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Spillover Effects of Social Housing Investment: England & Wales

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

The purpose of this thesis is to uncover what affects local government spending on affordable housing has on community wellbeing. The approach uses time series data for 11 years across 144 international territorial levels in the United Kingdom (U.K.) to perform a standard ordinary least squares (OLS) regression. Ultimately, I regress a proxy for community wellbeing, which is gross disposable income per head (GDHI), on government spending on housing. I also take into account other ways the local government can spend its budget and consider education, transportation, cultural, and total spending in addition to housing. I find that increasing capital expenditure on affordable housing improves community wellbeing by increasing GDHI. When controlling for other types of government spending the effect on wellbeing becomes less intense for housing specifically. This research in this paper will contribute to additional literature on affordable housing and the effects of government spending on infrastructure at the local level.

Table of Contents

Abstract	1
Introduction	3
Literature Review	4
2.1. History of Council Housing	4
2.2. Government Spending	6
2.3. Housing Subsidies	8
2.4. Micro Level Wellbeing	10
2.4.1. Wellbeing Based on GDP	11
2.4.2. Subjective Wellbeing	11
2.4.3. Wellbeing Based on Disposable Income	12
2.5. Spillover Effects	12
Data	13
3.1. Potential Omitted Variables	15
Methodology	17
Results	19
5.1. Housing Expenditure	19
5.2. Education Expenditure	20
5.4. Cultural Expenditure	21
5.5. Standard Errors	23
5.6. Additional Checks	24
Discussion	25
6.1. Threats to Identification	25
Concluding Remarks	27
References	28
Appendix	32

1. Introduction

Today, more than one billion people on the planet do not have access to adequate housing (United Nations Human Rights: OHC, 2009). Housing can be something that those of us who have it take for granted, although it is fundamentally a human right. The UNHR (2009) states that “the violation of the right to adequate housing may affect the enjoyment of a wide range of other human rights and vice versa.” This statement suggests that there are spillover effects from lack of adequate housing, and in order to uphold human rights, this essential need is considered key infrastructure (Denham et al., 2019) which should be invested in. Therefore, governments should be interested to see the effects of how infrastructure spending benefits societal wellbeing.

The United Kingdom (U.K.) is a compelling place to dive in deeper on this topic because they have a robust social safety net, which includes spending on housing. They have emergency based housing subsidies called Housing Benefit, and as a more long term solution each local government is responsible for providing affordable housing units called Council Housing. Unfortunately, construction of social housing units has been on a steady decline since the mid 1980s¹. Shelter UK, the leading housing rights non-profit, argues that we need more social housing, and continues to work on crucial research dedicated to this issue. Their recent report by Trew et al. (2022) details the importance of affordable housing since it’s innately designed with local wages in mind in order to not price people out of their right to adequate housing. Affordable housing provides a more stable and long term solution because it is a direct investment in physical housing stock so more adequate dwellings can be provided to more households. Housing Benefit, on the other hand, is a temporary solution to help people on unemployment or experiencing other financial hardship but it is not meant to support households with their cost of living over the long term. In their recent work Tsenkova (2021) finds the most efficient way to improve access to affordable housing is to pay attention to local needs, which is why this paper focuses specifically on affordable housing stock provided at a local level instead of the differences between Housing Benefit and council housing.

Clearly, there is a divergence occurring between the increasing importance of decent housing and the decreasing supply of affordable housing. This then begs the question, if governments increase expenditure on this piece of infrastructure do we see benefits? More specifically, does government spending on housing improve the wellbeing of all members of society? Coming back to the quote from

¹ <https://www.parliament.uk/business/publications/research/olympic-britain/housing-and-home-life/build-it-up-sell-it-off/>

the UN, ensuring the right to a secure home is intrinsically tied to human rights. In order to properly measure this, we need to establish a metric for wellbeing. Ultimately, I conclude that disposable income is the most appropriate way to measure wellbeing as it represents material welfare for a household, and based on availability and accuracy of data from the Office of National Statistics of the U.K.

I hypothesize that increased government spending will increase societal welfare, proxied by disposable income. We know from various research in urban economics that investing in infrastructure has economic benefits, such as increasing jobs which increases wages. However, it will be interesting to investigate what role the current population living in social housing plays for this relationship. Understanding the volume of current residents in social housing helps the government to assess where to spend their housing budget. Theoretically, it makes sense that the more services a government provides that encompass basic needs, such as education or housing, the more income a household would have to spend on alternative consumption bundles. In addition to housing expenditure, I analyze the impact of spending on education, transportation, and culture at the ITL3. These expenditures were chosen because they could directly or indirectly affect disposable income. I uncover that these expenditures have various effects on societal wellbeing, especially when considered alongside housing expenditures.

This thesis is outlined as follows: section 2 reviews the current literature in five parts. I dive into the history of council housing, discuss government expenditures, housing subsidies, and measurements of wellbeing. I then wrap these areas together demonstrating gaps in current literature which, hopefully, this thesis will fill. Section 3 gives an overview of the data and addresses potential omitted variables, section 4 details the empirical strategy, section 5 shows the results, section 6 provides a brief discussion and opportunities for future research, and, finally, section 7 concludes.

2. Literature Review

2.1. History of Council Housing

When World War I ended in 1918, there was an increased demand for housing for soldiers who had just returned home to the United Kingdom (U.K.). In response to this demand influx, the government of the United Kingdom launched the Housing, Town Planning, &c. Act in 1919 which tasked local authorities, or governments, with providing dwellings, or council houses, for their low income residents. The law stated local authorities must “consider the needs of their area with respect to the provision of houses for the working classes, and within three months after the passing of this Act,..., to prepare and

submit to the Local Government Board a scheme for the exercise of their powers.”² The act amended a similar housing law that was enacted in 1890³ tasked with providing housing to working class families and making it the local government’s responsibility to ensure each dwelling was reasonably fit for human habitation. The Housing Act of 1890 was designed for the largest cities in the United Kingdom at the time to try and clear out slum-like living conditions⁴. This was mostly targeted at London, so when the 1918 act was put into law, it required that all councils across the United Kingdom supply housing at a reduced cost to tenants to raise living standards across local authorities. This was a pivotal point for the increase in government spending in regards to housing. When the government made homes more fit for habitation, the cost of rent went up in these areas but no subsidies were provided so there was still a gap in housing affordability. Ultimately, the Housing, Town Planning, &c. Act in 1919 heightened citizen expectations of local authorities, and thus the creation of affordable housing became a higher priority.

Following this, construction of council housing peaked in the 1950s when local authorities built 147,000 homes a year on average⁵, totaling five million council homes up till 1981. Since 1981 only 250,000 council homes have been built by local authorities⁶. Although supply has slowed in recent years, demand for affordable housing remains high since the cost of living continues to rise while wages remain stagnant and the median income of renters has lowered relative to the mean (Albouy et al., 2016). Housing tenure refers to the arrangements in which a dwelling is occupied⁷, and can be rented from the public or private sector, or owned outright. This paper addresses rented public housing tenure to investigate if local authority spending on this provision boosts total community welfare.

Over time, social housing has gone from being a large part of local authority spending to a last resort known as the safety net for the worst off in a community, which has led to stigmatization of public housing (Forrest & Murie, 1983). Stigmatization of services may draw an aversion to the people who use those services, or discourage those in need from seeking help, and result in polarization in a community. Polarization in turn can result in reduced welfare in a community due to increased social segregation and decreased cohesion. To exemplify, those in need of housing assistance but are unable to gain access end up living on the street which increases homelessness, and in turn homelessness leads to increased violence (Anooshian, 2005). It has been proven in Lithuania by Vazonienė & Kiaušienė (2018) that housing is actually a key form of infrastructure and should be funded by the government for the sake of societal

² <https://www.legislation.gov.uk/ukpga/1919/35/enacted>

³ <https://www.legislation.gov.uk/ukpga/1919/35/part/1/enacted>

⁴ https://fet.uwe.ac.uk/conweb/house_ages/council_housing/section2.htm

⁵ <https://www.local.gov.uk/topics/housing-and-planning/council-housing-100/future-council-housing>

⁶ <https://www.parliament.uk/business/publications/research/olympic-britain/housing-and-home-life/build-it-up-sell-it-off/>

⁷ <https://stats.oecd.org/glossary/detail.asp?ID=2697>

welfare. Thus, understanding the effects of unstable housing infrastructure on local municipalities can help us infer outcomes of government investment in this area.

2.2. Government Spending

Government spending and provision of public goods are very important topics covered across economic literature. However, the relevant scope of government spending in the context of this paper focuses on local government spending and public attitudes towards it. It is curious to understand how a change to local level expenditures affects the wellbeing of that community. What impact does local infrastructure spending have on an area's residents? Does reducing investment in infrastructure, such as housing, decrease the welfare of those living in a specific council?

The majority of existing literature covers how government spending affects growth. Government spending can have indirect effects for wellbeing, for example, an infrastructure bill can create jobs which reduces unemployment, improves output, and increases wages. Furceri et al. (2018) conducted research to understand the distributional benefits of government expenditure and proved it leads to redistributive gains, which in turn lead to increased societal welfare. Redistributive gains are one goal of government subsidies on affordable housing in order to make homes more accessible to those who are economically worse off in society.

Historically, the U.K. government invested heavily in a program called Housing Benefit. This program covered nearly 100% of the rent for households falling below the income threshold for sufficient housing (Gibbons and Manning, 2006). Eventually, the government found the program expenditure to be too large, so they cut spending on this program after 1997 when the new Labour Party was elected. This exemplifies how it is important to strike a balance in order to maximize redistributive gains because it begs the question if providing housing subsidies for many who need it versus providing free housing for the worst off generates equity and efficiency gains. Most literature in this area discusses Housing Benefit instead of housing subsidy programs as a whole (Hills, 2001). However, we can take findings from Housing Benefit and apply them to this case since Kemp (2000) investigates what happens before and after the expenditure on this program was reduced. When compared with Australia, another commonwealth country, the United Kingdom has a larger social safety net and quantity of public housing stock (Bentley et al., 2015).

While most literature covers macroeconomic effects, specifically growth, there is little research done at the microeconomic level that covers community welfare. In a perfect world, this paper would be able to measure impacts to disposable income only for people who live in public housing. However, that income only for those residing in council housing is not available so the paper will look at how government housing expenditure affects societal welfare proxied through the average disposable income per head of each specific region. Housing is a type of key infrastructure (Ponce, 2010) and it is known from Vazonienė & Kiaušienė (2018) that government investment in infrastructure improves wellbeing and economic productivity. Thus, this paper examines if an increase in spending on housing infrastructure improves a local authority as a whole. We can infer from various views on essential government spending that citizens would feel similarly regarding government expenditure on housing. This paper will not shed light on how households feel about government spending on housing, but it will show what happens to the objective measurement of disposable income when local government expenditure increases.

One main goal of government redistribution is to reduce the gap between the rich and the poor⁸. In the UK as a whole, government spending financed by taxes helps redistribution to close the income gap between the richest and poorest from 12 times larger to 4 times larger. While it is proven the gap is reduced after taxes, it is unclear whether overall equality improves. It is reported in addition to this research that the Gini coefficient increases by .2 percentage points per year in the U.K. according to the Office of National Statistics⁹ (ONS), demonstrating that inequality is still increasing. How do we conclude that governmental redistribution helps? In regard to housing it is unknown whether redistribution of resources to housing specifically improves welfare of everyone in the community. For instance, this could be the case because communal dignity is restored when everyone has a roof over their head. As local government size grows in area and population, demand for spending on public goods increases (Egger and Koethenbueger, 2010), so when conducting empirical analysis we can't exclude variables that might be correlated with local authority size otherwise there would be endogeneity bias.

Government spending on policies to increase welfare are seen as positive in OECD Countries (Flavin et al., 2014). Citizens in OECD countries feel positively about government spending that holistically improves welfare. Flavin et al. (2014) also shows there are increases to welfare for citizens when the governmental policies shield from negative economic events. This can include decommodification, which in the context of this paper would mean decommodifying housing, which is a

⁸ <https://www.imf.org/en/Publications/fandd/issues/2018/03/bourguignon>

⁹ <https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/bulletins/theeffectsofaxesandbenefitsonhouseholdincome/financialyearending2020>

human right. This begs the question if the overarching aim of the government to provide an acceptable standard of housing is satisfied? Ideally, separating out the impact of spending on those with low disposable income versus disposable income of the community as a whole would exemplify how to help the least well off in society. However, creating an argument for progressing overall community welfare may improve public perception of government spending and use of taxation.

2.3. Housing Subsidies

Traditionally, housing subsidies are in place to help low income or unemployed households afford a dwelling that meets minimum living requirements. Housing Benefit is still the name of the U.K. housing subsidy program, but it is ever evolving. It currently is used for those who need help paying rent that may be unemployed or on benefits¹⁰. Ultimately, this is not a long term housing solution and has various requirements in order to claim the benefit. Council housing differs from housing subsidies in the sense that there are entire housing complexes dedicated to reduced rent in which households can live and don't need to pay more than 30% of their income. The goal of government spending on housing would be to make available “a decent home for all at a price within their means” (Hills, 2001). Spending around 30% of household income on rent is the golden rule for affordable housing according to ONS¹¹.

Housing is an essential consumption good and one of the most important commodities that households will spend their income on (Brueckner, 2011). Ideally, the data would allow us to calculate the disposable income of people living in council housing in each local authority. Since this information is not observable, it is implied that public housing is a form of infrastructure and the basis of this paper relies on how investing in public infrastructure boosts societal wellbeing.

According to Forrest & Murie (1983), there are three areas that will continue to negatively affect council housing: market marginalization in regards to essential consumption, political marginalization in the labour force, and uneven impacts of recessions. Housing and health are inextricably linked, and a safe home that provides a satisfactory life is essential. It has also been found that affordable public housing is used to increase economic efficiency and equity by fighting against homelessness, improving urban areas, and creating inclusionary zoning (Ponce, 2010). That then begs the question, if more resources are

¹⁰ <https://www.gov.uk/housing-benefit> (include more details about housing benefit)

¹¹

<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/bulletins/privaterentalaffordabilityengland/2012to2020>

invested in housing does that improve welfare noticeably for all citizens, not just those that receive housing subsidies?

Braakmann and McDonald (2020) find that housing subsidies have opposite effects depending on the type of tenure a household has. While subsidies can provide immediate assistance to those in need, they can distort real estate prices in the long run which can cause problems for buyers and, by proxy, renters. If an individual has to pay more to purchase their home and decides to rent it out on the private market, they may increase the price of rent. When rental properties increase in price the market adjusts based on the laws of supply and demand.

As Housing Benefit evolved over time, the U.K. saw a 60% decrease in funding for new council dwellings in 2010¹². This subsidy is currently transitioning to a new program called Universal Credit¹³ which combines income, childcare and housing support for low income citizens so instead of having a separate rent assistance fund it will blanket many needs. This program is more targeted at people who need assistance paying their current rent where council housing provides a more robust solution since landlords are not for profit and ensure residents are not paying more than a certain percent of their income in rent. This is intended for the poorest of citizens who need assistance making ends meet. On the other hand, council housing can help provide a balance for residents earning lower incomes so that they still have some disposable income to ensure basic needs and additional material goods.

Housing has now become inelastic in demand and is said to be falling into a free market trap¹⁴. Does the free market provide enough fair competition for market prices? From an economic standpoint, housing has inelastic demand because everyone needs somewhere to live. Goods with inelastic demand can create traps for the household because it's possible the price of an essential good increases to the point where the household must make a choice between eating or rent. The majority of the literature finds government intervention is needed as the free market drives prices in unreasonable directions for those who can't afford it. On the opposite end, there are famous economists such as Adam Smith who believe the market will self-regulate and prices will return to equilibrium levels by the invisible hand¹⁵. While that may be true, how long does that take to occur and what are households supposed to do in the meantime to be able to afford accommodation within their means.

¹² <https://www.housing.org.uk/about-housing-associations/the-history-of-housing-associations/>

¹³ <https://www.gov.uk/universal-credit>

¹⁴ <https://www.weforum.org/agenda/2019/01/why-housing-appreciation-is-killing-housing/>

¹⁵

<https://www.stlouisfed.org/education/economic-lowdown-podcast-series/episode-3-the-role-of-self-interest-and-competition-in-a-market-economy>

Unfortunately, decreased availability of affordable housing leads to more homelessness, homelessness leads to more people experiencing trauma on the streets, and thus more people needing emergency health services which puts more strain on health care system as a whole, in turn requiring more government spending and creating a vicious cycle (“Housing And Health: An Overview Of The Literature”, 2018). Housing is part of wellbeing, tenants can’t just get up and leave because they are receiving a bad service, meaning they don’t hold any exit power (Hills, 2001). These systematic strains can affect citizens at every level in a local community which is why it is important to measure how positive government spending shocks can permeate through the entire system and improve local welfare for everyone.

To conclude, it’s imperative that a local government invests in housing infrastructure through some form of government expenditure. In the United Kingdom policies are ever changing to meet the needs of households, but it’s unclear how these expenditures affect society on the whole. While it could be fascinating to see how banded solutions, such as Housing Benefit, compare to long term solutions, such as council housing, the purpose of this paper is to understand community wellbeing as a result of any spending on housing. Therefore, understanding the changes to supply of council housing will be crucial in this research.

2.4. Micro Level Wellbeing

Understanding wellbeing in economics dates back to old welfare economics and became more defined through the seminal work of Pigou in his book, *The Economics of Welfare*. In traditional neoclassical economics, welfare typically refers to individual utility while societal welfare is the aggregate of those individual utilities. The question then lies in how feasible it is to calculate individual utility for each member of society since people rank importance of needs differently, or ordinal utility. Coming back to Pigou, he states “though no precise boundary between economic and non-economic welfare exists, yet the test of accessibility to a money measure serves well enough to set up a rough distinction (11)” which demonstrates that we need a monetary, quantifiable measure to understand “welfare”.

2.4.1. Wellbeing Based on GDP

Traditionally, GDP per capita is used to measure country welfare, but increasingly makes less sense because it is used to measure growth and economic productivity. GDP can increase or decrease based on consumption, investment, government spending, imports and exports, and not all of these metrics have a tie to wellbeing. The literature suggests it's easier to use monetary measures, but if it is possible to measure happiness that would be ideal to use for this analysis. Therefore, gross disposable household income per head will be used to measure prosperity of a local authority and the respective wellbeing since it can be compared across regions (Oguz and Knight, 2010).

Monetary measures are used as an alternative to GDP for quantifying wellbeing, but only because there aren't better alternatives available (Fleurbaey, 2009). Fleurbaey (2009) also brings up the point that each person's conception of a good life is different, so using a metric such as disposable income is there to spend freely on how they perceive that expenditure will boost their wellbeing. He states "in sum, individual wealth is then a suitable measure for interpersonal comparisons. The market value of individual consumption can then be defended as a reasonable proxy for comparisons of wealth" (1035).

2.4.2. Subjective Wellbeing

Housing is now recognized under international human rights law as a basic human necessity (Kenna, 2012). Wellbeing and happiness are hard to quantify so the U.K. government defines gross disposable income as a measure of material welfare. Based on research from Giles and Vassilev (2018) disposable income per head is an appropriate metric for welfare because it can be compared across regions to discern the average consumption power of a household in that region. Smeeding and Sullivan (1998) perform well being analysis across various countries in Europe with the United States and use disposable household income in order to make these comparisons. All in all, there is no better metric available to measure household wellbeing at a local level than disposable income per head. This metric can be compared across regions as it is equalized for population, and is used to consume a bundle of necessities the household must purchase. While surveys may be a viable alternative, they are open to selection bias since some people may under or over report their wellbeing based on stigmatization of mental health.

2.4.3. Wellbeing Based on Disposable Income

Disposable income is then a good argument for social welfare because it's homogenous and provides available market level consumption for a household. Nevertheless, we can't correlate happiness with income, but we can use it as a definition of material welfare and consumption power. Wiesel et al. (2021) argues that disposable income per head after housing costs are taken care of is a better measure of wellbeing. While this would provide a better picture of available household consumption, it is difficult to locate data on household rents per local council in order to difference out cost of rent. Disposable income without differencing rents is still a viable metric for wellbeing due to the cost of living crisis. Research done by the OECD shows that GDP for OECD countries is expected to grow in 2022 while disposable income decreases for most countries, including the United Kingdom¹⁶. This means economic growth may look positive on the outside, but does not give a good indicator of how individual households are doing. Figure 4 in the appendix plots disposable income per capita from 1997-2019. While it is linearly increasing, we see it only increases £10,000 over the course of 20 plus years. The next step would be plotting this against cost of living for the same time period to truly understand how cost of living has outpaced income.

A new study from Housing Europe (The Economic Benefits of Affordable Housing | Housing Europe, 2021) shows that limiting the number of for profit landlords and increasing publicly rented housing improves incomes and gives purchasing power back to the citizens. For the sake of this paper, we assume that an increase in disposable income improves the household utility because they have additional income to spend on goods or services that they desire.

2.5. Spillover Effects

In an ideal world, current literature on how government expenditure on housing impacts households at the microeconomic level contains many gaps. Since housing is an innate human need, it's crucial for policy makers to see how investing in this infrastructure affects societies. Will households be better off if they spend less of their income on their rent? Naturally, the less you have to pay for an inelastic good the better. It makes logical sense that the less a household has to spend on consuming housing, the more they will have to spend on other consumption goods with which they can derive utility.

¹⁶ <https://oecdecoscope.blog/2022/06/22/structural-reforms-to-help-address-the-cost-of-living-crisis/>

Clearly, the United Kingdom has a larger social safety net than other OECD countries and has certain housing subsidy policies in place. While these policies help raise the standard of living for those who are unemployed or have low income, it is unknown whether these investments benefit local communities overall. The goal of this paper is to uncover what effects an increase to housing spending has for the greater good. Will we be able to see the spillover effects of social housing on local authorities as a whole?

While the main focus is on housing expenditure, it's crucial to understand the government has other ways they can spend their budget and those expenditures may have effects on housing. Since housing is already defined as infrastructure, I use education, transportation, and cultural expenditures to see if spillovers in community wellbeing match that of housing investment.

The effects of increased spending on housing will probably be more evident in the incomes of people who live in social housing, but it's unclear if we will see an increase in disposable incomes for the entire community as a trickle down effect. Ultimately, based on current literature it seems that government investment in housing will improve overall community wellbeing. The main unknown is if we will be able to see those effects through disposable income. Intrinsically, it can be predicted that investing more in community infrastructure, reducing slumlike conditions and homelessness impacts all households positively, not just the ones that receive the housing benefits. This paper will contribute to understanding if disposable income is a valid channel to observe changes in wellbeing for local communities. It will contribute to housing literature as a whole to support the notion that increased government spending on public goods, up to the point of diminishing returns, improves society as a whole.

3. Data

Statistical data for the United Kingdom is matriculated through various government ministries, and collected and displayed by the Office for National Statistics (ONS). I constructed my own panel data set from the ONS data set Regional Gross Disposable Income (GDHI). This data is available for 1997-2019 at various international territorial levels (ITLs), but my sample period is 2009-2019 at ITL3. I chose the third ITL as it provides the most granular breakdown of local regions. The sample period starts in 2009 as to not include the 2008 financial crisis and spans to 2019 to reach as close to present day with the available data.

Government spending data by local authority on housing is added into the panel and comes from the Department for Levelling Up, Housing, and Communities (UK Ministry)¹⁷. It is part of the collection titled “Local authority capital expenditure, receipts and financing”, specifically the capital outturn return table (COR A1). This data is available for the desired sample period 2009-2019 on a yearly basis. The same information is available for the local authorities in Wales from the Welsh government website¹⁸ which are then aggregated to the corresponding ITL3. Since there are often multiple local authorities inside an ITL3, I summarize these expenditures to the matching ITL3 because GDHI is only provided at that level.

During the sample period, there is only one census year in 2011 which is important when accounting for demographic factors across local authority populations. I do not use the census data since demographic factors change very slowly over time and it is taken close to the beginning of the sample period. Thus, I include ITL3 fixed effects as part of the identification strategy, which covers time invariant elements. For example, this covers geographical factors that could affect wellbeing, such as distance to the ocean or accessible green spaces. This also picks up the demographic factors, such as, age, gender, race, household size, and education level.

In order to separately analyze areas based on their social housing needs, I use the percent of the population living in social housing by local authority from the House of Commons Library (UK Parliament). I then use the population of people living in social housing by local authority to split the sample into three data sets based on 25%, 50% and 75% quartiles. There are approximately 500 observations for each split. I then run three regressions for the municipalities split in three areas. I also run the same regression for the whole sample, but the purpose of splitting it up is to compare local authorities with a similar percentage of its population living in social housing. The distribution of the population in social housing is shown in Figure 1 in the appendix.

¹⁷ <https://www.gov.uk/government/collections/local-authority-capital-expenditure-receipts-and-financing>

¹⁸ <https://gov.wales/local-authority-revenue-and-capital-outturn-expenditure>

Table 1: Descriptive Statistics

Variable	N	Median	Mean	Min	Max
GDHI	1584	17,368.50	18,714.91	10,804.00	62,408.00
% Population in Social Housing	1585	0.17	0.18	0.06	0.44
Housing Expenditure	1551	23,399.00	36,988.57	2.00	303,701.00
Education Expenditure	1584	22,751.50	43,906.99	0.00	455,802.00
Transportation Expenditure	1584	18,298.00	31,915.46	-6.00	4,069,896.00
Culture Expenditure	1584	5,793.50	8,772.26	0.00	77,636.00
Total-Housing Expenditure	1551	85,678.00	134,300.70	374.00	3,435,042.00
Percent of Total Spent on Housing	1584	0.20	0.25	0.00	0.93
Total Expenditure	1584	115,865.50	169,000.10	109.00	3,439,980.00

Additionally, it is important to consider that the government has a choice of what to spend their budget on so it is imperative to understand how spending on housing stacks up against other types of expenditure. Thus, I consider three other categories of government expenditure, total education, total transportation and total culture. I chose these three controls to compare with housing expenditure because they either are key forms of infrastructure for a local area or they help improve wellbeing, or both. Education expenditure covers capital expenditures and assets related to education through secondary school. Transportation expenditure covers capital expenditures and assets related to public transportation, highways, and roads. Culture expenditure covers capital expenditures and assets related to libraries, art, and open spaces in a local community. On top of the three specific expenditure categories, I construct a new variable that subtracts housing expenditure out of total local authority expenditure. This control encompasses all else the authority could spend their money on besides housing.

3.1. Potential Omitted Variables

In this section I will cover potential omitted variables that cannot be included due to availability of data. I will evaluate how the results in section 5 will be biased in the absence of these controls. In the discussion section I will address whether these omitted variables entirely discredit the results or not.

The measure of personal wellbeing by local authority also comes from ONS¹⁹. This data could be interesting to use as a robustness test to see how government spending on housing affects this wellbeing

¹⁹ <https://www.ons.gov.uk/datasets/wellbeing-local-authority/editions/time-series/versions/2>

measurement versus gross disposable household income. This data is not used as the main dependent variable since it does not cover the whole sample period, and is a survey taken from 150,000 participants asking them to rate their life satisfaction on a scale from 0 to 10. Surveying wellbeing is subjective to the individual filling out the survey and can lead to selection bias. It's possible people would not respond honestly to the survey due to stigmatization around mental health since it also asks questions about anxiety. This could lead to more people reporting that they are feeling satisfied with life which would overestimate results, showing that government spending disproportionately improves wellbeing. Additionally, the UK government reports that comparing this metric across local authorities may not be accurate due to the way that they constructed sample sizes. Using a measurement, such as disposable income, cannot be manipulated by survey respondents which eliminates selection bias.

The average rental cost per housing unit by local authority could be a potential omitted variable because rents are usually set around the cost of living of an area. Taking this information as given, an increase in average rental price would also increase GDHI. This would also impact government spending on housing because if the rental price is too high the government would increase spending to create more housing supply. Since this would affect the independent and dependent variable the same way, we can expect results to be overestimated without this control.

Another interesting variable to add would be the new supply of affordable housing year over year which comes from the House of Commons Library (UK Parliament)²⁰ on a local authority level. Spending on housing might differ by authority if there is a lack of supply of affordable housing. For example, if an ITL3 region has no supply of affordable housing but a large housing expenditure for the following year it could be implied that that authority is working to increase the supply for their area. This will be compared with percent of the population living in social housing as a robustness check on a one to one, but it is not complete for the whole sample period, the local authority lines do not match with the ITL3, and data for Wales is unavailable. I predict the results will be different without this control because an increase to housing supply would mean an increase in local authority government spending. The results would be underestimated if increasing housing supply decreased GDHI which could be the case if cost of living goes down and incomes adjust. The results would be overestimated if increasing housing supply increased GDHI which could be the case if more housing brought more people to an area and more jobs were created from this infrastructure investment.

²⁰ <https://commonslibrary.parliament.uk/local-authority-data-housing-supply/>

Social rent: set through National Rent Regime and is about half of local market rent

Affordable rent: no more than 80% of local market rent

Unemployment and households below average income could have an effect on the dependent or independent variable in this regression. Neither of these metrics are available year over year at the ITL3 or local authority level. Unemployment across the United Kingdom has an average of 6.2% during my sample period²¹. It peaked around 8% in 2011 and then fluctuates around 4% from 2015 onward. Unfortunately, this doesn't show what unemployment looks like at a more granular level. Due to the mild changes year over year for the whole country, we can infer that the changes will not be too drastic over time. I still believe it could bias the results because it's possible unemployment is unnaturally high in certain local authorities. This would lead the results to be underestimated since an increase in unemployment would decrease GDHI and increase government spending on housing to support those receiving unemployment.

The density of jobs by local authority changes year over year and comes from NOMIS which is the labor statistics portal powered by ONS²² could be important for understanding if employment density affects spending on housing. Since affordable housing can be a benefit for those who may be unemployed or living in an area with fewer economic opportunities, this metric could be correlated with government spending. I do not predict it will affect the results much because people across the United Kingdom typically commute for their work, specifically to London. This should thus not affect GDHI or spending on housing, but the access to London could bias earnings potential during this time period. However, geographical factors by ITL3 are picked up in fixed effects since they are time invariant, so distance to London is already covered in the regression, thus the omission of this variable should not bias the results.

4. Methodology

The analysis in this paper covers data from England and Wales only instead of the entire United Kingdom. The main reason for this is the Housing Act 1919 didn't extend to Scotland and Ireland, and the local authority zones were redrawn during the sample period 2009-2019²³. However this issue did not occur in England and Wales. Migration of households across local authorities should not pose a problem to this analysis because I use GDHI per head which accounts for population changes so regions can be easily compared. Each local council also has rules on who can apply for council housing²⁴. Typically, the

²¹ <https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/unemployment/timeseries/mgsx/lms>

²² <https://www.nomisweb.co.uk/query/construct/components/stdListComponent.asp?menuopt=12&subcomp=100>

²³ <https://www.ons.gov.uk/methodology/geography/ukgeographies/eurostat>

²⁴ https://england.shelter.org.uk/housing_advice/council_housing_association/how_to_apply_for_council_housing/who_can_join_the_housing_register Rules from Shelter UK outlining key rules that are common across councils for joining the housing registry for council housing. - savings below a certain threshold - minimum number of council points- you can bid up the property ladder if you have disability, unemployment, etc

individual needs to be a resident of that local authority for three plus years before getting access to affordable housing. This mitigates any incentives for people to migrate to the cheapest council housing complexes. In order to verify that people are not migrating to authorities with cheaper council housing, I run the same regression with the last five years of the sample from 2015 to 2019 since it's unlikely residents were able to move and successfully sort into new council housing in a different authority. This does not provide groundbreaking information, it just confirms that the results for the whole sample still hold.

In order to measure the spillover effects government spending on housing has on societal welfare, I apply a standard Ordinary Least Squares (OLS) model to the panel data set I constructed. All variables are log transformed to ensure a normal distribution. This is important to normalize the data since some variables were left skewed, and when all variables are log transformed the results can be interpreted as percent changes. Figure 2 (Appendix) shows log transformed GDHI. The empirical strategy is specified below:

$$\ln(y_{it}) = \alpha_{it} + \lambda_{it} + \beta_1 \ln(x_{1it}) + \beta_2 \ln(x_{2it}) + \epsilon_{it} \quad (1)$$

$$\ln(y_{it}) = \alpha_{it} + \lambda_{it} + \beta_1 \ln(x_{1it}) + \beta_3 \ln(x_{3it}) + \beta_4 \ln(x_{4it}) + \beta_5 \ln(x_{5it}) + \epsilon_{it} \quad (2)$$

where y is the dependent variable, GDHI for local authority i at time t , α is the fixed effect, λ is the year effect, β_1 is the parameter of interest, x is the independent variable government spending on housing for local authority i at time t , and β_2 is the coefficient on total minus housing expenditures for local authority i at time t . β_3 , β_4 , and β_5 are added in equation 2 as parameters of interest for other types of government spending, namely education, transportation, and culture respectively replacing total minus housing expenditure, and ϵ is the error term. I then compare the output on the independent variable when controlling for total minus housing versus specific expenditures. Regressions for equations 1 and 2 are run for all 144 ITL3, then three separate times splitting the sample into low, mid, and high quartiles that the local authority is in with respect to percent of the population in social housing. The purpose of this is to see how government spending affects areas based on how much of the population lives in social housing.

5. Results

The results for the regression outlined in equation 1 hold with the idea that gross disposable household income and government spending on housing have a positive relationship when evaluated across all 144 ITL3. For every one percent increase in local housing expenditure, disposable income increases by .01%²⁵ and is statistically significant at $p < .05$, shown in column 1 of table 2. Moreover, when total spending minus housing increases by one percent, disposable income increases by .013%. I then split the sample into three, labeled low, mid, and high, based on where that authority falls in the distribution of population living in social housing. When splitting the sample, I find that the parameters of interest are only significant if the percent of the ITL3 population living in social housing is in the bottom 25 percentile. I also find that a one percent increase in total minus housing expenditure increases GDHI by .019% for the low quartile and .022% for the mid quartile, suggesting that housing expenditure doesn't play a part in increased welfare. The following subsections discuss the coefficients for each parameter in more detail and the potential implications of those findings.

5.1. Housing Expenditure

An increase in housing expenditure at the local authority level consistently leads to an increase in GDHI across all regressions, albeit some results are not statistically significant. Table 2 shows the regression output for equation 1 when run with 1,551 observations in column 1, and around 500 observations in columns 2 to 4 which are labeled based on what quartile the authority is split into. The results show that for every one percent increase in housing expenditure, GDHI increases .024% for the ITL3 with their population in social housing in the lowest quartile. The coefficient isn't even statistically significant for mid and high quartiles, rendering results for those ITL3 inconclusive. Columns 1-3 have $Prob > F = .05$ or lower which is required for a good fit, while column 4 representing the high percent of the population in social housing has a very high $Prob > F = .744$, meaning it is not a good fit.

Table 3 shows the regression output for equation 2 for all ITL3s, low, mid, and high social housing quartiles. When controlling for specific types of expenditures, the coefficient on housing becomes more pronounced. The results are now statistically significant for all quartiles, albeit a one percent increase in government spending on housing still leads to the highest increase in GDHI for the low quartile at .037%.

²⁵ Increase or decrease in GDHI is calculated by $(1.01^{\text{coefficient}} - 1) * 100$ to get the percent. Ex: $(1.01^{.01} - 1) * 100 = .01\%$ increase

To check the robustness of my results, I run the regression for equation 2 across time periods for low and high quartiles. These results are displayed in table 4 and 5 (Appendix). I find that spending on housing for the lowest quartile leads to consistently higher increases in GDHI than any other quartile. In my mind, this suggests that if there are less people living in social housing there may be more of a demand for housing expenditure which leads it to have a stronger effect on income. The more people that live in social housing the less expenditure is needed there, demonstrating diminishing returns of investing in this area.

Table 2: Main Results

VARIABLES	Log GDHI			
	(1) Total	(2) Low	(3) Mid	(4) High
Log Housing Expend.	0.010** (0.005)	0.024*** (0.008)	0.010 (0.007)	0.006 (0.008)
Total-Housing Expend.	0.013** (0.005)	0.019** (0.008)	0.022** (0.009)	-0.003 (0.009)
Observations	1,551	535	506	510

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

5.2. Education Expenditure

Spending on education is the only parameter that has a negative relationship with gross disposable household income. It is particularly curious that a one percent increase in education expenditure decreases GDHI by .055% for the low quartile, .058% for the mid quartile, and .082% for the high quartile.

I find the negative relationship between these variables quite interesting. I would have predicted that there would be little to no effect on GDHI. While much research has been done to show that investing in education improves future incomes, these coefficients show something different. GDHI is recorded for those above 16, but education spending stops at secondary school which is about 16 to 17 years old. Thus, we are looking at the incomes of parents when education spending goes up in their local authority.

5.3. Transportation Expenditure

The coefficients for transportation expenditure align with the effect I expected it to have on income. For a one percent increase in government spending on transportation we see an increase in GDHI by .04% for the low quartile, .067% for the mid quartile, and .036% for the high quartile.

This makes sense because if the government invests in large transportation infrastructure projects, that typically leads to an influx of jobs. This would then increase wages. Additionally, if the government improves the way citizens get around an area then that could decrease the out of pocket cost people pay to move around. Thus we would see an increase in government spending on transportation and an increase in income because people would be spending less money on transportation related expenses.

5.4. Cultural Expenditure

When interpreting the results of culture expenditure, we see for tables 3 and 4 that the change is statistically insignificant. This means that there is no relationship between an increase in government spending on cultural related expenses and income. This makes sense because cultural expenditures include resources that are nice to have, but not essential. Investing in parks and libraries can improve wellbeing and perhaps make someone happier, but it is not crucial to everyday life in the way that housing or transportation are.

In table 5 (Appendix) I test the high quartile group during different time periods to verify my results hold across time, and to account for any migrational changes. The only time cultural expenditures are statistically significant is when 2009 is eliminated from the sample, or the sample shrinks to 5 years (2015-2019). I cannot draw any reasonable conclusions from this, but it could be said that places where there is a larger portion of the population in council housing benefit more from cultural expenditures. This would make sense because affordable housing is typically associated with those making lower incomes, so investing in the culture of a local authority provides wellbeing improvements to those who may otherwise be unable to afford it. The only issue is that eliminating 2009 and 2010 shouldn't change the magnitude and significance of the coefficient so much. The only hypothesis for that is that the economy was still recovering from the recession in 2009 and that can cause a bias within the data.

Table 3: Main Results

VARIABLES	Log GDHI			
	(1) Total	(2) Low	(3) Mid	(4) High
Log Housing Expend.	0.019*** (0.005)	0.037*** (0.007)	0.013* (0.008)	0.027*** (0.009)
Log Education Expend.	-0.064*** (0.007)	-0.055*** (0.012)	-0.058*** (0.011)	-0.082*** (0.006)
Log Transport Expend.	0.049*** (0.008)	0.040** (0.016)	0.067*** (0.013)	0.036*** (0.008)
Log Culture Expend.	-0.005 (0.004)	-0.009 (0.010)	-0.009 (0.007)	0.001 (0.005)
Observations	1,299	406	436	457

Robust standard errors in parentheses

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

In the authorities with a lower percent of the population in social housing, we see government housing expenditure has a higher effect. While there is a positive relationship between spending and household income for all population distributions of social housing, seeing the largest effect for the lowest quartile could have to do with a lack of supply. Since the demand for social housing at a local authority level is not available, all we know is the population density of those living in social housing (Figure 1). It could be inferred that more spending is invested in these communities because there isn't enough council housing to meet the demand. The best way to verify this is to see if there is an inverse relationship between social housing supply and percent of the population residing in social housing. I cross checked housing supply from the UK House of Commons Library and it shows for high density areas that new supply peaked in 2011 and fell until the end of the sample period where it increased slightly in 2020. For low density areas, housing supply starts minimal in 2011 and increases towards the middle of the sample then falls towards 2020. This confirms that there exists an inverse relationship between these two variables. Diagrams from the dashboard for Islington and Sussex are available in figures 5 and 6 (Appendix) demonstrating this.

Table 4

VARIABLES	Log GDHI (Low Population in Soc. Housing)		
	(1) 2009-2019	(2) 2011-2019	(3) 2015-2019
Log Housing Expend.	0.037*** (0.007)	0.036*** (0.007)	0.018*** (0.004)
Log Education Expend.	-0.055*** (0.012)	-0.049*** (0.007)	-0.024*** (0.004)
Log Transport Expend.	0.040** (0.016)	0.054*** (0.007)	0.027*** (0.006)
Log Culture Expend.	-0.009 (0.010)	-0.001 (0.008)	0.005 (0.004)
Observations	406	333	192

Robust standard errors in parentheses

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

5.5. Standard Errors

After running the original regression from column 1 of table 2, with and without robust standard errors I plotted the residuals to test for heteroskedasticity. This could pose a problem for the results if it is not corrected as there would be unequal variability in the error term, or set of unobservables. Figure 3 shows this plot and details evidence of slight heteroskedasticity. Research from Angrist and Pischke (2009) shows that a bit of heteroskedasticity will not bias the results, and by including robust standard errors it should correct for any variability in the unobservables without biasing the coefficients of interest. Thus, all regressions reported in the results tables have robust standard errors to correct for this so as to not invalidate the results. This doesn't change the coefficients of the regression, but slightly changes the standard errors by approximately .001.

5.6. Additional Checks

Lastly, I test to see if the time period of the sample affects the results. I split the sample into different years and then run equation 2. I use a five year period to try and understand if we can see the effects of migration in the results. Shrinking the sample to five years can be a proxy for migration patterns in case people move to local authorities with cheaper housing. Put another way, it's unlikely people will move across local authorities within 5 years, and receive access to council housing that allows them to pay lower rent and receive more income. This is the case because the majority of local authorities have rules in place where an individual needs to be a resident of that council for a minimum of 2-5 years before they are considered.

Tables 4 and 5 (Appendix) detail the results when splitting the sample by population living in social housing and time frame. We can see in tables 4 and 5 the results hold with the findings described in tables 2 and 3. The main difference is the coefficient on housing for the low quartile from 2015-2019. Since the coefficient drops 50% when reducing the time frame, it is possible there is evidence of migration. This is so because during the five years with which I have restricted the regression, the increase in government spending on housing by one percent results in a .018% increase in GDHI versus a .037% increase in GDHI. While this could differ for various reasons, I infer that after the five years of living in a local authority people are incentivized to move to other authorities where they can maximize income and minimize rent costs.

Table 6 (Appendix) shows regression outputs when changing the independent variable to a different type of government expenditure and no other controls, except fixed effects. The purpose of this table is to verify the relationship between different government expenditures and GDHI. I find the relationships hold with the main results in tables 2 and 3 when performing this analysis.

Overall, the results show that an increase in government spending on housing can increase gross disposable household income. While the exact driver of this relationship might not be clear, it does support the idea that investment in infrastructure has a positive relationship with micro-level wellbeing. Another possibility why we see increased coefficients in the low social housing quartile could be that high income places correlate with income inequality so investment in social housing is increased for redistributive reasons. It is also possible council housing is so badly stigmatized that people don't want to live around it for fear of certain reputation driving down the significance of the coefficient in the high social housing quartile.

6. Discussion

This section will discuss the implications of the results, how they line up with my hypothesis, along with other curiosities I found in the data. I will then discuss the pros and cons of using OLS as a strategy, and how this research could be improved upon with additional data and time.

While the basic results indicate a positive relationship between GDHI and government spending on housing which was expected, it is curious that the coefficient on the independent variable changes depending on the controls added to the regression. This is one sign of omitted variable bias, which is addressed below in threats to identification.

The most curious finding to me are the results in table 2 showing that an increase in government spending on housing only increases GDHI in authorities with a lower population in social housing. This could suggest that there are diminishing returns to investing in housing in an area that already has a lot of people living in social housing. This result is also solidified in table 4 when I check if the results hold across time periods. My hypothesis is that there is evidence of diminishing returns for housing expenditure. Since these areas already have a lot of people living in council housing, they have previously had larger expenditures to build the housing stock. Thus when spending increases in those areas, it has less of an effect because more people reside in affordable housing.

Furthermore, it would be helpful to understand demand for council housing on a deeper level. Each local authority has a waiting list, but it is not kept in a database with ONS. I would recommend the local authority measure the waiting list volume at the beginning and end of each year, then report it to ONS. Then ONS would be able to list all local authorities together so it's easier to see demand for council housing based on the area of the United Kingdom.

6.1. Threats to Identification

The main threats to the identification strategy I see are omitted variable bias and endogeneity issues. These are common issues when using OLS for analysis. I am not particularly worried about heteroskedasticity since findings from Angrist and Pischke (2009) show it will not overly bias results especially when robust standard errors are added. However, I do believe omitted variable bias poses a

concern for this regression. Without affordable housing supply and unemployment the results are likely to be overestimated and underestimated, respectively. There is not enough information to assume that these two effects would cancel each other out.

On the other hand, the pro of using the OLS regression with fixed effects is it is a straightforward way to understand the relationship between government spending on social housing and societal material welfare across time. In a perfect world for policy analysis, we would be able to see before and after effects of certain expenditures, not just to see how welfare changes over time. For all intents and purposes, it is valuable for a government to understand the welfare of its citizens over various time periods. These results can help nudge local governments in the right direction to increase spending on housing, however, the allocation aspect of this policy advice is unknown.

Fundamentally, OLS made the most sense to analyze a relationship between government spending on housing and wellbeing. Once the variables were logged transformed to ensure normal distributions, which is imperative to balance out any bias in the data, this is the simplest method to try and determine a causal relationship. I believe the methodology is strong because it allows me to isolate government expenditure on housing and quantify its effect on GDHI, but the potential for omitted variables is too high and thus still biases the results.

If I had two years to understand the data and work on this research, I would drill into the before and after effects of welfare when adding social housing developments to local authorities. I would find local authorities that recently built large volumes of affordable housing stock. I would then take the year of completion of the stock as the cut off year and perform difference in difference analysis before and after the cut off on welfare proxied by incomes. For good measure, I would also clean up the personal wellbeing data and cross check the results before and after the housing stock is constructed in the local authority. I believe it would take a very long time to construct such a data set for 144 plus local governments, but it could provide quantifiable benefits of providing a basic need in a community.

While this paper measures spillover effects for a whole community, in a perfect world I would have also been able to analyze the effect of government spending on housing on only the incomes of people who live in council housing or receive Housing Benefit. This would better provide results on how redistribution affects those who are worse off in society and need assistance with basic needs. This would be incredibly helpful for local governments because then they could reallocate budgets depending on their preference for redistribution.

7. Concluding Remarks

This thesis set out to uncover the relationship between local government spending on housing and local societal welfare. I use international territorial level (ITL3) data from England and Wales to perform granular analysis of local level spending. As the cost of living crisis continues to worsen, it is important that governments continue to monitor the wellbeing of their citizens, specifically to ensure adequate housing for human rights reasons. The results show that increasing spending on housing in ITL3s where the population living in social housing is in the bottom quartile yields the highest increase in GDHI per capita. My main hypothesis behind this reasoning is that there are diminishing returns to affordable housing investment.

Can we draw any policy related conclusions from these results? Unfortunately, not all endogeneity concerns are eliminated as I believe social housing supply, unemployment, and rental prices are key omitted variables. As a long term goal it would be prudent to see if making housing more affordable for certain households creates ripple effects through a community and boosts overall wellbeing. Until then, all we can conclude is that an increase in government spending on housing can increase incomes, and by proxy wellbeing, if there is a lower percent of the population residing in social housing. Once the percent of the population of an authority living in council housing crosses the median of the distribution, we see diminishing returns when increasing spending on housing.

All in all, GDHI provided the best measure of wellbeing based on available data. In the future, it would be helpful for the local authorities to publish social rent prices for the same ITL3 as disposable income. This way policy analysts can back out housing costs at a local level and understand the household budget constraint on a deeper level. Until then, the policy findings from this paper are statistically significant, but should be taken with a grain of salt. It does give insight into the benefits of government spending on infrastructure, but does not break down how exactly to spend the housing budget. For example, we see that transportation expenditure leads to larger increases in GDHI than housing expenditure but that doesn't mean a local authority should just decrease their housing budget and increase their transportation budget. While there isn't a broad sweeping conclusion from this research, we can still see that infrastructure spending at a local level improves community wellbeing through an increase in disposable income.

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Source 1

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Appendix

Table 1

Variable	N	Median	Mean	Min	Max
GDHI	1584	17,368.50	18,714.91	10,804.00	62,408.00
% Population in Social Housing	1585	0.17	0.18	0.06	0.44
Housing Expenditure	1551	23,399.00	36,988.57	2.00	303,701.00
Education Expenditure	1584	22,751.50	43,906.99	0.00	455,802.00
Transportation Expenditure	1584	18,298.00	31,915.46	-6.00	4,069,896.00
Culture Expenditure	1584	5,793.50	8,772.26	0.00	77,636.00
Total-Housing Expenditure	1551	85,678.00	134,300.70	374.00	3,435,042.00
Percent of Total Spent on Housing	1584	0.20	0.25	0.00	0.93
Total Expenditure	1584	115,865.50	169,000.10	109.00	3,439,980.00

Table 2

VARIABLES	Log GDHI			
	(1) Total	(2) Low	(3) Mid	(4) High
Log Housing Expend.	0.010** (0.005)	0.024*** (0.008)	0.010 (0.007)	0.006 (0.008)
Total-Housing Expend.	0.013** (0.005)	0.019** (0.008)	0.022** (0.009)	-0.003 (0.009)
Observations	1,551	535	506	510

Robust standard errors in parentheses

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

Table 3

VARIABLES	Log GDHI			
	(1) Total	(2) Low	(3) Mid	(4) High
Log Housing Expend.	0.019*** (0.005)	0.037*** (0.007)	0.013* (0.008)	0.027*** (0.009)
Log Education Expend.	-0.064*** (0.007)	-0.055*** (0.012)	-0.058*** (0.011)	-0.082*** (0.006)
Log Transport Expend.	0.049*** (0.008)	0.040** (0.016)	0.067*** (0.013)	0.036*** (0.008)
Log Culture Expend.	-0.005 (0.004)	-0.009 (0.010)	-0.009 (0.007)	0.001 (0.005)
Observations	1,299	406	436	457

Robust standard errors in parentheses

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

Table 4

VARIABLES	Log GDHI (Low Population in Soc. Housing)		
	(1) 2009-2019	(2) 2011-2019	(3) 2015-2019
Log Housing Expend.	0.037*** (0.007)	0.036*** (0.007)	0.018*** (0.004)
Log Education Expend.	-0.055*** (0.012)	-0.049*** (0.007)	-0.024*** (0.004)
Log Transport Expend.	0.040** (0.016)	0.054*** (0.007)	0.027*** (0.006)
Log Culture Expend.	-0.009 (0.010)	-0.001 (0.008)	0.005 (0.004)
Observations	406	333	192

Robust standard errors in parentheses

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

Table 5

VARIABLES	Log GDHI (High Population in Soc. Housing)		
	(1) 2009-2019	(2) 2011-2019	(3) 2015-2019
Log Housing Expend.	0.027*** (0.009)	0.030*** (0.008)	0.009 (0.008)
Log Education Expend.	-0.082*** (0.006)	-0.073*** (0.006)	-0.024*** (0.007)
Log Transport Expend.	0.036*** (0.008)	0.037*** (0.007)	0.006 (0.007)
Log Culture Expend.	0.001 (0.005)	0.011** (0.005)	0.014*** (0.005)
Observations	457	369	206

Robust standard errors in parentheses

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

Table 6

VARIABLES	Dependent Variable GDHI			
	(1) GDHI	(2) GDHI	(3) GDHI	(4) GDHI
Log Housing Expend.	0.014*** (0.005)			
Log Education Expend.		-0.057*** (0.007)		
Log Transport Expend.			0.011*** (0.003)	
Log Culture Expend.				0.000 (0.004)
Observations	1,551	1,320	1,539	1,564

Robust standard errors in parentheses

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

Figure 1

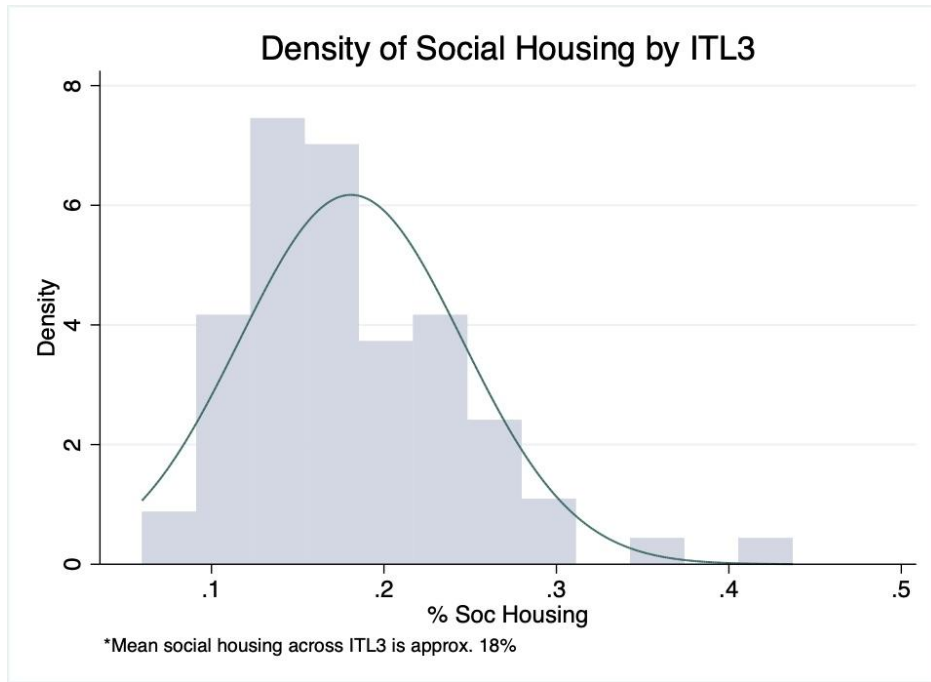


Figure 2

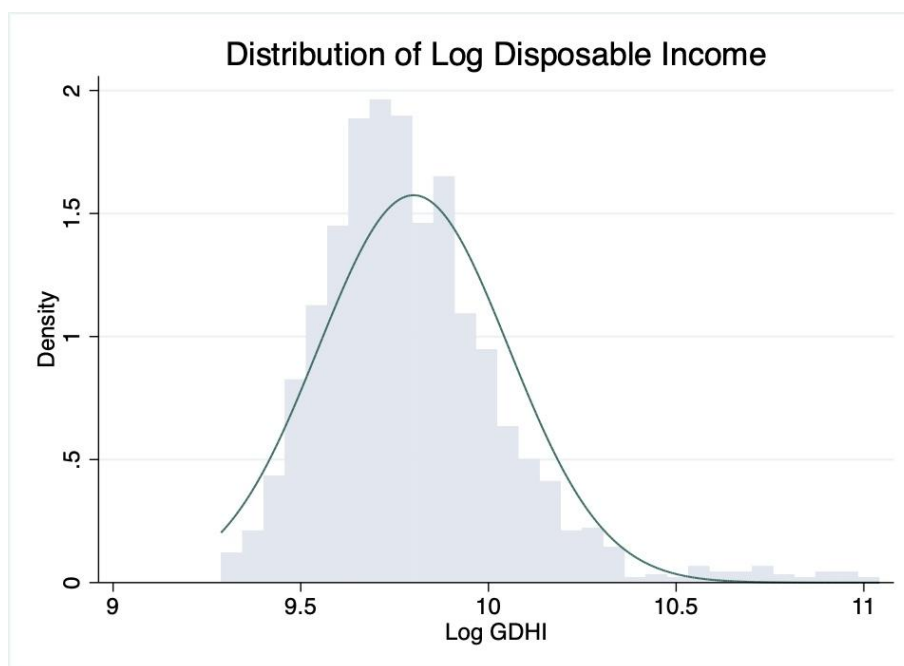


Figure 3

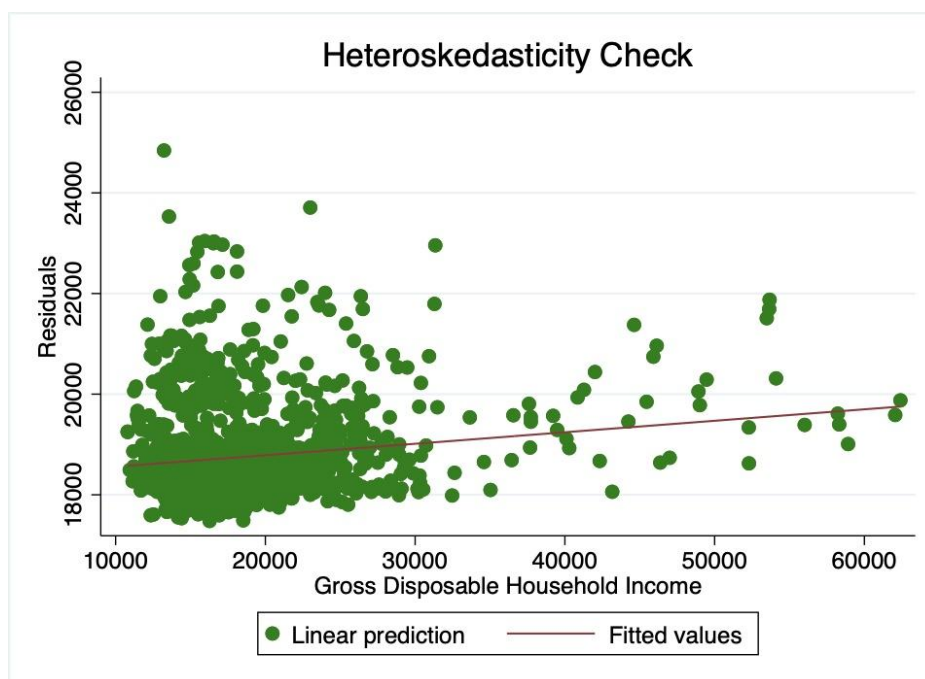


Figure 4

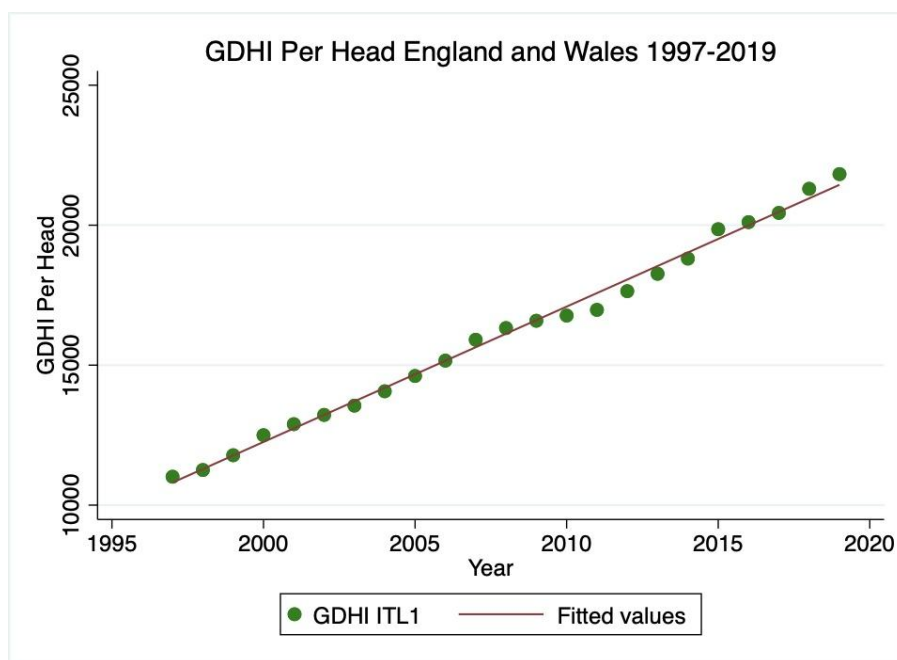


Figure 5: Islington



Sources: House of Commons Library Housing stock: DLUHC, Live Table 100, New supply: DLUHC, Live Table 123, Affordable housing: DLUHC, Live Tables 1006C, 1006aC, 1007C, 1008C

Figure 6



Sources: House of Commons Library Housing stock: DLUHC, Live Table 100, New supply: DLUHC, Live Table 123, Affordable housing: DLUHC, Live Tables 1006C, 1006aC, 1007C, 1008C