changing residential landscape of the UK’s capital, London, stating:

"One by one, many of the working class quarters have been invaded by the middle class ... Once this process of ‘gentrification’ starts in a district it goes on rapidly until all or most of the working class occupiers are displaced and the whole social character of the district is changed" (Glass 1964 p.xvii)

The terms ‘gentrification’ and ‘Sustainable Development’ have terminological similarities as they both lack universally accepted definitions and so with additional characteristics, can both be considered as wicked problems that do not have a simple or collective solution (Rittel & Webber, 1973). Another factor of wicked problems is that one problem is frequently a symptom of another wicked problem (ibid); this is the case for gentrification, which sits under the umbrella of Sustainable Urban Development with many other difficult issues as these effect many people with various mind-sets and worldviews.

A universal definition of the concept is troublesome to provide, with the effects of gentrification being relative to its formulation. However, for comprehensiveness, the definition used for this thesis will be taken from the work of Hamnett stating that gentrification is a “physical, economic, social and cultural phenomenon” involving the “invasion by middle-class or higher-income groups in previously working-class neighbourhoods” causing “the replacement or displacement of many of the original occupants”, whilst also involving the “physical renovation or rehabilitation of what was frequently a highly deteriorated housing stock and its upgrading to meet the requirements of its new owners” (Hamnett 1984 p.282).

While the causes and definition of gentrification are not unanimously clear, there is more consensus related to the effects (Brown-Saracino 2010). There are both positive and negative consequences due to this complex and sensitive issue, and the opinions of the concept often vary due to the ideologies or educational discipline of the researcher (Yazdani 2012). However, due to the worldviews of the individuals involved in urban redevelopment decisions (Rittel & Webber 1973), the undesirable processes over time do not affect those in power (Atkinson 2000a).

There have been numerous reports written on the topic of gentrification without providing any suggestions or solutions for the problems. These authors are instead descriptive of the problem, rather than prescriptive in the possible strategies for a resolution. In the context of wicked problems, Rittel and Webber stated this as where “many parties are equally equipped, interested and/or entitled to judge the solutions...none has the power to set formal decision rules to determine correctness” (Rittel & Webber 1973, p.163).

It is also hard to measure the gentrification of a city or region as there are many metrics and constraints that can be applied. Time is one metric that can be problematic, as it is hard to state a time in a city’s history that is the reference point for the gentrification of the area. Wicked problems in general have the tendency to be challenging to investigate due to multitudes of limitations not only relevant to time, but to scope and to methods. Whereas any mode of investigation will succumb to the wickedness of the issue, this should not be a deterring factor, but one that the author should be aware of during the thesis.

In recent years there has been an increase in attempts to measure and visualise the impact of gentrification within cities. The Center for Community Innovation collected a vast array of information surrounding the San Francisco Bay Area related to neighbourhood incomes, transport facilities and amenities, however many arbitrary decisions make the results questionable (Center for Community Innovation 2009). A similar method was used in 2014 by the Voorhees Center to represent the socioeconomic change of Chicago’s neighbourhoods between 1970 and 2010, creating an index score and a community typology for the city (Voorhees Center 2014). Whereas in this
instance the data was correlated, the number of indicators was low, and mainly focused upon demographic information. There have also been more unorthodox methods to try and measure the “notoriously slippery concept” including combining Indices of Multiple Deprivation with social media data (Hristova et al. 2016) and comparing heat maps of quantities of cafes and fried chicken shops against house prices (Floy 2015; Murphy 2016).

There, however, appears to be a lack of a systematic and universal approach to evaluate the level of gentrification in urban areas that considers and combines numerous statistics of a city to provide an interdisciplinary overview of the impacts on the region – good and bad (U.S. National Research Council, 2003). The collection and use of data to enhance city planning has also recently been advocated in the NUA in §158-160. The sections highlight the importance of statistic capacities in transparent decision making (§158), a demand for improved capacity of knowledge sharing in national, sub-national and local governments (§159) and the promotion of open and user-friendly data platforms for effective urban planning and management (§160). By investigating and implementing data visualisation to create a gentrification index, it would be anticipated that this method could be replicated and applied to many cities facing urban inequality issues. Subsequently, this could enable more transparent decision making on this problem and bring these issues to a global debate (United Nations, 2016). Whereas the desired use of such an index would be to reduce urban inequality, pragmatically we should be aware of the hazards of creating a tool like this, especially when related to such a complex issue. Such an index may suggest that a solution to this issue can be solved with a ‘quick fix’, which is not possible for wicked problems – instead it should be used as a support for solutions.

When choosing a test city for the index, the study will use the inner boroughs of London, where Glass’ observations of gentrification were first made and provided a context that several other reports have been based upon. For residents of the city, gentrification is a well-known, on-going and commonly discussed process, with high awareness of the urban development and upgrading of specific areas that were originally considered run-down and undesirable such as Shoreditch, Dalston and Peckham. For these areas, the mock concept of “Shoreditchification” is applied where the regeneration is fuelled by middle and creative class hipsters and trend hunters moving in to ‘up and coming’ areas (Florida 2003; Proud 2014). London is also home to a wider discourse on inequality and gentrification in academic literature (Atkinson 2000b; Butler & Robson 2001; Hamnett 2003). The concept super-gentrification is even considered, where an area that was once gentrified, is now becoming gentrified by a new wave of individuals, who are generally associated with the financial sector (Lees 2000; Batty 2016).

1.2. Aim and Scope

The overarching aim of this thesis is to investigate the potential of gaining conclusions relevant to decision making on wicked problems by using quantitative methods and data visualisation. This thesis more specifically aims to answer the following research questions:

- How can the extent of gentrification, that has occurred in an area, be evaluated numerically and what are the implications?
- Can production/consumption drivers of gentrification be observed using quantitative analyses of London borough information?

In line with the NUA and its aim to reduce urban inequality, a framework or tool, could be applied to city neighbourhoods or boroughs, that are suspected to be gentrifying, allowing for numerous aspects of the urban environment to be considered and examined simultaneously for improvement. The target group for such an instrument would be associations or agencies interested in eradicating urban inequality and helping households that are at risk of displacement. The data from the tool would provide concrete data to assess a city’s gentrification, creating awareness on the issue and encouraging a change of processes to incite sustainable urban equality.
The thesis aims to investigate and develop a gentrification index that will consider multiple changes occurring in a city over a certain time period. This index framework will be applied to the inner boroughs of London, United Kingdom as a test city due to its importance in the history of gentrification, the quantity of academic literature on the city, and the availability of data on the area and its inhabitants.

Within this thesis, the work will focus on urban gentrification as a whole with the traditional viewpoint of the class of gentrifiers being considered, which is traditionally connected to an individual’s income and occupation. Literature in this area has refined to also include female gentrifiers (Bondi 1991; Lyons 1996), gay gentrifiers (Castells 1983; Seitz 2015) and also black or Chinese gentrification (Taylor 1992; Ley 1995), however, these precise examples of this concept will not be examined within this version of the index.

1.3. Disposition
The thesis will begin with a literature review of the previous studies of urban gentrification, focusing on the main two theories of the concept and the phenomenon within London. Additionally, the aspect of quantifying qualitative aspects within gentrification shall be investigated. Next, indicators that act as proxy measurements for gentrification will be discussed based on the two gentrification theories. This will be followed by the methodology of the index, its timescales and size of study size. The findings and results of this index will then be presented and analysed, followed by a discussion with reflections on the index and the process used. The thesis will then be concluded with overall findings on the topic considering the index’s relevance and potential future usage.

2. Background
2.1. Research Overview
Gentrification has become a hot topic globally gaining increasing media attention, however it is far from a new phenomenon, and is “much older than Ruth Glass” (Osman 2016 p.215). Whilst historically it is considered that there is little examination on the concept, there are blurred suggestions that gentrification took place as early as 200 AD in Roman Britain or as far back as Ancient Greece (Parkins & Smith, 1998 p.197; Philip Jacks 2008). The earliest examples of gentrification in a similar template to what we see today however date back to New York in 1922. In this year, Greenwich Village creatives complained about estate agents and wealthier residents pushing them out of the area into Brooklyn (which would later itself become a hotspot of gentrification activity). The greed of landlords was criticised at the time, yet it was not illegal to raise prices of accommodation or to let anybody live in a specific building/area (New York Times, 1922). Similar events from this era also occurred within New Orleans, Boston and Charleston (Osman, 2016).

Since Glass’ invention of the phrase and her essay listing the negative impacts of gentrification on London, the concept has been applied to numerous cities across the globe. Later within the mid-1900s, Jane Jacobs attacked the theories of city planners, which had been redeveloping our cities, within her influential The Death and Life of Great American Cities. Jacobs discussed how planners should focus on how cities actually work compared to what they have been taught works within their education, and states four factors that have produced declining and poor performing cities: reduction of diversity within economically successful districts, which results also in massive single elements, population instabilities causing restrictions to diversity growth and the cataclysmic effects of public and private money (Jacobs 1961). These factors all have connections to the factors and causes resulting in gentrification.

In the decades that followed, the “urban renaissance” (Lees 2003b) fuelled by wealthy investors with their demands prioritised, was favoured over the pursuit of deliberative democracy and the common

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1 For those interested in the sub-categories of gentrification and the characteristics of gentrifiers, Lees’ reappraisal of gentrification is a sound introduction to the topic (2000).
good, benefitting a wider community (Flyvbjerg 2002; Glynn 2009; Dahl & Soss 2014). Deliberative democracy, a horizontal theory of negating the disadvantages of representative democracy, involves and engages citizens within decision making. As Smith states, “democratic deliberation encourages mutual recognition and respect and is orientated toward shared understanding and the public recognition of the common good” (Smith 2003 p.63). Today however, in the words of Flyvbjerg, “Rational, deliberative democracy gave way to premodern, tribalistic rule by the strongest. Distorted relations of power produced a distorted project” (2002 p.360). With these distortions, plans that can improve the quality of life for those with lower wealth or control are reduced to the bottom of the pile (UN-Habitat 2016c).

Gentrification has been given several different definitions since its formation, which can be explained by the lack of consensus based upon the causes of gentrification (Petrovic 2007). Freeman portrays this strikingly in There Goes the ‘Hood saying “The significant gaps in our understanding of gentrification persists despite a voluminous literature developed over several decades … this chaos results from the different manifestations of gentrification and its differing ways of impacting people in its wake” (2006 p.3).

Urban redevelopment and investments can also be seen as positive properties of gentrification. Examples include the prevention of property dilapidation, lower crime rates and eliminated overcrowding in areas that are socio-economically weaker and that are seen as a potential for urban regeneration (Yazdani 2012). However, these advantages only benefit the new and remaining residents. The displaced, accompanied by the issues that resided in these locations are just pushed to another area, often moving to inferior accommodation and receiving minimal compensation (Hamnett & Williams 1980; Atkinson 2000b; Glynn 2009). Secondary effects can also include the evaporation of local business, and weakened connections within the community and families (Glynn 2009).

Within urban gentrification there are many forms and culprits of the phenomenon over the past century and in different countries. These include social exclusion, changes in consumption, mortgage lending shifts and disagreements on public space and citizenship. Additionally, these causes are integrated into numerous sub-fields including urban and housing policy, sociology and economy (Lees, Slater & Wyly 2007). With such varied causes and fields, this emphasises the wicked problems of social development in a globalised era. Where there may be some unanimous features, the characteristics that set cities apart is also important to analyse (Lees 2000; Brown-Saracino 2010).

When considering the cause of gentrification, over the past thirty years many academic authors have fallen on either one side of a sociological fence, with both theories originating from human geographers. One concentrates on gentrification as an economic process known as production-side theory, whereas the counter considers the concept from a social approach called consumption-side theory. These theories are often referred to as supply or rent-gap (production) and demand or value gap (consumption) theories interchangeably (Smith 1987; Hamnett 1991; Ley 1997; Franken 2005).

Another theory splits the causes of gentrification into five more precise socio-economic factors (Palen & London 1984). This theory however has not gained a following compared to production and demand-side theories, and is not investigated further in this thesis.

2.1.1. Production-side Theory

Production-side theory was first considered in research by Neil Smith in 1986, with the ‘Rent Gap Theory’ being a core explanation for this model. Within this structure, the major culprits of gentrification are investment flows related to urban space formation (Smith 1987; Smith & Williams 1986; Wang & Lau 2009).

The rent gap appears after the initial expansion of cities to suburban areas, which was driven partly by the inexpensive cost of this land outside of the city, in addition to changed mobility patterns, the growing middle class and planning ideals. As people moved out of the inner regions, this lead to
neglected properties in the city centres, resulting in devalued properties and rents far lower than their potential values in best use. Therefore, an increasing disparity between the land values in cities compared to property values becomes apparent (Smith 1987; Hamnett 2003). Once this gap is wide enough, investors and developers move in to these areas to capitalise on these gaps increasing housing prices and rents, resulting in displacement of existing tenants and residents (Smith & Williams 1986; Franzén 2005; Hochstenbach, Musterd & Teernstra 2015).

Simultaneously, the rise of housing prices and rent should be understood in relation to the reduced rise of wages due to global competition. This leads to lower-income city residents in more public-sector and labour employment being pushed out to peripheries of cities. In addition to the uncertainty and psychological effects this has on these residents, this displacement could also affect activities related to this labour (Hamnett & Williams 1980; UN-Habitat 2016b).

The discussed aspects are closely intertwined with neoliberalism, a concept that is frequently associated with gentrification (Hammel & Wyly 1996; Glynn 2009; Hedin, Clark, Lundholm, et al. 2012). Simply put: “Gentrification is the leading edge of neoliberal urbanism” (Lees, Slater & Wyly 2007). Neoliberalism has fuelled many policies within capitalist driven states, encouraging privatisation, free trade and increasing roles for private sectors reducing the need of government funding. Again, this provides further power to businesses and produces a “dispossession of common rights”, with a commitment more fixed to the markets’ welfare than the well-being of people (Hammel & Wyly 1996; Harvey 2007). From a housing perspective, this has resulted in poorer individuals being restricted from accessing adequate housing, with their needs not being considered (Hodkinson 2009; Hedin, Clark, Lundholm, et al. 2012; UN-Habitat 2016a).

Since the era of Thatcherism, the British Government housing has become considered a commodity rather than the shelter and physiological requirement for human survival (Glynn 2009). The commodification of housing has been raised on a global scale this year by the UN’s Special Rapporteur on adequate housing, who has condemned the expanding role of financial corporations on the housing market, using homes as financial instruments, resulting in empty residences, sometimes in house-scarce regions (United Nations, 2017).

Advancing on the housing commodification, with the housing crisis of the later 2000s, there is an extreme lack of trust towards the housing market (UN-Habitat 2016a). An additional side effect still being felt today was the disregard of social housing, which lost over 2 million units via the Right to Buy scheme, an act passed in Thatcher’s Britain which allowed residents of social houses the legal right to buy the houses they lived in at a discounted price (Glynn 2009; Whitehead 2014).

Whereas connected to a Swedish context, Clark and Johnson detail interrelated consequences caused by the changes in the country’s housing policy following a neoliberalisation since the early 1990s, which can be associated to effects also resonating in the UK. These factors include:

- Decline in new production
- Public housing companies operating increasingly on market terms (increased exclusion of the poor)
- Segregation: super-gentrification and slum formation
- Privatisation and out-sourcing of planning (Clark & Johnson, 2009)

Whereas many still advocate this model of gentrification, arguments have been raised against the rent gap element of the Production-side theory. First, the move to suburban areas was common practice, causing far more rent gap instances than gentrified areas (Beauregard, 1986). Additionally, this theory is only relevant to the form of gentrification where developers enter an abandoned area and completely transform it. This differs from other gentrification transformations where a steady stream of middle class families enter a neighbourhood and slowly renovate residences (Munt 1987).
2.1.2. Consumption-side Theory
Consumption-side theory on the other hand focuses on the change of social status and the demographics of the individuals moving into gentrifying areas. Whereas it could be argued that Glass’ definition of gentrification would fall into this category (Barton & Gruner 2016), David Ley was the first geographer to argue that gentrification required “a prior grasp of wide-ranging processes of change in society itself” (1980). Ley formulated the theory using six Canadian cities as his case study, focusing on the demands of a “new middle class” in a post-industrial, postmodern society (1997). These pioneering individuals differ from the generation they are succeeding as they do not want to reside in the suburbs and desire to live within cities that promote diversity with other contemporaries (Lees, Slater & Wylie 2007; Hochstenbach, Musterd & Teernstra 2015). This group is also discussed by Richard Florida, where he refers to this new group as ‘the new creative class’ who are positive for successful urban development and integral for the economic growth of today’s city with their “Technology, Talent and Tolerance” (2003).

The creative class expanded largely due to shifts in city employment, with a swing from manufacturing and labour positions, to service related occupations in financial, media and creative sectors (Lees, Slater & Wylie 2007; Savills 2014). An additional factor was the rise of managerial positions (Hamnett 2003). This resulted in an increasing number of middle class individuals, and a reduction of working class members of society. In turn, this caused changes and pressures within neighbourhoods and housing markets in major cities. Other reasons for an increase of gentrification originate from demographic shifts including more women in the workplace resulting in both partners in the household working (Rose 1989), as well as changing household compositions. Examples include increases in single dwellers who have larger opportunities to meet others in the inner city than the suburb (Beauregard 1986) and a rise in homosexual couples moving into the same neighbourhoods generating liberating acceptance, yet displacing minority neighbourhoods (Castells 1983; Rothenburg 1995). Collated, these shifts caused a change in rationale when considering land use and urban regeneration, which could not be explained purely by house market dynamics (Ley 1997). It should be noted that this is Ley’s main point on the aspects of housing markets and urban land, considering these are reinforcements within the gentrification process instead of key elements (Hamnett 1991). From this consumption-side viewpoint, the change of demographics and consumption and lifestyle from this class group are responsible for gentrification (ibid; Hamnett 2003; Wang & Lau 2009). Put simply, “[g]entrification without gentrifiers does not exist” (Hamnett 1991).

When considering UK gentrification from this viewpoint, there have been certain changes in society that match Ley’s theory. The UK’s manufacturing industry has been declining since the 1960s, with the industry accounting for roughly 30% of the country’s economy in 1970 to only 9.7% in 2014 (Parliament. House of Commons 2015), with many large companies moving their factories to countries with lower labour costs. The majority of the UK’s economy is now accounted by the service industry, totalling to almost 80% within a range of career areas such as finance, IT, architecture and consultation (Cadman 2016).

While Smith noted the prominent consumer-side theory aspects within his own work, he felt these were more secondary effects and the results of production-side theory than a responsible factor (Smith & Williams 1986). Beauregard (1990) additionally warned about putting the sole blame on the young professionals (or yuppies) moving into an area by stating “To attribute gentrification solely to yuppies is to eliminate quite complex processes and to shift the burden of the negative consequences of gentrification away from factions of capital (for example, developers) who often are responsible.”

2.1.3. Hybrid Theories and Criticisms
Whereas many authors and their opinions on causes of gentrification normally fall within one theory, in recent decades some experts have stated that to strengthen the understanding of gentrification, both theories should be synthesised to complement one another (Lyons 1996; Franzén 2005). Hamnett relates this to the fable of the blind men and the elephant, stating that the major theories should be
considered as complimenting perspectives of the elephant that is gentrification, which by themselves are not sufficient (1991). In a later article, when discussing the importance of combining the theories, Hamnett demanded “recognition of the importance of chances in the economic base and the class structure of cities in the transition from industrialism to post-industrialism” (Hamnett 2003 p.2403). Munt argued that the two main factors at the root of gentrification were the de-industrialisation of the city and the changing demands of the middle classes, taking important aspects from both main theories (1987). Even Lees, who is a strong advocate of the consumption-side theory, in her later works notes that that gentrification is driven in some percentage by investment flows (Lees 2000).

Whereas many academics are now synthesising the two theories, some researchers feel that gentrification is too complex a problem to theorise. Criticisms include the lack of considering gentrification as a more heterogeneous process, where the differences of gentrification cases should be considered on a case by case logic (Butler & Robson 2001; Brown-Saracino 2010). Butler & Lees also back this by stating that due to the huge metropolitan areas of some of the more commonly researched cities such as New York, London and Paris, it is difficult to collate the findings from these cities to smaller cities of the world (2006).

What is interesting within this review is that many authors’ opinions on which theory is more suitable fluctuate and sway. As discussed previously, to formulate a complete definition of gentrification is essentially impossible, suggesting the concept’s wickedness (Rittel & Webber 1973). As a framework for this study however, both theories will be considered to propose a bridging of perspectives.

2.2. London and Gentrification

Similar to the North American cities of New York, Philadelphia and San Francisco, London is often referred to as a ‘textbook’ example of urban gentrification, frequently used as a case study city in gentrification articles.

Glass’ seminal essay contains many observations of the evolving London residential landscape including the increasing demand for metropolitan accommodation, rising rents and housing prices and limited space (Glass, 1964). Many of the issues raised are still apparent in twenty-first century London. At the end of 2016, the average cost for a London home was £473,073 compared to the UK average of £205,937 (Monaghan 2016). There are also the bizarre rental adverts promoting cupboards in flats for £500 per calendar month and ‘bright and airy one bedroom’ homes which are sheds in gardens of residents (Time Out London 2014). These stories, which feel more like urban myths than fact strongly resonate with Glass’ lament of people being crammed into badly-designed small living areas and having to “pay exorbitant rents for the privilege” (1964).

In post-war London, relocation to suburbs and expanded towns outside the city were encouraged by governmental policies such as the Greater London Plan in 1944 and the 1952 New Town Development Act (Lees, Slater & Wyly 2007). Yet in the following decade, the movement of middle-class ‘pioneers’ returning to large Georgian and Victorian built houses began (Munt 1987; Hamnett 1991). Generations previously, the class group had abandoned such buildings for the once more desirable location of the city periphery, so these residences became home to working class populations in the core of the city (Robson 1969; Timms 1975). However, in the 1960s, the middle class began to return to these areas to purchase these well-built and aesthetically pleasing accommodations (Hamnett 2003). Working class wards close to existing, upmarket areas such as Hampstead and Westminster also became gentrified (Hamnett & Williams 1980). From the 1980s to the new millennium, London’s population began to rocket and the economic fortunes improved. At the beginning of this period, many inner London boroughs were still considered as some of the most deprived and disadvantaged urban districts based upon deprivation data, such as Tower Hamlets and Hackney (Fenton 2016). However due to an increasing economy and an influx of residents, these boroughs started transforming. This also resulted in larger social mixing within these boroughs, however from interviews conducted by Butler and Robson, there are minimal interactions between
these culturally different groups, causing a ‘tectonic aspect’ in these boroughs, which can be problematic (2001; Lees 2000).

From a literature review of papers concentrating on London, a map of the first time a borough is referenced as being or becoming gentrified is presented in Fig. 1, followed by a table listing the data’s sources.

![Fig. 1. Visualisation of first mention of gentrification in London boroughs](image)

<table>
<thead>
<tr>
<th>Boroughs</th>
<th>Decade where Gentrification is first mentioned in literature/media</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of London</td>
<td>1970</td>
<td>Munt, 1987</td>
</tr>
<tr>
<td>Camden</td>
<td>1960</td>
<td>Hamnett and Williams, 1980</td>
</tr>
<tr>
<td>Greenwich</td>
<td>1960</td>
<td>Hamnett and Williams, 1980</td>
</tr>
<tr>
<td>Hackney</td>
<td>2000</td>
<td>Owen, 2015</td>
</tr>
<tr>
<td>Hammersmith and Fulham</td>
<td>1970</td>
<td>Hamnett and Williams, 1980</td>
</tr>
<tr>
<td>Islington</td>
<td>1960</td>
<td>Hamnett and Williams, 1980</td>
</tr>
<tr>
<td>Kensington and Chelsea</td>
<td>1960</td>
<td>Glass, 1964</td>
</tr>
<tr>
<td>Lambeth</td>
<td>1990</td>
<td>Keddie, 2014</td>
</tr>
<tr>
<td>Lewisham</td>
<td>2010</td>
<td>Jones, 2016</td>
</tr>
<tr>
<td>Southwark</td>
<td>1980</td>
<td>Keddie, 2014</td>
</tr>
</tbody>
</table>
Table 1. Sources of first mention of gentrification in London boroughs

<table>
<thead>
<tr>
<th>Boroughs</th>
<th>Decade where Gentrification is first mentioned in literature/media</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tower Hamlets</td>
<td>2000</td>
<td>Owen, 2015</td>
</tr>
<tr>
<td>Wandsworth</td>
<td>1960</td>
<td>Hamnett and Williams, 1980</td>
</tr>
<tr>
<td>Westminster</td>
<td>1960</td>
<td>Glass, 1964</td>
</tr>
</tbody>
</table>

Evidently, gentrification in London was initially concentrated within Western city boroughs with Greenwich as an anomaly (presumably due to its connection to royal history and cultural importance), before then moving to the less desirable districts that were originally dockland areas such as areas in Tower Hamlets and Southwark. Glass’ (1964) suspicion that “...any district in or near London, however dingy or unfashionable before, is likely to become expensive; and London may quite soon be a city which illustrates the principle of the survival of … financially fittest” became true.

On the map there is an East/West divide, which is still discussed today and that originated from the concentration of poverty reduction in the Western boroughs, causing a sharp contrast between the two regions (Glass 1964; Hamnett 2003). Nowadays however, whereas house prices may still differ, housing investments are taking place on both sides of London, creating a regenerating city.

Whereas some areas of London are experiencing their first wave of gentrification, many areas that are considered upper class are experiencing their own form of displacement, where the old school, middle class gentrifiers are now becoming displaced by individuals in a higher economic class to them. This has been defined as super-gentrification, conceived by Lees originally to describe the observed change of residents within Brooklyn in New York and Barnsbury in London (Lees 2003a; Butler & Lees 2006). This new breed of super rich gentrifiers are funded mainly from the corporate finance sector, with many originating from the Middle East and Asia, placing monetary and housing pressures on the class below (Batty 2016).

This super-gentrification has caused many inhabitants of Islington, Westminster and Kensington & Chelsea to have to move to southern and eastern boroughs, which in turn increases neighbourhood prices that affect average income dwellers. Whereas the money of highly wealthy London investors was meant to ‘trickle down’ to benefit the city as whole, instead the result has been further displacements and reduced affordability (ibid 2016).

London is a truly global city with magnificent architecture, culture and events, however it is slowly becoming a rich man’s city (Bambrough 2016). Such socioeconomic polarisation within the British capital – how some can live in poverty when others can buy million pound properties and leave them unoccupied – supports the overarching goals of the NUA to ensure reduced inequality within our global cities.

2.3. Quantifying the Qualitative
For a large number of studies on gentrification, one main method used to collect results regarding the change and displacement within an area is the qualitative approach of interviewing residents (Castells 1983; Rothenburg 1995; Butler & Robson 2001). From these interviews, rich and unique information of a location can be discovered and analysed, however the findings cannot be generalised over a broad population or concept (Steckler et al. 1992). At its core, the effects of gentrification can too easily be dismissed as ‘soft’, speculative results without addressing the potential patterns entailed. This is one reason why some researchers began more quantitative overviews of city data.

It has been discussed that the various methods and methodologies that have been used to identify and investigate gentrification result in different conceptualisations and scopes of the phenomena (Lees,
Slater & Wyly 2007; Barton & Gruner 2016). The biggest difference when comparing methods is scale, and this is often due to the academic’s favoured theory. Author’s that favour the consumption-side theory focus on responses from interviews and surveys, resulting in insights from an individual gentrifiers’ perspective. Butler & Robson investigated gentrification patterns in inner London by executing semi-structured in-depth interviews with 75 gentrifiers (2001), whereas Wang & Lau used a survey focused on professional employees within Shanghai’s two main business districts and the city’s core to learn about their income, residential distribution and the city’s new middle class (2009). There are however disadvantages to using empirical qualitative research. Atkinson provides an example related to ethnographic methods where respondents within a survey may not consider themselves as displaced by gentrification (2000).

Productive-side theorists on the other hand are more concerned with the overarching changes occurring within a society, collecting gentrifiers in a ‘one size fits all’ group. In this instance, more quantitative aspects are then used, such as analysing census data from the city. In 1980, Hamnett and Williams used data based on economically active males in managerial and professional categories from the 1961, 1966 and 1971 UK Censuses to investigate the social change in London boroughs, suggesting that a “middle-class recolonization of inner-city areas” occurred. Atkinson took this to another level by attempting to measure gentrification-induced displacement with Census data from 1981 and 1991 focussing on seven variables – working class, unskilled labour, households privately renting, ethnicity, unemployment, elderly and lone parent (2000a). From the descriptions, it can be seen that quantitative research predominantly used data provided from population Censuses focussing on the housing tenure and the occupations of residents within an area, ignoring changes to the social character (Barton & Gruner 2016).

In the past decade, additional quantitative factors derived from alternative sources have been incorporated into gentrification studies with data from national surveys. Examples originate from both sides of the Atlantic, ranging from mapping social media check-ins on Foursquare and Twitter against Indices of Multiple Deprivation to analyse social diversity in an area (Hristova, Williams, Musolesi, et al. 2016) to comparing the quantities of cafés and coffee shops in areas against house prices and gang crime (Floy 2015; Papachristos et al. 2011).

Additionally, there have been advancements within quantitative gentrification studies, with attempts to provide numerical values to gentrification. Two examples include the Gentrification Index created by the Nathalie P. Voorhees Center for Neighborhood and Community Improvement at the University of Illinois in Chicago (hereafter referred to as the Voorhees Center) and the the Early Warning Toolkit for gentrification susceptibility from the Center for Community Innovation (CCI) at UC-Berkeley.

In 2009, the CCI collected a vast array of information surrounding the San Francisco Bay Area from Census tracts. This, in addition to a discussion on transport facilities in the Bay was used to state nineteen factors that were considered to have encouraged gentrification in certain tracts in the 1990s, which included variables on local amenities, housing and demographics. The average San Francisco results for these variables were then compared to the property of each tract and then scored depending on whether the tract was above or below the average. From the total scores, the tract’s susceptibility to gentrification was stated.

A similar method was used in 2014 by the Voorhees Center to represent the socioeconomic change of Chicago’s neighbourhoods over a 40-year period, aiming to confirm which neighbourhoods have experienced gentrification. The 13 indicators for this method focused on demographic data, education and income. Depending on how a neighbourhood scored against the indicators, and how much it changed over the time period, the neighbourhood was grouped into a typology stating the class of the community and whether it had undergone gentrification (Voorhees Center 2014). Whereas the reasoning behind social status splits within the data are clear, the method of dividing the communities into specific typologies appears arbitrary.
When analysing gentrification, the concept has often been investigated with the viewpoint of analysing the demographic of the “gentrifier” – with a large amount of analysis and papers from the demand side, instead of combining factors from both theory aspects. Incorporating data from housing statistics and economic data includes supply factors to be considered numerically in conjunction. Within this thesis, it is aimed to incorporate empirical, numerical data from production and consumption side gentrification theories to provide an index that incorporates both viewpoints on the concept.

Here it should be noted that whereas data can be considered as maintaining “a veneer of scientistic objectivity”, its analysis allows for manipulations by its designer, then subjectivity by its spectators (Johnson 2015). This should be deliberated when implementing data collation and analysis.

3. Materials

3.1. Indicators of Gentrification

From the literature review and the core theories surrounding gentrification, the key base factors surrounding the concept were connected to social and economic aspects. Within these topics, 12 indicators were chosen for the exploration of a gentrification index, depicted in Fig. 2, providing examples of factors from both production-side and consumption-side theories and some that apply to both theories. Whereas many different properties could be considered as indicators, it was ensured that indicators did not overlap one another’s properties as this would provide no benefit to the accuracy of the index (Atkinson 2000b). Wherever possible, data percentages were used to provide an easier comparison between boroughs.

The reasoning behind selecting each indicator can be found below, with assumed correlations between specific indicators stated, and will be considered further within the discussion. The data used for all indicators was attained on the London Datastore website created by the Greater London Authority (hereafter the GLA). The site enables free access to valuable data on the capital and collates the data gathered from the GLA and numerous public sector organisations onto one site to provide a comprehensive and standardised dataset (Greater London Authority n.d.). How the data was used will be discussed within the next section. Furthermore, it can be assumed that some indicators will have a

![Fig. 2. Venn diagram providing a visual overview to indicators explored within the gentrification index](image)
form of linear relationship to one another, whether that be positive or negative, which is stated in the following sub-sections.

The indicators with their association to gentrification, their respective sources, units and the years the data was available from are summarised within Table 2 at the end of this section.

3.1.1. Percentage of economically active residents with NVQ4+

The relationship between education and gentrification has been investigated within London by Butler & Robson (2003) and Hamnett & Ramsden (2013) with associations found. The educational facilities in an area have been considered as an important factor of middle class gentrification in association with employment and housing markets. The tactic could be considered as that middle class parents want to ensure that their children also have the opportunity to become middle class with high level educations like their own (Butler & Robson 2003; Lees, Slater & Wily 2007). Additionally, from empirical studies in the form of qualitative interviews, it was considered that wealthier middle class residents of East London have pushed out lesser affluent residents from well-reviewed state schools, considered as a “dichotomization of schooling” (Butler, Hamnett & Ramsden 2013).

As a proxy for education, the percentage of children attending private school in a borough was intended to be used as an indicator, in a similar method to the Voorhees Center’s index for Chicago (2014). It was assumed that the more gentrified an area, the more possible it will be for borough inhabitants to pay for their children to receive a higher-quality education. This is also connected to literature stating that the more advantaged members of society will be open to a larger choice when choosing schools (Power et al. 2003). However, on a borough level, the main information available on education is based on examination results, which cannot be correlated with gentrification.

Instead, the percentage of economically active residents in a borough with a National Vocational Qualification of 4 or above (NVQ4+) will be compared. As education is an important aspect to families that are gentrifiers, it is expected that this significance is continued into further education. Therefore, a higher percentage of NVQ4+ educated residents would suggest a gentrified area. NVQs range from 1 to 5, with 1 being equivalent to a General Certificate of Secondary Education (shortened to GCSEs) and 5 a postgraduate degree. Compared to the framework for Higher Education Qualifications, an NVQ4 is representative to an undergraduate degree (GOV.UK 2017d). The data was collected by the ONS.

This indicator is expected to have a positive correlation with median gross annual pay and also the percentage of manager occupations as argued by Kerstein (1990).

3.1.2. Crime Rates

The influence of gentrification on crime rates is a heavily researched theme in relation to gentrification. Over the past two decades, crime in London has considerably dropped along with the UK in general, reaching its lowest rate since the 1980s in 2013 (Travis 2013). A similar pattern has been observed in many US towns over the past twenty years. Due to this societal change a report from the Furman Center at New York University discovered from analysing Census and American Community Survey data that once crime rates had lowered, there was a higher probability of higher-income residents moving into an area (Ellen, Horn & Reed 2016).

There is however a chicken and the egg causality element to this. Whereas there are articles and reports stating that the reduction in crime encourages gentrification (O’Sullivan 2005; Ellen, Horn & Reed 2016), others believe that gentrification helps the reduction of crime (McDonald 1986; Barton & Gruner 2016). One example is a hypothetical experiment, which used crime policy models to see how crime spreads within a region depending on whether a neighbourhood with high crime rates are situated next to a high income neighbourhood or a middle income neighbourhood. Results showed that removing economic segregation, and hypothetically positioning high crime regions next to prosperous regions, prevented a spread of crime into new areas (Roman 2013). Furthermore, not all
studies found a positive correlation between gentrification and reduction of crime, particularly related to gang crime and street robberies (Papachristos, et al. 2011; Smith 2014).

Neither Chicago’s nor San Francisco’s indexes include any connotation between crime and gentrification. The assumption for its exclusion would be that crime is a difficult, and potentially wicked indicator to include in already a troublesome subject. For this exploration, we will include crime data and follow the main journal claims that crime rates decrease when an area is gentrifying. We will however, dive deeper into these results to see how they have changed by borough.

Crime rates of offences per thousand populations were calculated by the Metropolitan Police Service and the Home Office. Data for the City of London is not included, because the Metropolitan Police do not monitor this area of the city because it has its own police force. Crime rates from the City of London police are not available, so will remain at null within the index results. There is a third police force in London, which is the British Transport Police that regulate the full rail network of England, Scotland and Wales and the London underground. Data from this force is also excluded as the statistics available for the capital are on a station by station basis, with open data only available for the past 24 months (British Transport Police 2017).

3.1.3. Percentage of residents aged 65+
Whereas lower income residents are the first group to be associated with gentrification displacement, another key demographic group are the elderly. Many individuals in the 65+ age group are dependent on fixed financial incomes such as state pensions. Additionally, there are less chances to gain additional funds compared to younger members of society who can seek further employment opportunities (Henig 1981; Lyons 1996; Petrovic 2007).

From reviewing census data from nine cities to assess migration changes, Henig discovered that many professionals were moving into areas which contained high numbers of retired households, causing the elderly to leave. This was particularly common in locations close to central business districts (Henig 1981).

The percentage of residents over 65 in a neighbourhood was included in the University of Illinois’ index with a negative association to gentrification, which is applied also within this index. However, it was discounted within Atkinson’s study on London’s displacement. The reason being that it did not receive a strong prominence in the statistical models used, which is surprisingly when there is a strong correlation stated within gentrification literature (Atkinson 2000b).

Data for this indicator was obtained from the Office for National Statistics (ONS) Population Estimates, where estimates were rounded to the nearest hundred persons.

3.1.4. Housing Benefit Claimant Rates
If United Kingdom residents have difficulty paying rents within their area, they are eligible to receive housing benefits, which is a variable rate depending on many factors including your income, savings, circumstances and the tenure type i.e. is the accommodation rented from a private landlord or a housing association (GOV.UK 2017b). It is assumed that if an area is becoming more gentrified, housing benefit claimants will decrease as new, higher income residents will have little issues paying rents. It is expected that the house benefit claimant rates will increase in a similar rate to the percentage of residents earning less than the London Living Wage and percentage of workless households, with a negative correlation compared to the employment rate.

Data on Housing Benefit claimants was collected annually by the Department of Work and Pensions and collected per Local Authority, however the data has only been collected since 2009. The rates represent the number of housing benefits claimed per 100 adults (aged 18+). The Housing Benefit claimant statistics are calculated from the Single Housing Benefit Extract (SHBE), a list detailing the monthly returns of housing benefit claimants from each Local Authority.
3.1.5. Percentage of Self-contained Social Units or Bed-spaces
The decisions implemented by housing policies can either prevent or discourage the displacement of low-income individuals (Center for Community Innovation 2009). As mentioned in the background, social housing was disregarded and commodification of the remainder of the housing units was emphasised within neoliberal Britain (Glynn 2009; Whitehead 2014a). Whereas in many countries within Europe, social housing is a first step for many on the path to residential independence after university (Scanlon, Whitehead & Arrigoitia 2014b), the majority of social housing occupiers in the UK include the elderly, single parents and workless individuals (Whitehead 2014a).

For this exploration, we will work on the assumption that if the percentage of social houses decreases within a borough then, either the level of social housing is decreasing within the area or the necessity of this housing is lower in demand, suggesting higher income residents within the area. Therefore, if the number of social units decrease in a borough, the area is more susceptible to gentrification. This assumption contrasts the finding from the CCI at UC-Berkeley, that considered a positive correlation between public housing units and gentrification, using the ambiguous argument that neighbourhoods near public housing often undergo a large amount of transition with its residents (2009).

It was originally anticipated that a percentage of social housing within a borough could be calculated by dividing the number of social units by the total number of dwellings. However, from 2002, the Department for Communities and Local Government counted social bed-spaces as well as social units, whereas the main dwelling stock tables are self-contained units. After consideration, the social units and bed-spaces was still divided by the total dwellings to create an approximate average. As all boroughs are calculated using the same method, the averages will all be skewed proportionally.

3.1.6. Percentage of Workless households
Workless households within the UK are commonly congregated into close proximities due to the concentrated locations of social housing units (Atkinson 2008). It has also been noted that amassing many workless households into one area can create issues with employment networking and motivation, crime, education and health (Berube 2005). From this argument, the opposite can be claimed for gentrifying areas, that are also usually socially homogenous (Atkinson 2008). For the exploration, it will be assumed that if the percentage of workless households in a borough increases, gentrification is less likely to take place in the area. Additionally, it should be apparent that as the percentage of workless households increase, the total employment rate in that borough will decrease – of all the indicator relationships, this should be strongest correlation.

The Annual Population Survey collects a household database listing the number and percentage of households in the UK that are considered working, mixed or workless. Households within this database are defined as households that contain at least one member that is aged between 16 and 64.

3.1.7. Percentage of residents earning less than London Living Wage
The cost of living in London surpasses the other regions of the UK, with many of the city’s inhabitants having minimal disposable income at the end of the month after paying basic monthly costs (Sheffield 2015). Whereas many residents may have full-time employment, their wages still place them within poverty after their housing costs (Fenton 2016). Whereas the UK has a national minimum wage (NMW) set by the Government funded Low Pay Commission, a London Living Wage (LLW) is a non-compulsory hourly rate, which is suggested by the GLA to London companies to allow for their employees to be able to pay for necessary items whilst also being able to save. At present, the LLW is calculated at £9.75 an hour, compared to the minimal national wage of £7.50 per hour for anyone in the UK over the age of 25 (Greater London Authority 2015c; GOV.UK 2017c).

As the LLW does not need to be implemented by companies in the capital, there are still many residents being paid lower rates and are considered people on low income. We will use this as a
negative proxy for gentrification, stating the higher the number of people being paid less than the LLW, the smaller the chance of gentrification occurring within a borough.

Data on individuals being paid less than the LLW, with those being paid less than the NMW was collected by the ONS as part of the Annual Population Survey.

3.1.8. Median Gross Annual Pay
Within many academic papers, the shift from “blue-collar”, labour jobs to professional occupations in service-orientated professions is a key factor encouraging gentrification, with those employed in these career fields desiring close proximity to their inner London, located offices (Hamnett 2003; Voorhees Center 2014). One can also deduce that with an increase in professional occupations within an area, the average gross income will also increase (Kerstein 1990).

Whereas from the data available we cannot confirm whether the income growth is due to a change in residents or a change of occupation for existing residents, this still provides insight regarding the people living in the borough (Center for Community Innovation 2009).

The gross annual pay by place of residence was assembled from the ONS Annual Survey of Hours and Earnings. This data does not account those who are self-employed. The gross annual pay on the London Datastore was based upon the workplaces within the boroughs, which would not have provided accurate results as people commute between Local Authorities (in and outside of London) to work. As an example, in the 2011 census results, it was revealed that over 2 million London residents work within different boroughs with a net inflow of 519,000 people arriving into the capital from other local authorities in England and Wales (Greater London Authority 2014a).

ONS prefer to use the median average for earnings because the result is less skewed by a small number of very high earners, providing a better indication of pay compared to the mean average. For example, in Westminster, in 2015 the mean gross annual wage was £61,115 compared to a median result of £37,930.

3.1.9. Percentage of Households on Local Authority waiting list
Residents of the UK can also apply for council housing via local authorities. There are large numbers of individuals on these lists, so allocation can take a long time. Additionally, houses are allocated on a priority system, where homeless people, people living in cramped conditions and people whose current accommodation is damaging their health receive precedence (GOV.UK 2017a). In a similar vein to 3.2.4, if a borough is increasingly gentrified, it is assumed that less households will require the assistance of the local authority to help them find a home for them and their family.

Data regarding the number of households in a borough waiting for local authority housing has been collated by the Department for Communities and Local Government (hereafter DCLG) since 1997. This list does not include members of the public on waiting lists for Housing Association accommodation. The values provided are absolute figures, so to ensure a fair comparison between boroughs, the data was divided by the estimated number of households within the local authority in that particular year. Household estimates were also provided by the DCLG.

3.1.10. Median House Value
As mentioned within the background of this thesis, a prominent result of the production-side theory of gentrification is that when an area becomes more gentrified, the house prices increase due to landlord and investor inflows (Smith 1987). For example, within twelve gentrifying neighbourhoods, DeGiovanni found that property prices increased due to development carried out by new residents at a higher rate than index rises for housing. Additionally, value growth also occurred for accommodation that had not been restored during the neighbourhood regeneration (DeGiovanni 1984). Therefore, for the index we will assume that as the median house value rises, so does the threat of gentrification.
Within the Land Registry’s average house price data, mean and median annual house values were available, however for the mean house values, the data was only available up to 2014. As housing data can be considered as continuous and symmetrical, with presumably minimal outliers, a mean average would have been preferred (Australian Bureau of Statistics 2013). However, to ensure completeness, the full median data shall be added to the index.

3.1.11. Employment Rate
One argumentation used when considering the benefits of gentrification is that employment rates will increase due to an area’s economic and population growth, providing new connections for individuals especially in upcoming industries (Lees, Slater & Wyly 2007; Lester & Hartley 2014). However, it could also be argued that gentrification can shatter social networks that were originally in place before gentrification, making it even more difficult for long-term unemployed individuals to get jobs due to a reduced network (Smith & Williams 1986). To follow the numerical result of Lester & Hartley’s study (2014), it is expected that a borough will be more susceptible to gentrification if the employment rate within the local authority increases over the time span.

Employment percentages are collected within the Labour Force Survey, obtained by ONS annually. It should be noted that employment and unemployment rates do not equal 100%. The employment rate is the percentage of the whole population at working age that are employed. Contrary, the unemployment rate is defined as the percentage of economically active people that are unemployed – this excludes members of the working age population that are caring for family members, sick themselves or students (Office for National Statistics 2011).

3.1.12. Percentage of Manager Occupations
As mentioned in 3.2.8, the structural change in British employment, resulting with the rise of service-orientated profession employment is associated with consumption-side theories of gentrification (Hamnett & Williams 1980; Lyons 1996). This has been backed by longitudinal data showing that the London region provides a type of “escalator” into professional, managerial roles at an accelerated pace (Fielding 1992). Additionally, as house prices and rents rise, lower-income residents in more labour related jobs are pushed out of the inner city, also changing occupation proportions (Hamnett & Williams 1980). To confirm, a borough with an increasing percentage of workers in managerial occupations is more likely to concede to gentrification. Additionally, it will be interesting to see the correlation with median house prices.

To gain insights on the number of the workforce in this type of employment, the National Statistics socio-economic classification scale will be used (also known as NS-sec), which is an occupation-based class scale used within the Annual Population Survey created by the ONS. Occupations are broken down into eight categories, ranging from “Higher managerial and professional occupations” at 1 to “Never worked or long-term unemployed” at 8. In a similar fashion to Hamnett & Williams (1980) and the Voorhees Center index for Chicago (2014), the percentage of workers within the top ranking occupation class will be compared.
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Association with Gentrification</th>
<th>Source</th>
<th>Indicator Unit</th>
<th>Years of Available Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of economically active residents with NVQ4+</td>
<td>Positive</td>
<td>ONS</td>
<td>Percentage of population at working age</td>
<td>2004-2015</td>
</tr>
<tr>
<td>Crime rates</td>
<td>Negative</td>
<td>Metropolitan Police</td>
<td>Rates of offences per thousand population</td>
<td>1999-2017</td>
</tr>
<tr>
<td>Percentage of residents aged 65+</td>
<td>Negative</td>
<td>ONS</td>
<td>Percentages created from population figures rounded to the nearest hundred persons</td>
<td>1999-2015</td>
</tr>
<tr>
<td>Housing Benefit Claimants</td>
<td>Negative</td>
<td>Department of Work and Pensions</td>
<td>Percentage of population at working age</td>
<td>2009-2015</td>
</tr>
<tr>
<td>Households on Local Authority waiting list</td>
<td>Negative</td>
<td>Department for Communities and Local Government</td>
<td>Percentage of households on the waiting list for local authority Housing compared to total number of households</td>
<td>1997-2016</td>
</tr>
<tr>
<td>Percentage of workless households</td>
<td>Negative</td>
<td>ONS (Annual Population Survey)</td>
<td>Percentage of workless households compared to total number of households</td>
<td>2004-2015</td>
</tr>
<tr>
<td>Percentage of residents earning lower than the LLW</td>
<td>Negative</td>
<td>ONS (Annual Population Survey)</td>
<td>Percentage of people on less than the LLW</td>
<td>2008-2015</td>
</tr>
<tr>
<td>Median Gross Annual Pay</td>
<td>Positive</td>
<td>ONS</td>
<td>GBP (£)</td>
<td>2002-2015</td>
</tr>
<tr>
<td>Number of self-contained social housing units or bed spaces</td>
<td>Negative</td>
<td>Department for Communities and Local Government</td>
<td>Percentage of social housing units to total number of households</td>
<td>2002-2016</td>
</tr>
<tr>
<td>Median House Value</td>
<td>Positive</td>
<td>Land Registry</td>
<td>GBP (£)</td>
<td>1996-2016</td>
</tr>
<tr>
<td>Percentage of manager occupations</td>
<td>Positive</td>
<td>ONS (Annual Population Survey)</td>
<td>Percentage in employment who are managers, directors and senior officials</td>
<td>2004-2015</td>
</tr>
</tbody>
</table>

Table 2. List of indicators investigated with their respective sources, units, and the years that the indicators were available
3.2. Indicators Excluded from Index

Whilst researching indicators to investigate for the index, three factors were initially selected, but then removed. Their description with the reasoning behind their removal is below.

3.2.1. Tenure

Tenure transformations have commonly been used to comment on the gentrification of a region, in particular relation to the percentage of owner occupied accommodation (Munt 1987; Butler & Lees 2006; Voorhees Center 2014). However, in his recent work on London’s gentrification progress and inequality, Fenton states the following on Tenure: “…in London, with a large, growing and differentiated private rented sector, there is no reason to suppose that “upward” changes in socio-economic composition should correspond in any simple way to changes in tenure composition…housing tenure itself is of limited use in measuring gentrification” (Fenton 2016 p.8). This is also backed by consultancy reports estimating that by 2025, 60% of residents will rent their accommodation (PWC 2016).

3.2.2. Public Transport Accessibility Levels

Whilst there is currently no literature connecting the relationship of stronger public transport links with the rise of gentrification, within UC-Berkeley’s toolkit on gentrification susceptibility, this affiliation is examined. The arguments for its inclusion as an indicator include the relationship between an increase of transport links and house prices due to the improved accessibility to surrounding and outer city areas (Center for Community Innovation 2009).

Transport for London has its own measurement scale called Public Transport Accessibility Levels (PTALs), which ranks an area’s accessibility and availability to public transport links, in addition to the reliability and level of service of these access points (Greater London Authority, 2017). An area is graded with a PTAL from 0, which means an area has very poor public transport access to 6b, which is excellent access. However, accessible data on this scale is only available back to 2015; after contacting Transport for London for this information on numerous occasions with no response, the indicator was discarded from the index.

3.2.3. Race and Ethnicity

One key theme that is common within both American indexes is the numerous referrals to the race of residents within an area. The Chicago index contains three indicators measuring the percentage of White, Black and Latino residents in a neighbourhood, and the San Francisco toolkit states that if a neighbourhood contains a higher amount of Latino families, the more likely it is to become gentrified (Voorhees Center 2014; Center for Community Innovation 2009).

The US and the UK collect this type of demographic data differently, with the UK population that are from Black, Asian and Minority Ethnic groups listed as the BAME population. This generalisation of race for members of society that are not white does not consider the multiple adversities faced by each ethnicity and has been found to be a “confusing or unacceptable” way to distinguish ethnicity, with references expressing that ethnicity and race are being confused (Kertzer 2002; Okolosie et al. 2015). Although acknowledging the importance of an intersectional perspective, ethnicity is therefore not explored in this index.

4. Method and Material

4.1. Research Approach

As discussed in section 2.3, quantitative and qualitative methods are frequently used to approach the understanding of gentrification (which can also be considered as a proxy for wicked problems). Whereas the two methods have differing epistemological assumptions and sometimes provides conflicting findings, there is more pressure in modern research and institutions to converge the two
methods and implement mixed method research (Brannen 2005, Creswell 2007). Additionally, there have been calls to transform the methods used for social science analysis, which have not changed dramatically since the field’s origins in the 1800s, stating that they are unable to handle complex issues (Law & Urry 2004).

Whereas it is acknowledged that relying solely on quantitative methods is undesirable, to ensure a wide enough geographical scale, specific, qualitative accounts cannot be used. The research method for this study focused on exploring the quantification of complex problems such as gentrification. However, the results were critically discussed from a qualitative understanding of how people’s lives are affected. Additionally, in terms of the results received, the interpretation of the data was also explorative.

From the theoretical understanding of the two main theories of gentrification, the indicators selected aimed to cover both production-side and consumption-side aspects, bridging the two perspectives. Next, the indicators are explored empirically using available data from the inner London boroughs to investigate the opportunity of gaining conclusions relevant to decision making on wicked problems with quantitative methods.

4.2. Index Methodology

Using a methodology inspired by the Voorhees Center’s paper to calculate a gentrification index, quantitative statistics were collected from two different time periods to create a longitudinal study that could establish how an area has changed, and to provide a basis for assessing/discussing whether gentrification has occurred. The aim of the index was for the technique to be easily applied to any city nationally or internationally, allowing for comparison on a wider scale. For this reason, only census and governmental data was included in the index.

Primarily, a number of indicators were selected as gentrification proxies to demonstrate the social change within a specific spatial geography. An association with gentrification was stated to confirm how the change in indicator affects the concept. For example, increasing wages relate to an improving socio-economic status, so will be positively associated with gentrification; the opposite applies for factors that decline the status, such as factors related to poverty. The indicators were chosen to provide a more integrated overview of the changes a city can face due to gentrification, across sectors and disciplines. The indicators originated within fields such as urban policy, sociology and economics.

After this, the data was collected. All data on the selected indicators were collected and split to consider all 12 statutory inner London boroughs as defined in the London Government Act 1963 with the addition of the City of London (British Government 1963). These boroughs were:

- City of London
- Camden
- Greenwich
- Hackney
- Hammersmith and Fulham
- Islington
- Kensington and Chelsea
- Lambeth
- Lewisham
- Southwark
- Tower Hamlets
- Wandsworth
- Westminster

Whereas Greenwich is considered an inner borough within the statutory definition of inner London, it is excluded from the Office of National Statistics’ (hereafter ONS) definition, which however includes information on the City of London, and considers Haringey and Newham as inner boroughs instead. For this exploration, due to its early history of gentrification, Greenwich was investigated replacing Haringey and Newham and its results were monitored to check whether it appeared as an anomaly, or lowered the sample average. It should be noted that whilst using the GLA’s London
Datastore, for some indicators borough data was missing due to high coefficient of variations. This occurred frequently for the City of London seeing as it is considered a city, not a borough.

When examining London data, it is possible to analyse smaller geographies of the city, such as wards, which are local electoral units and Lower Super Output Areas (LSOAs), which were created to collect even smaller neighbourhood statistics. Currently there are 249 wards within inner London and 1,895 LSOAs (Greater London Authority 2015b, 2014b). Whereas census and tax data can be analysed on both these scales due to respondent address information, many of the statistics used for the index are not collected on such a local level. For this reason, borough data was used and analysed.

Once all the data was collected, two methods to calculate the gentrification index were investigated:

1. The average result for the borough’s indicators were calculated for the base year, which was the first year of data collected. Next, the borough values from the two time periods for each indicator were indexed compared to the base year’s sample average i.e. the index of the sample average for the base year was 1.0, with other boroughs scoring integers above or below this value. Then, the change of index for each borough index was calculated by subtracting the earliest borough index from the most recent borough index. When data is missing for particular boroughs or time periods, the index change for this indicator scored 0. Finally, the gentrification index was calculated by subtracting the sum of the indicators negatively associated with gentrification from the sum of the indicators positively associated with gentrification. It was believed that if the gentrification index result for a borough was a positive value, the borough is becoming gentrified. If the index result was negative, this may mean that the neighbourhood’s rate of regeneration was decreasing or that it was slower than the sample average’s rate.

2. The second method follows the process above. The main difference in this index was that borough indicator indexes were calculated against the sample average from that year instead of the initial year’s data, so that the sample average for each year is 1.0, not just 2005. This method applied the same technique that was used by the Voorhees Center, allowing for a specific year’s data to be compared to the city’s overall transformation rather than a comparison with the first year in the data sequence.

The key difference between this index and the Voorhees Center index was that with their method there was no available scale regarding the index changes to analyse with this method. As mentioned within their limitation section “[u]sing dichotomous variables only takes into account two values: above or below city average. This approach does not allow us to account for the magnitude of what we are observing” (Voorhees Center 2014 p.8).

When choosing a time span for the index, a period of ten years was the desired time frame to compare differences in time, similar to many other quantitative, gentrification reports (Hammel & Wyly 1996; Atkinson 2000b; Hamnett 2003; Voorhees Center 2014). Longer ages between data collection include additional socio-economic changes other than displacement from gentrification such as long term occupational and industrial change. Additionally, changes in longer time periods could be accounted to retirements or death (Hamnett 2003). Ten year spans are also often used due to the frequency of census data collection, which is the same in the UK as the US. The most recent date with comprehensive data collection was 2015, therefore the time span used within this study will be 2005 to 2015.

However, for two indicators (Housing Benefit Claimants Rates and the Percentage of residents earning less than London Living Wage), their datasets did not begin until after 2005. Because of this, and for further exploration with the data, a secondary timespan noting the difference between 2010 and 2015 will also be investigated. A visual representation of the two methods and two timeframes can be seen in Fig. 3.
All data was collated within an Excel spreadsheet and then analysed. Due to the small size of the sample (N=13) and the number of indicators (N=12), the statistical analyses available for the results was limited because the statistical data returned would not have a high enough significance. Therefore, the indicator data for all three years analysed were compared to each other using scatterplots to find whether any indicators had a strong correlation coefficient. This was completed for each index method and timeframe. It was also assumed that some indicators had a form of linear relationship to one another, whether that be positive or negative. To investigate these relationships, data for the three selected years and borough for each indicator were compared to the eleven other indicators to discover the correlation coefficient between the indicators. This could have been completed graphically, however this would have required the creation of 78 graphs (i.e. the 12th triangular number). Therefore, instead the data was numerically analysed using the correlation tool in Excel. In conjunction, the statistical significance of these correlations (i.e. p-values) were also calculated.

Another aim of the London Datastore is to provide opportunities and tools for the public to visualise their findings with the data on the site. One such tool is the Standard Borough Thematic Map, which allows for visualisation of the index with colour from Excel data (Greater London Authority 2015a). This shall be modified to display the gentrification indexes calculated within a Choropleth map. This visualisation method was also selected due to the spatial representation of the method. To check the accuracy and capability of the index, values of boroughs that are considered to be undergoing gentrification in recent academic research and media articles were compared against the index results and the Choropleth maps.

As seen in Fig. 1, recently gentrified boroughs are Tower Hamlets and Hackney, with claims that there has been a “dispersal of London’s poorer residents” from these areas to outer London boroughs such as Barnet and Bromley (Owen 2015). Additionally, the index changes of Southwark were investigated due to Peckham lying within its vicinity. In the 2010s, Peckham has been considered the most recent victim of gentrification in London (Robins 2016; Segger 2016; Engel 2016). For Hackney, Tower Hamlets and Southwark, it was expected that these boroughs will have the largest positive change from 2005 to 2015.

Whereas Lewisham is considered the most current gentrified borough, there is little academic research on this area’s transition and due to it recent change, data between the time spans may not provide as noticeable variances.
4.3. Limitations

When exploring and creating an index, certain limitations arise. Many of the restrictions that were encountered were also present within the Chicago index. Below provides an overview of the challenges faced.

On the topic of time, if the duration for the study was longer, the aim would be for additional information from previous years to also be included to investigate trends for specific boroughs. Furthermore, the remaining 29 London boroughs would also have been incorporated into the index for a full London overview.

Within this index, all indicators have an equal weighting, so the factors are considered equally as important to gentrification. Evidently, it is unlikely for this to be the case. It was anticipated that the index could have indicator weightings similar to a Multiple Criteria Analysis, however as there is no literature confirming which factors are most influential related to gentrification, the weighting shall remain equal. This contextuality presents another element of why this issue is a wicked problem – one indicator might be more important for a specific neighbourhood compared to a multitude of other factors.

When analysing London using borough data, it is difficult for localised impacts of gentrification to be discovered. Within their numerical assessment of social change in London, Hamnett and Williams (Hamnett & Williams 1980 p.475) state that “although gentrification is by no means a random process, its occurrence is confined in many London boroughs to a large number of small areas consisting of a few streets, and only in a limited numbers have these coalesced together”. When Tower Hamlets is considered, the borough contains a spectrum of areas, including Canary Wharf, which is one of Europe’s main financial districts. However, the borough also encloses Bow, Millwall and Stepney, areas that throughout the years have been commonly connected to poverty and violence (Hibbert & Weinreb 2008).

Finally, data was not modified to account for aspects such an inflation. Whereas this is not a concern for method 2, where the impact of inflation will be cancelled out by using the yearly averages, this does flaw the results within method 1 where the 2005 average is used against 2015 data. Whereas this index is for investigative purposes, if the index was to be accurate for socioeconomic examination, inflation corrections should be applied to the median gross annual pay and median house value indicators.
5. Results and Analysis

To explore the extent of gentrification that has occurred in an area and whether this can be evaluated numerically, two indexes were created with differing methods. Method 1 uses the 2005 sample average for the index baseline, whilst method 2 uses the sample average from each respective year for the index baseline. Ten indicators representing neighbourhood change were indexed and compared to one another over a ten-year span, before creating a ‘gentrification index’ of the neighbourhood change between 2005 and 2015. These indicators are:

- Percentage of residents aged 65+
- Crime rates
- Percentage of economically active residents with NVQ4+
- Percentage of self-contained social units or bed-spaces
- Percentage of workless households
- Median gross annual pay
- Percentage of Households on Local Authority waiting list
- Median house value
- Employment rate
- Percentage of Manager Occupations

The same two methods were used with the full twelve indicators over a five-year span between 2010 and 2015. The two additional indicators are:

- Housing Benefit Claimants Rates
- Percentage of residents earning less than London Living Wage

5.1. Index Method 1

Choropleth maps presenting the data for the ten-year span and the five-year span using Method 1 are presented within Figures 4 and 5 respectively, followed by the index results for both time periods in Table 3. The figures present the boroughs grouped into quartiles depending on their total index change using a relative scale. The second maps present whether the borough was above or below the average change over the time period, displaying which boroughs are regenerating quickly or slowly.

As can be seen from the figures and table, all boroughs in both indexes have displayed positive changes that would suggest an increased susceptibility to gentrification. Index changes for the ten-year timeframe are larger than for the five-year time frame. The reasoning for this cannot be confirmed for certain, however one aspect may be the consequences of the UK’s economic recession, which may have decelerated development in many boroughs. Furthermore, it is difficult to provide a comparison between the two time periods as from this data you cannot determine the borough’s status in 2010, and whether it improved or declined between 2005 and 2010. From observing Fig. 4 and 5, when focusing on the sample averages, the boroughs that appear to be performing strongest in both time periods are predominantly situated in West London.
**Fig. 4.** Choropleth maps of Method 1’s Index displaying neighbourhood change over a ten-year period with a base year of 2005, followed by secondary map displaying which boroughs are above or below the average sample change.
Fig. 5. Choropleth maps of Method 1’s index displaying neighbourhood change over a five-year period with a base year of 2010, followed by secondary map displaying showing which boroughs are above or below the average sample change.
<table>
<thead>
<tr>
<th>Borough</th>
<th>Gentrification Index Method 1 Results</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>City of London</td>
<td>3.10</td>
<td>2.73</td>
<td></td>
</tr>
<tr>
<td>Camden</td>
<td>2.07</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>Greenwich</td>
<td>1.67</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Hackney</td>
<td>3.39</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Hammersmith and Fulham</td>
<td>3.66</td>
<td>2.38</td>
<td></td>
</tr>
<tr>
<td>Islington</td>
<td>2.23</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>Kensington and Chelsea</td>
<td>4.82</td>
<td>2.09</td>
<td></td>
</tr>
<tr>
<td>Lambeth</td>
<td>2.11</td>
<td>1.19</td>
<td></td>
</tr>
<tr>
<td>Lewisham</td>
<td>2.33</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>Southwark</td>
<td>2.62</td>
<td>1.84</td>
<td></td>
</tr>
<tr>
<td>Tower Hamlets</td>
<td>2.62</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Wandsworth</td>
<td>3.01</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>Westminster</td>
<td>3.84</td>
<td>2.09</td>
<td></td>
</tr>
<tr>
<td>Sample Average</td>
<td>2.88</td>
<td>1.28</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Summed, numerical index results for ten-year and five-year span using Method 1. Test boroughs that are assumed to be currently gentrifying are italicised.

5.1.1. First-time Gentrified Boroughs

As discussed within the method, the boroughs that were expected to have the largest change from the base year were the recently gentrifying boroughs of Hackney, Tower Hamlets and Southwark. As can be seen in Table 4, these boroughs sit within the mid-range of the borough positions, with Hackney, Tower Hamlets and Southwark ranking 4th, and then joint 6th out of thirteen respectively in the ten-year index, and 11th, 10th and 5th respectively in the five-year index.

<table>
<thead>
<tr>
<th>Borough</th>
<th>Gentrification Index Method 1 Results</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hackney</td>
<td>3.39</td>
<td>4th</td>
<td>0.55</td>
</tr>
<tr>
<td>Southwark</td>
<td>2.62</td>
<td>7th</td>
<td>1.84</td>
</tr>
<tr>
<td>Tower Hamlets</td>
<td>2.62</td>
<td>7th</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Table 4. Index results and borough rankings for newly gentrified boroughs in London using Method 1

When analysing the results of each indicator, there are no major outliers or patterns that connect the three boroughs’ results in the listing. From a geographical viewpoint, there was potential for similarities between neighbouring boroughs Hackney and Tower Hamlets, however a relationship between the two does not seem present. A lack of data for Hackney and Tower Hamlets regarding their Gross Annual Pay data (the data’s coefficient of variation was too high, making them unreliable for practical analysis) may have reduced their final score.

When observing the raw data of the index (which applies to both methods used), the boroughs all score lower in regard to negative factors for gentrification such as the percentage of elderly residents and crime rates, however all boroughs score particularly poorly for residents earning less than the London Living Wage (LLW), especially in 2015.

To investigate this further, the full LLW data for all boroughs were analysed. Fig. 6 displays boroughs that most commonly had higher percentages than the sample average of residents earning less than the LLW. Boroughs had to have a higher percentage than the sample average for at least six of the eight past years to appear within the figure.
From the graph, it can be seen that of the five boroughs with frequent low-earners, four (Hackney, Lewisham, Tower Hamlets and Southwark) are the London boroughs that have been considered as recently having experienced gentrification as outlined in Fig. 1. This suggests that the lower-income residents are trying to remain in these (considered to be) gentrifying boroughs. Additionally, for the boroughs that are experiencing increasing percentages of residents earning under the LLW such as Tower Hamlets, Hackney and Lewisham, perhaps these residents are moving out of already gentrified areas further west in the city.

The presence and high results of Greenwich in this graph are also worth considering; whereas this could suggest that Greenwich may undergo a new wave of gentrification, further research would be necessary to make any conclusions. Additionally, if all London boroughs were included within the sample, all these boroughs could potentially fall underneath the sample average.

5.1.2. Super-gentrified Neighbourhoods

Whereas the initial purpose of this index was to detect boroughs that may be becoming gentrified for the first time, the neighbourhood changes of super-gentrified boroughs were not considered or expected to be observed. As mentioned in Section 2.2, Barnsbury in Islington was the first area of the UK to be considered as super-gentrified (Butler & Lees 2006), with reports of Kensington and Chelsea and Westminster becoming the next habitats for the super rich (Batty 2016).

Kensington and Chelsea has the highest index change of all thirteen local authorities researched within this method, mainly due to the exponential increase of the median house price in the borough. House prices in the base year at 2005 began at £465,000, rising to £750,000 in 2010 before another sharp increase to £1,200,000, the highest median house price, followed by Westminster (£920,000) and the City of London (£800,000). Additionally, compared to the other three boroughs in Table 5, there was also a large increase in residents within senior managerial roles, with an increase from 15% to 27%.

Fig. 6. Boroughs that had higher percentages of residents earning under the LLW per hour compared to the sample average from all twelve boroughs. No data was available on the City of London.
(Data Source: ONS, 2017)
Westminster also totalled an index result that suggests super-gentrification has taken place over the ten-year span. Its result would have been higher if not for its crime rate results, which are the highest in the sample group for all three periods and within the whole London region. The main reasoning for this anomaly compared to the rest of the sample boroughs is that Westminster is a popular tourist spot in the city, containing the Houses of Parliament, Buckingham Palace and Hyde Park. This makes the borough popular for criminals and also increases the day population of the area. The majority of crimes committed in the borough are connected to petty crimes. Between 2015-16, of 45,270 recorded offences in Westminster, 58% of offences were connected to ‘Theft and Handling’ (Metropolitan Police 2017). This raises the question of whether crime is a suitable indicator to use within such an index.

Hammersmith & Fulham has additionally been added to this table due to its high scores within both indexes – residing within the second highest quartile in the ten-year index, and scoring the highest index within the five-year results. Where the borough scored high in all indicators, the increase of house prices influenced the total index change. This could be a suggestion that Hammersmith & Fulham may be the next borough susceptible to super-gentrification.

However, the story is very different for Islington, sitting within the lowest quartile in both the ten-year and five-year index. Compared with the other three boroughs, Islington scores far higher on the number of households on the local authority waiting list; where the percentage of households on the list for Islington have increased, in the other boroughs there is a rapid reduction as can be seen in Table 6. Council house waiting lists seem to be a difficult issue for the borough, stating on their application site “We cannot offer a council home to most people who apply and this is likely to get worse” (Islington Council 2017). This is an interesting aspect, as it is not clear what the cause of this sharp increase is. Within the analysis it is therefore examined whether any other indicators are directly correlated with the local authority housing waiting list data.

Whereas the social change of Islington is decelerating, a reason for this may be because the super-gentrification has already taken place. Butler and Lees’ article on Barnsbury’s transformation was published in 2006, therefore perhaps the majority of Islington’s super-gentrification took place between an earlier time period, slowing down in the later 2000s.

At this point, it is worth considering how the two socioeconomic theories of gentrification can explain this rise of super-gentrification within these boroughs. It provides support for Smith’s economic
production-side theory, with the insane increase of real estate investments within the boroughs that have doubled house prices over a ten-year period. It also backs Ley’s consumption side theory, with London’s changing demographic, with an increasing number of high-income residents driving this gentrification. However, there are flaws with both theories, which were both conceived when observing first-time gentrification. In this instance, there is no true ‘rent gap’, as properties have not experienced disinvestment (Lees, 2003a), and this new gentrifying class have no intention of living in diverse neighbourhoods like the generation before them.

This provides evidence that gentrification is a continuous and transformative process (ibid). Furthermore, it supports Hamnett’s argument that “There are no universally and temporally stable residential patterns” (1984, p.341), affirming that gentrification does not have a stopping point, a further characteristic of a wicked problem (Rittel & Webber 1973).

5.2. Index Method 2
Method 2 used the relative year’s average for each indicator as the base for the index. Choropleth maps presenting the data for the ten-year span and the five-year span are presented within Fig. 7 and 8 respectively, with the index results for both time periods in Table 7.

<table>
<thead>
<tr>
<th>Borough</th>
<th>Gentrification Index Method 2 Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of London</td>
<td>0.56</td>
</tr>
<tr>
<td>Camden</td>
<td>-1.58</td>
</tr>
<tr>
<td>Greenwich</td>
<td>-0.46</td>
</tr>
<tr>
<td>Hackney</td>
<td>0.93</td>
</tr>
<tr>
<td>Hammersmith and Fulham</td>
<td>0.49</td>
</tr>
<tr>
<td>Islington</td>
<td>-0.96</td>
</tr>
<tr>
<td>Kensington and Chelsea</td>
<td>0.57</td>
</tr>
<tr>
<td>Lambeth</td>
<td>-0.52</td>
</tr>
<tr>
<td>Lewisham</td>
<td>0.14</td>
</tr>
<tr>
<td>Southwark</td>
<td>0.10</td>
</tr>
<tr>
<td>Tower Hamlets</td>
<td>0.34</td>
</tr>
<tr>
<td>Wandsworth</td>
<td>0.37</td>
</tr>
<tr>
<td>Westminster</td>
<td>-0.20</td>
</tr>
<tr>
<td>Sample Average</td>
<td>-0.02</td>
</tr>
</tbody>
</table>

Table 7. Summed, numerical index results for ten-year and five-year span using Method 2. Test boroughs that are assumed to be currently gentrifying are italicised.

When using the modified method from the University of Illinois, there are drastic adjustments in the results that can be seen visually and numerically. The first observed change is that when using the relative year’s sample average for the base index, many boroughs’ neighbourhood changes totals to negative results, whereas using the 2005 sample average resulted in all boroughs displaying improving changes. This finding, could suggest one of two possibilities; the negative boroughs could be declining with regard to their social status, or it may be that some neighbourhoods are not receiving the same rate of regeneration as the sample as a whole, meaning that there is still a high development rate in central London.

The City of London and Hammersmith & Fulham score highly in both time frames, whereas the remaining boroughs fluctuate within the rankings. Furthermore, there is less of an East/West divide regarding the social changes using this method, with eastern boroughs Hackney and Lewisham scoring above the sample average.
**Fig. 7.** Choropleth map of Method 2’s Index displaying neighbourhood change over a ten-year period with a base year of 2005, followed by secondary map displaying which boroughs are above or below the average sample change.
**Fig. 8.** Choropleth map of Method 2’s index displaying neighbourhood change over a five-year period with a base year of 2010, followed by secondary map displaying showing which boroughs are above or below the average sample change.
Another finding is that the size of the range in results is also more similar between the 2005-2015 results and the 2010-2015 results. Whereas in Method 1, the five-year timeframe always provided smaller borough changes than the ten-year index, Method 2’s five-year index calculates index changes that are of equal or larger size than the ten-year change. This is presumably due to this method’s base indexes being connected to the year of data collection, providing a stronger relativity between the borough and the sample average.

5.2.1. First-time Gentrified Boroughs

Again, to assess the effectiveness of the index, the boroughs considered most recently gentrified shall be analysed. Their results are summarised below in table 8.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hackney</td>
<td>0.93</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
<td>-0.59</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Southwark</td>
<td>0.10</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>0.81</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Tower Hamlets</td>
<td>0.34</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
<td>-0.53</td>
<td>9&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Table 8. Index results and borough rankings for newly gentrified boroughs in London using Method 2

Within this method, the boroughs are now ranked very differently with respect to the initial method results and to each time-frame, with Hackney being the borough with the largest improvement within a ten-year period, before falling dramatically to the bottom of the table in the five-year period. In the ten-year period, the main indicator that ensures Hackney is at the top of the table is the increase of residents that are within senior management positions, which improves significantly when compared to the sample averages in 2005 and 2010. However as mentioned within Method 1, there is little correlating the three boroughs’ results that suggest that any indicator has a key significance with regard to gentrification.

5.3. Comparison of Methods

Table 9 provides an overview of the results from both methods and timeframes, with their respective comparison rankings. It can be seen that whereas the index results differ principally on magnitude, the borough rankings are at times more similar than would be expected from the standalone index data. Additionally, when the Choropleth maps are compared to one another many boroughs are frequently above or below the sample average in both methods.

The boroughs that resided at the top of the table frequently were the City of London, Hammersmith & Fulham and Kensington & Chelsea, whereas Camden, Greenwich and Islington commonly sat at the bottom of the rankings. Although the City of London scored highly, its result should be considered with caution due to the lack of data for many indicators. The fact that Greenwich and Islington scores so low within all four index calculations is surprising, as these areas are still considered desirable locations within the city. Without further data to analyse, these boroughs are considered to have remained socioeconomically stable, whilst other boroughs in the city have changed more rapidly over the ten years.

The boroughs which that have been frequently discussed within recent gentrification literature (Hackney, Tower Hamlets and Southwark) are dispersed within the intermediate scores.

To observe the relationship of the methods, the correlation coefficients between the four indexes were calculated which can be found below in Table 10. A correlation coefficient of 0 represents no relationship between the index values, whereas a value of 1 (or -1) would signify a perfect positive (or negative) linear relationship.
<table>
<thead>
<tr>
<th>Borough</th>
<th>Gentrification Index: Method 1</th>
<th></th>
<th></th>
<th>Gentrification Index: Method 2</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>City of London</td>
<td>3.10</td>
<td>5</td>
<td>2.73</td>
<td>1</td>
<td>0.56</td>
<td>3</td>
</tr>
<tr>
<td>Camden</td>
<td>2.07</td>
<td>12</td>
<td>0.37</td>
<td>12</td>
<td>-1.58</td>
<td>13</td>
</tr>
<tr>
<td>Greenwich</td>
<td>1.67</td>
<td>13</td>
<td>0.16</td>
<td>13</td>
<td>-0.46</td>
<td>10</td>
</tr>
<tr>
<td>Hackney</td>
<td>3.39</td>
<td>4</td>
<td>0.55</td>
<td>11</td>
<td>0.93</td>
<td>1</td>
</tr>
<tr>
<td>Hammersmith and Fulham</td>
<td>3.65</td>
<td>3</td>
<td>2.38</td>
<td>2</td>
<td>0.49</td>
<td>4</td>
</tr>
<tr>
<td>Islington</td>
<td>2.23</td>
<td>10</td>
<td>0.74</td>
<td>9</td>
<td>-0.96</td>
<td>12</td>
</tr>
<tr>
<td>Kensington and Chelsea</td>
<td>4.82</td>
<td>1</td>
<td>2.09</td>
<td>3=</td>
<td>0.57</td>
<td>2</td>
</tr>
<tr>
<td>Lambeth</td>
<td>2.11</td>
<td>11</td>
<td>1.19</td>
<td>6</td>
<td>-0.52</td>
<td>11</td>
</tr>
<tr>
<td>Lewisham</td>
<td>2.33</td>
<td>9</td>
<td>0.93</td>
<td>8</td>
<td>0.14</td>
<td>7</td>
</tr>
<tr>
<td>Southwark</td>
<td>2.62</td>
<td>7=</td>
<td>1.84</td>
<td>5</td>
<td>0.10</td>
<td>8</td>
</tr>
<tr>
<td>Tower Hamlets</td>
<td>2.62</td>
<td>7=</td>
<td>0.56</td>
<td>10</td>
<td>0.34</td>
<td>6</td>
</tr>
<tr>
<td>Wandsworth</td>
<td>3.01</td>
<td>6</td>
<td>1.01</td>
<td>7</td>
<td>0.37</td>
<td>5</td>
</tr>
<tr>
<td>Westminster</td>
<td>3.84</td>
<td>2</td>
<td>2.09</td>
<td>3=</td>
<td>-0.20</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 9. Index results from each borough using the 2 methods and 2 timeframes. Borough ranking related to the other boroughs are also displayed.
Table 10. Correlation coefficients for the four calculated indexes

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1 2005-2015</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method 1 2010-2015</td>
<td>0.66*</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method 2 2005-2015</td>
<td>0.62*</td>
<td>0.44</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Method 2 2010-2015</td>
<td>0.40</td>
<td>0.86***</td>
<td>0.62*</td>
<td>X</td>
</tr>
</tbody>
</table>

From Table 10 it can be seen that there are moderately positive correlations between all four datasets, however the author would have presumed that the coefficients would have been higher correlations as all calculations used the same raw data. Only one correlation (the connection between the alternative 2010-2015 methods) could be considered as a strong relationship due to its high correlation and low p-value. It is difficult to confirm the cause of why these values are so diverse, however it does raise the interesting discussion of how data is used and analysed.

It is interesting to also note how using the changing averages of the sample over the three periods affects the indexes. For example, over the ten-year time period, the average employment rate for the sample increases from 65% in 2005 to 72% in 2015. Using Method 1, a borough that scored in between these percentages in 2015 such as Hackney, which had an employment rate of 69%, the borough’s index would be positive, yet in Method 2 the index would be negative as this would be compared to 72%.

5.4. Correlation of Indicators

Indicator data for each year and borough were compared to the remaining eleven indicators to identify any potential correlations. The results of this analysis can be found in Table 11, with any correlations of a magnitude of 0.7 or above marked in bold.

Many positive correlations are present between economic indicators such as the median annual house price, gross annual pay and percentage of manager occupations, which all correlate to one another. The percentage of economically active residents with NVQ4+ also correlated positively with the median annual house price and gross annual pay. This is as expected; if a resident has been educated to university level, they are further opportunities to begin work on a higher salary leading to the opportunity to buy a higher priced house after working and saving. All these indicators also have a low p-value confirming significance.

It is surprising to see a lack of correlation between the education level indicator and the employment rate, receiving only a coefficient of 0.36. However, this may be caused due to the timeframe the years were taken from, which contained the economic recession.

The only strongly negatively correlated indicators are the employment rate and the percentage of workless households, again a predicted relationship. This score provides a good gauge for the validity of the data in general. A perfect, negative, linear relationship would have a correlation coefficient of -1.0, however this is rarely observed within real data. Therefore, as these two indicators have theoretically the strongest connection, to provide a correlation coefficient of -0.88 suggests the data is reliable.

Whereas it was expected that housing benefit rates would correlate positively with the percentage of residents under the LLW and workless households, the correlations are too low to consider any relationship. Additionally, the relationship between housing benefits and LLW residents actually appears negative from this data. Another expected relationship was a negative correlation between
<table>
<thead>
<tr>
<th>Elderly residents</th>
<th>Crime Rates</th>
<th>% of economically active with NVQ4+</th>
<th>House benefit claimant rates</th>
<th>% of households on the waiting list for LA Housing</th>
<th>% of workless households</th>
<th>% earning less than London Living Wage/per hour</th>
<th>Median Annual House Price</th>
<th>% of social self-contained units or bed spaces</th>
<th>Gross Annual Pay</th>
<th>Employment Rate</th>
<th>% Manager Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elderly residents</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crime Rates</td>
<td>0.30</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of economically active with NVQ4+</td>
<td>0.42**</td>
<td>-0.09</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>House benefit claimant rates</td>
<td>-0.43*</td>
<td>0.08</td>
<td>-0.38</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of households on the waiting list for LA Housing</td>
<td>0.06</td>
<td>0.00****</td>
<td>-0.04</td>
<td>0.42*</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of workless households</td>
<td>-0.18</td>
<td>0.67***</td>
<td>-0.56***</td>
<td>0.27</td>
<td>0.14</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% earning less than LLW/hour Index</td>
<td>-0.60**</td>
<td>-0.54**</td>
<td>-0.61**</td>
<td>0.15</td>
<td>-0.12</td>
<td>0.54**</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median Annual House Price</td>
<td>0.52***</td>
<td>0.01</td>
<td>0.72***</td>
<td>-0.43*</td>
<td>-0.24</td>
<td>-0.22</td>
<td>-0.22</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of social self-contained units or bed spaces</td>
<td>-0.68***</td>
<td>-0.08</td>
<td>-0.31</td>
<td>0.62***</td>
<td>0.07</td>
<td>0.14</td>
<td>0.38</td>
<td>-0.13</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Annual Pay</td>
<td>0.30</td>
<td>0.18</td>
<td>0.76***</td>
<td>-0.51*</td>
<td>-0.16</td>
<td>-0.01</td>
<td>-0.57**</td>
<td>0.85***</td>
<td>-0.08</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Employment Rate</td>
<td>-0.20***</td>
<td>-0.57***</td>
<td>0.36*</td>
<td>-0.28</td>
<td>-0.30</td>
<td>-0.88***</td>
<td>0.36</td>
<td>0.10</td>
<td>-0.17</td>
<td>-0.01</td>
<td>X</td>
</tr>
<tr>
<td>% Manager occupations</td>
<td>0.56***</td>
<td>0.03</td>
<td>0.55***</td>
<td>-0.37</td>
<td>-0.47**</td>
<td>-0.24</td>
<td>-0.17</td>
<td>0.84***</td>
<td>-0.08</td>
<td>0.70***</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Table 11. Correlation coefficients between all 12 indicators used within the gentrification index
housing benefits and the employment rate. Whereas the linear relationship is negative, the coefficient of the correlation is only -0.28 with a high p-value.

6. Discussion
The key aim of this thesis was to discover whether data and quantitative analysis could enhance research and decision making in regard to wicked problems. To investigate this, an index was created to understand whether the extent of gentrification within London’s inner boroughs over the past ten years could be evaluated numerically.

6.1. Gentrification in London
From the results, it appears that many boroughs (or all boroughs depending on the method) are developing and increasing their socio-economic status with large areas of London seeing increasing employment rates, house prices and managerial roles, including the boroughs that are suspected to be gentrifying. Depending on your perspective, this could be seen as a positive change — with residents making more money, there are opportunities for more spending in the local economy and higher tax returns to push back into the state. However, whilst there are improvements in the inner city, negative indicators are presumably being pushed out to boroughs on the periphery of London.

In terms of largest neighbourhood changes, the biggest changes appear to be taking place within boroughs that are undergoing super-gentrification such as Westminster and Kensington & Chelsea. Additionally, the results suggest that the next borough to become super-gentrified will be Hammersmith & Fulham, which scored highly in all four methods. For the boroughs that are assumed to be currently gentrifying, it is difficult to place a firm conclusion on the results. Whereas Hackney and Tower Hamlets have been considered gentrifying since the first decade of the 21st century, has enough time passed for the full effects of the transformation to be observed numerically?

When Manley and Johnston used Census data to analyse the class structure change within the city (2014 p.642), the authors state that “London remains an extremely diverse place socio-economically, and … over the decade 2001 – 11 changes in its socio-economic class structure and associated geography have not been extensive”. It can be seen that there definitely are still large socio-economic differences within the inner boroughs as observed from the varying spectrum of index scores returned in both methods. It should also be added that even though there are some weaker conclusions collected from this thesis’ data, this report analyses far more indicators connected to socio-economics that Manley and Johnston’s that bases their finding on just occupational class.

Additionally, where there may still be major differences between different geographies in the city, many of the speculated gentrifying boroughs are undergoing positive development. All three suspected boroughs received 3 out of 4 positive index changes within the methods, suggesting that class structure and associated geographies may be slowly transforming. Whereas many negative indicators have reduced over the five and ten year timeframes, as urban inequality is still high within the UK capital, it can be presumed that these issues are being pushed out of central London boroughs to the periphery of the city, with displaced residents as argued by Hamnett & Williams (1980). To gain proof of this assumption, the outer boroughs of London would also need to be incorporated into the index.

6.2. Quantifying Gentrification
The second research question within this study was to investigate the benefits of using data collection and visualisations methods when analysing complex issues such as gentrification. Whilst investigating and implementing this exploration of quantitatively analysing gentrification, many impediments and questions arose, which are discussed below.
6.2.1. The Danger of Data
From using two similar methods to create and investigate an index on gentrification, varying results were received, at times providing contrasting conclusions and rankings of boroughs.

This leads to one of the key issues raised by this study, whether a collection of this data would be used with the intent stated in this paper, to pursue more equal opportunities within our cities, or whether a misuse of statistics could occur. For example, a property development company could take the collected data and deliberate buying locations in boroughs that are behind in current property prices, however currently inhabited by an increasing number of managerial employees.

Whereas using two methods within this thesis was purely for investigative purposes, a misuse of data could be intentional to provide gain for those authoring the information. With data collected, users could discard results that are unfavourable to their intended gains or purely manipulate it to present a result that isn’t true.

In an interesting analogy comparing data to television, data is a message communicated to an ‘audience’ that is first determined by the data’s ‘producer’. Whereas the producer of a dataset may not have intentionally navigated results to prove a point, choices are always made with what data is useful and how it should be presented based on the producer’s worldviews, assumptions and background. Additionally, the subjectivity of the audience will also vary the result as the spectators will observe this in different ways (Johnson 2015). Data is rarely, if ever neutral, which should be considered throughout quantitative investigations. This returns to an argument previously raised regarding the battle between power and knowledge. When stakeholders have a larger control the famous phrase “knowledge is power” becomes inverted. Within these scenarios, the powerful are able to produce knowledge which best suits their goal, instead of the common good (Flyvbjerg 2002). Whereas the index investigated within the report would be intended to be an open tool, that allows for prevention of further urban inequality, this is perhaps an idealistic viewpoint, and data may be used for other purposes.

A lesser, but also interesting observation within this topic is the use of data visualisation. Within the figures presenting the index results (Fig. 4-5 and 7-8) whereas the same colours are used within the Choropleth maps, the minimum and maximum quartile values vary largely. Again, to use the previous television analogy, whereas the producer may believe they are presenting one argument with their visualisation, the viewer may perceive another (Bresciani & Eppler 2015; Johnson 2015).

6.2.2. Availability of Data
During this thesis, a major obstacle when collecting data was accessibility. When researching potential indicators, it became noticeable that many of these aspects could be found within the Annual Population Survey, a study examining UK households conducted by the Office of National Statistics. The survey was appropriate to use due to data being available over a decade time span.

Access to the survey was available via an application to the UK Data Service stating your nationality, current location and usage of the data. Once accepted, data was downloaded from the 2005 and 2015 surveys to process when it was discovered that there was no geographical data connected to respondents’ results. After further enquiry, it was revealed that the location of respondents was removed from the End User Licence for discretion purposes. A secure version of the APS was available, however access to this data could only be provided to ONS-accredited researchers based physically in the UK. PhD students in UK institutions can apply to this data, but they will need to apply jointly with their supervisors (UK Data Service 2017). From research, the main groups that have been entitled with ONS Researcher Accreditations are UK universities and governmental institutes (Office for National Statistics 2017).

Whilst this outcome hindered the development of the thesis at a key stage, data for many of the preferred indicators alternative sources were discovered, meaning that data was collected with
different statistical methods. Whereas it was unachievable to collect all indicators as previously anticipated, academics at a more advanced level of study based within the UK are encouraged to continue this work and use the stated method.

This complication, however, does raise the issue and present shortcomings of open data. As mentioned in the introduction, there are sections within the NUA that advocate the opportunities of sharing data to improve knowledge sharing nationally and internationally and to allow transparent decision making (United Nations, 2016). However, when education and bureaucracy raises barriers to the common good and knowledge, even when unintentionally, amendments are required.

Another issue that surfaced was that the City of London was frequently not included in all data sets, as it is not defined as a borough. There was also missing data within the Gross Pay and the Local Authority waiting list datasets. Whereas there is no explanation provided for the missing waiting list data, for the Gross Median Pay data, this was due to the available data receiving a coefficient of variation (CV) about 20%. For results above this CV, the data is not considered statistically reliable for practical purposes.

When considering the index’s application to numerous cities, the opportunities appear quite limited. The index was intended to be universal and applicable to all cities, however different cities will measure indicators with differing methods and whereas data collection for city planning is a staple initiative for the NUA, many cities may not dedicate as large an amount of resources to this as London does. Additionally, it is hard to confirm that an indicator in one city may have such a strong impact on gentrification as it would within another city. This also connects to the concerns raised by those who criticise the concept of having one homogenous theory for gentrification (Butler & Robson 2001; Brown-Saracino 2010).

6.2.3. Critique of Index and Indicators

Next, whereas the moral concerns of whether a data index would be used appropriately have been discussed, the capability and value provided from an index should also be considered.

A key query on this topic is how the index can provide guidance on the future changes that are set to occur within London boroughs by using past data on the city. The method investigated in this study, in addition to the indexes created by CCI and the Voorhees Center, do not provide any proof or evidence that the neighbourhood changes will continue with the patterns observed over their respective timeframes. The Voorhees Center’s Chicago index uses a larger amount of data which allows for trends to be identified for the neighbourhoods; with the indicators selected, this would not be an option for the test index due to a lack of recorded and available data.

One possible, yet limited, solution could be to plot projected trends for indicators that have strong correlations to one another to estimate how these aspects will change in the inner boroughs. This however, cannot provide an index change due to the lack of strong coefficient correlations and the unknown relationships between many indicators.

Another aspect to consider is the displacement of residents out of boroughs and how plausible it is to connect this purely to gentrification, which was also a concern mentioned within the San Francisco index (Center for Community Innovation 2009). This issue was raised by Hamnett (2003) in response to Atkinson’s study, which aimed to measure the displacement caused by gentrification (2000a) as mentioned in Section 2.3. Hamnett argues that the displacements observed within Atkinson’s research cannot be directly associated with the gentrification proxies used (these included class level, ethnicity and employment). Additional factors also have effect such as retirements, death and progression to a higher social status (Hamnett 2003).

As mentioned in the background, the two alternating theories of gentrification are measured with different methods, with production-side causes being evaluated by quantitative means and
consumption-side causes being assessed by more qualitative approaches. This became an obstacle when attempting to include as many social indicators within the index to ensure both social and economic factors were considered equally. That being said, many indicators such as the percentage of economically active residents with NVQ4+ and manager occupations do fall within the consumption-side theory.

When considering specific indicators, it was difficult to unanimously state whether their presence confirms or denies gentrification. For example, for this exploration, the assumption that an increase in housing benefit claimants is a negative aspect for gentrification as it demonstrates that residents within the borough don’t have large enough incomes. However, this could instead prove that an area is gentrifying. As rents increase on homes in the area, residents within the borough that may have been able to pay for their board previously now need assistance to remain there.

The same argument can be applied to local authority waiting lists for new homes. Additionally, data on just its face value can be construed incorrectly. For example, the total number of households on the waiting list in London boroughs increased between 2005 and 2010, followed by a decrease in the following five years. On face value, an analysis of this data could be that after the economic recession in 2008-9, more people were in need of assistance in finding an affordable home and this demand reduced between 2010 and 2015. However, in 2011, British parliament passed the Localism Act, which aimed to decentralise decisions related to local financing and planning, giving larger control to local authorities (UK Parliament 2011). A key result of this act was amendments to the 1996 Housing Act – this allowed for local authorities to set stricter eligibility on who can apply for council houses in the authority. One such rule forced prospective tenants to have a “local connection” to the area, with some London boroughs stating that tenants must have lived in the borough for two or more years before they can apply to join the waiting list (Foster 2016).

When creating an index, the temporal aspect related to gentrification might also therefore also be an issue. For example, which date in a city should be used as a comparison to the magnitude of gentrification in an area? How long does it take for a “newcomer gentrifier” to become an “original resident” who may be displaced by a new wave of gentrifiers in the future (Osman 2016)? An additional aspect to consider is how time affects the indicators and how what are the expected results for when a borough is gentrifying compared to when it has been gentrified.

An additional issue is that depending on the researcher’s discipline, a vast array of indicators may be selected or snubbed. For example, the indicators chosen within the index were based in the fields of urban policy, sociology and economics. However, a geographer, or an architect may have selected numerous other indicators. This is a concern with the current formulation of the index as indicators have not been analysed to see what external influences may affect them.

Ideally, a further analysis of the data would have been desired to ensure reliability, however as stated the sample size was too small. Within the San Francisco toolkit, CCI used multivariate regression to decide on which factors make a neighbourhood more likely to gentrify. This regression method is based on data that has 2 or more independent variables (Hidalgo & Goodman 2013), however it is believed that all the variables will in some way be connected to another socio-economic aspect. The CCI state also state this within their appendix notes; on the topic of public housing, which within the toolkit is stated to be a positive variable related to gentrification, they write “controlling for all other factors, public housing actually makes gentrification less likely, suggesting that some other variables are intervening to make the influence of public housing seem positive” (Center for Community Innovation 2009 p.23).

As mentioned in the introduction, the definition of gentrification being a “physical, economic, social and cultural phenomenon” (Hamnett 1984) has been used for this study. Whereas this index allows us to estimate the social and economic changes taking place in boroughs, we cannot capture any strong information on the cultural, political or social changes occurring within the boroughs with the present indicators, which also face residents (Brown-Saracino 2010).
6.3. The Wicked Problems of Gentrification

The core objective of this work was to begin the consideration of wicked problems numerically. It is apparent within this discussion that when attempting to answer the two research questions, countless additional questions sprang up, increasing the difficulty of the work’s process and progress. Many indicators could have been considered from the polar opposite perspective with as a defendable argument. Results using slightly differing methods provide rankings for boroughs that are marginally different. These additional problems can be considered as symptoms to the core wicked problem of this thesis topic.

Throughout this thesis, decisions made related to the theories, the methodology and the indicators used were always intended to be as impartial and open to all perspectives. Unfortunately, this is not true; this is not with intent, but from being. Within every step of writing this report, a choice was made, which was influenced by numerous external factors. The data gathered because of this choice will also reproduce those specific assumptions – if an alternative, initial choice had been made, alternative data would have been collected creating different results. During writing this thesis, the author fears that she at times has fallen into the trap of snobbery when considering some indicators herself. These decisions and the explanation for such choices are guided by numerous sociological characteristics such as upbringing, education and cultural background. In addition to the various decisions that are made, different methodologies also will provide different responses (Lees, Slater & Wyly 2007). As discussed in section 2.3, various methods have been used when investigating gentrification falling either into quantitative or qualitative methodology categories. The overall method used within this thesis focused on a numerical, longitudinal study, however when this data is analysed, further theoretical and ontological issues can be raised (Brannen 2005). As the inputs into these studies vary significantly, so will the results received. These multiple pathways and decisions are poignantly expressed within Rittel and Weber’s article on wicked problems:

“The choice of explanation is arbitrary in the logical sense. In actuality, attitudinal criteria guide the choice. People choose those explanations which are most plausible to them. Somewhat but not much exaggerated, you might say that everybody picks that explanation of a discrepancy which fits his intentions best and which conforms to the action-prospects that are available to him. The analyst's "world view" is the strongest determining factor in explaining a discrepancy and, therefore, in resolving a wicked problem.” (Rittel & Webber 1973 p.166)

Whereas this work has also been susceptible to attitudinal preconditions, all endeavours focusing on providing insights into wicked problems will suffer similar consequences.

7. Conclusion

This thesis investigated to what extent gentrification can be evaluated numerically and what insights can be provided on this complex problem with the assistance of data and its visualisation. To explore this subject, a test index for the inner boroughs of London was created using indicators that were intended to include many aspects from the two main theories surrounding the topic – production-side theory and consumer-side theory.

Whereas the key focus of this study was to identify neighbourhood changes in boroughs that are undergoing their first wave of gentrification recognised by prevalent research, such as Hackney, Southwark and Tower Hamlets, these boroughs were perceived as increasing in socioeconomic status, yet were ranked in the middle ground of the boroughs analysed. The index however presents more neighbourhood change taking place in areas that are super-gentrifying such as Kensington & Chelsea and Westminster. The results also suggest that the next area to become super-gentrified will be Hammersmith & Fulham. Whereas noteworthy findings were discovered relating to the potential connection of gentrification with high percentages of residents earning under the London Living Wage and the decelerating status of Islington and Greenwich, further analysis is required for conclusive evaluation on the city. Additionally, further analysis identifying the correlation between
indications would benefit an updated version of the index – with larger datasets, multiple regression analysis or factor analysis could be implemented to explore what or which indicators are the most relevant for gentrification. It is also recommended that future investigations include all London’s boroughs and that access is gained to the ONS’ Annual Population Survey to ensure as large an amount of datasets are received from the same source.

The main purpose for this index was for it to be used by associations interested in eradicating urban inequality and assisting residents who could be displaced. Whereas further investigations and data collection are necessary for the index to be used in such a manner, the index within its current format still raises awareness of the changing socioeconomic status of inner London. In addition to awareness, the data and visualisations illustrate this urban change, allowing for discussions to be incited surrounding the positives and negatives of urban development, which is more important than ever within our urbanising world.

To enhance the index, more indicators relating to the cultural, physical and political aspects occurring within the boroughs should be present. Future, potential indicators could include:

- Community strength indicators, which consider how welcome and included people feel in their neighbourhood and whether they trust their neighbours
- Gated communities per borough, as this is a very visual and increasing representation of urban inequality (UN-Habitat 2016b)
- Another physical indicator could be the availability of public open space and nature within a borough
- The political party controlling a borough could also be included. In the 1980s left-liberal reform policies were associated with Canadian gentrifiers in the cities of Toronto, Vancouver and Montreal (Ley 1997), and leftist ideologies have been considered more present of middle class residents of British cities (Savage 1991).

This thesis has contained many trials, errors and lessons on a range of elements within this report, including the assumptions related to gentrification and the methodology used for the index. It also brought an important reflection point to the forefront surrounding the reliability and objectivity connected to data.

Whereas in such an investigative work, little concrete conclusions could be expected, its primary contribution is the investigation of gentrification from a wicked problem perspective, considering the many complex traits of the phenomenon. Whereas the process and methodology would perhaps become even more complex, to investigate this area with numerous researchers with varying worldviews would achieve a comprehensive and advanced index investigation proceeding this first exploration. Furthermore, an additional advancement would be to include the viewpoints and recommendations of individuals outside of academia to improve objectivity within the index.

Gentrification is one of many complex and wicked urban problems civilisation will continue to face within its forthcoming future. Whereas there is no stopping rule or quick-fix for these issues, time, effort and research should be invested into these areas to ensure sustainable urban development, providing liveable cities for every individual, regardless of income and background and beliefs.
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