Relative housing inequality: The decline and return of housing space inequality in England and Wales, 1911-2011

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Abstract

Low consumption of housing and housing inequality have generally been measured through absolute rather than relative standards. This paper develops a relative measure of housing space consumption and applies it to England and Wales for 1911-2011. Over this period, the population grew by half, but the number of rooms tripled. The rate of low absolute housing consumption (overcrowding) fell from 49% to 4%. However, using the Gini coefficient, inequality in housing space was almost unchanged. Using inequality definitions more sensitive to the bottom of the distribution, the century splits into two parts. Housing space inequality reduced steadily from the 1920s to the 1980s, but then the trend reversed, and by 2011 inequality had returned to levels not seen for fifty years or more. This rise in housing space inequality warrants attention. Possible explanations include increased income inequality, a reduction in social housing, the rise of one person households, and new development of larger homes. [could be longer??

Keywords

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Long-term trends
Overcrowding
Housing occupation density
Housing consumption

Word count??
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1 table = 225
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Introduction

Throughout the twentieth century, the aims of housing policy in England and Wales, as in many other countries, included enforcing or enabling minimum housing consumption, and improving the housing conditions of the worst housed (Wohl 1977, Gordon *et al.,* 2003, Mullins & Murie, 2006, Schwartz, 2010, Gallent *et al*., 2010). Low consumption of housing and housing inequality have generally been measured through two main characteristics of housing, space and quality. This paper focuses on the consumption of housing space. In turn, low housing space consumption and inequality in housing space has traditionally been measured through the concept of ‘overcrowding’. This is a measure of low absolute consumption of housing

space. ‘Overcrowding’ has fallen dramatically in England and Wales over the period 1911-2011. However, this measure does not allow us to assess how housing space has been distributed across society, and whether the distribution of housing space between individuals has become, more or less, equal over that time.

This paper aims to explore: i) whether relative, as well as absolute, low consumption of housing space has reduced in England and Wales over the period 1911-2011, ii) how housing space has been distributed across society, and iii) whether the distribution of housing space between individuals has become more or less equal over that time.

The paper starts by describing the familiar concept of low absolute housing space consumption, or overcrowding, and describes the reduction in overcrowding in England and Wales in the twentieth century. Then it introduces the new concept of ‘low relative housing space consumption’ and ‘housing space inequality’, noting that the analogous concepts of low relative income or relative poverty and income inequality have been widely accepted and used for decades. It discusses the data required to measure these concepts, and how they were derived for England and Wales 1911-2011 from census records. Then it presents evidence on the trends in low relative housing space consumption and housing space inequality, in England and Wales 1911-2011. This evidence shows that using the Gini coefficient measure, there was little change in housing space inequality over the period. However, using measures more sensitive to the lower end of the distribution, the proportions living with less than 60% of the median space per person and the 90:10 and 50:10 percentile ratios, low relative housing space consumption and inequality reduced until the 1980s, but then began to rise again, wiping out much or all of the century’s progress. The article discusses some potential explanations for increases in housing space inequality, including: increased income inequality, changes in the tenure system, the rise of one person households, and changes in housing development.

The concept of low absolute housing consumption

The assessment and study of housing space inequality has been dominated by the concept of low absolute housing space consumption, with measurement focussing on the proportion of households falling below various absolute minima. In Britain, as early as 1891, *‘the importance of forming some kind of estimate of overcrowding, and the necessity for fixing upon some standard of overcrowding was fully recognised’* by statisticians (General Register Office (GRO), 1904 p40).

Two main ways of conceptualising minimum permissible or desirable consumption of housing space have developed since then, both referring to absolute consumption. The approach is that satisfactory consumption of housing space can be distinguished from ‘overcrowding’ in terms of a fixed threshold. This is defined in rooms per person (or persons per room as it was for much of the twentieth century), regardless of the types of people. The

Britain, the 1891 and 1901 Great Britain census reports noted that any cut-off would be arbitrary (GRO, 1904), but nonetheless, recorded the proportion of households and people living at densities above a cut-off of two people per room. In 2003 the proportion of children living at more than five people per room was included in the first international study of multi-dimensional child poverty (Gordon *et al*., 2003). The second approach takes into account variations in the amount of space different kinds of people might need, and in particular, which household members might be expected to share bedroom space. The 'room standard', which has been a statutory minimum in the UK since 1935, and was last reaffirmed in the Housing Act 1985, is of this type. The variant 'bedroom standard' has been used in UK housing policy and practice since 1960 (Holmans, 2005).

Several sources have expressed dissatisfaction with these existing absolute housing space standards. In 2004 the government department responsible for housing in England referred to the room standard as '*very low… now generally accepted as being completely unacceptable',* and said that the bedroom standard as at the *'margins of acceptability'* (Office of the Deputy Prime Minister, 2004a npn). In their review of English housing policy, Bramley *et al*. said that both space standards were *'dated'* and *'not capturing some important aspects of the overall need'* (2005 p43). Gilroy said, *'housing need that can no longer be measured by the traditional bedroom standard',* and suggested a *'fresh look'* (2005 p142). Recent research suggests that members of the public may share the opinions of these experts. In 2007 Bradshaw *et al*. included consultation on minimum housing consumption requirements, in a wider project on consensual definitions of acceptable minimum incomes (2008). The results were much more generous than the early- and mid-twentieth century official housing standards described above. For example, members of the public consulted felt that a pensioner couple needed two bedrooms, in case of illness of one of the partners or visiting family, rather than the one allowed by the 1960 bedroom standard. They felt that all children, including those of pre-school age, needed rooms of their own, while the official standards generally assumed that younger children and children of the same sex should share bedrooms (Holmans, 2005). The implication of these points is that even absolute standards should contain a relative element, in that they should be altered periodically, to take account of changes in median standards and expectations.

Despite the misgivings of government departments and others, an adaptation of the 1960 'bedroom standard' is currently central to the UK policy to reduce housing benefit payments to social housing tenants deemed to be 'underoccupying' and consuming more space than they need (DWP 2012), colloquially known by its opponents as 'the bedroom tax'. This policy has been partly justified on grounds of fairness, and seeks to level the housing space entitlement of housing benefit claimants in the private and social rented sectors as well as to reduce inequalities in housing space between social tenants and between tenants and applicants for social housing. It has attracted more comment than other aspects of welfare reform that affect more people or involve greater potential financial losses to claimants. The renewed 'politics of housing space' provides an additional justification for examining

concepts and evidence on the consumption of housing space and housing space inequality.

The concept of low relative housing consumption

Relative measures are well established in the study of low income and income inequality (eg. Townsend, 1976, Mack & Lansley, 1985, Gordon *et al*., 2003, Gordon & Pantazis, 1997, Hills *et al*., 2009, DWP, 2010, Hills *et al.*, 2010). At the start of the twentieth century Rowntree described 'primary poverty' in absolute terms, as the absence of resources to maintain health and physical efficiency (1901). However, in his second report twenty years later, he included resources to maintain normal social participation, such as newspapers and a radio on the list of 'essentials', as well as the food, rent, clothing and fuel (1941). Thus, low income and low consumption were defined relative to incomes and consumption across society at the time.

By the last quarter of the twentieth century there was a very broad consensus, amongst researchers and many policymakers that concepts of poverty must acknowledge normal patterns of behaviour and expenditure in society, and that measures should be uprated as average incomes rise (Townsend, 1976, Piachaud, 1987, Sen, 1992, Nussbaum and Sen, 1993, Dean, 2010). The concept of relative child poverty, defined as children living in households with below 60% of median equivalised household income, was at the heart of UK social policy in the 2000s (Hills *et al*., 2009). The Child Poverty Act 2010 defined as child poverty as income below 60% of the median, and made reducing it a legal duty for the UK government (Kennedy, 2010). The concept of relative low income has also been applied worldwide (Gordon *et al*., 2003).

In addition to relative poverty lines, which can be used to calculate the numbers of people or households who are 'poor', numerous measures have been developed to describe the characteristics of the overall distribution of income across societies (eg. Atkinson, 1970, Piachaud, 1987, Gordon *et al*., 2003, Hills *et al.*, 2010). These include the Gini coefficient, which quantifies the shape of a continuous distribution, and ratios which compare the values for particular groups at the top, bottom and sometimes the middle of the distribution, such as the 90^{th} and 10^{th} percentiles. Each require continuous or quasi-continuous variables, such as the income, for each person or household in the society.

There seems to be no strong logical argument that relative standards, widely accepted in examination of acceptable minimum income, should not apply to major areas of consumption, such as housing. Some researchers have made a positive argument in favour of using relative standards, at least to supplement absolute ones. Nearly thirty years ago, Robinson *et al*. commented that while there had been research on numerous issues connected to housing inequality, *'none… provide a measure of the extent of housing inequality across the entire household population or the way in which it has changed through time'* (1985 p249). Robinson *et al*. went on to pioneer

the application of concepts, from the measurement of income inequality to the measurement of housing inequality, in the UK (1985). They used the rateable value of homes held by individual households as their quasi-continuous variable. This approach has been used in countries where there are suitable datasets reflecting housing size or other important aspects of housing consumption, for example on internal floor space in the US (Landis *et al*., 2002) and in China (Logan *et al*., 1999, Li, 2000, Feng, 2008).
Stephens *et al*. argued recently that rising standards, rising national minima and increasing social expectations all provided support for *'considering 'housing poverty' to be a relative concept, in much the same way as income poverty'* (2010 p13). Bradshaw *et al*.'s work appears to demonstrate public support for this idea, and has already created a potential relative housing space standard for the UK in the 2000s, as a by-product of the more developed study of income poverty (2008).

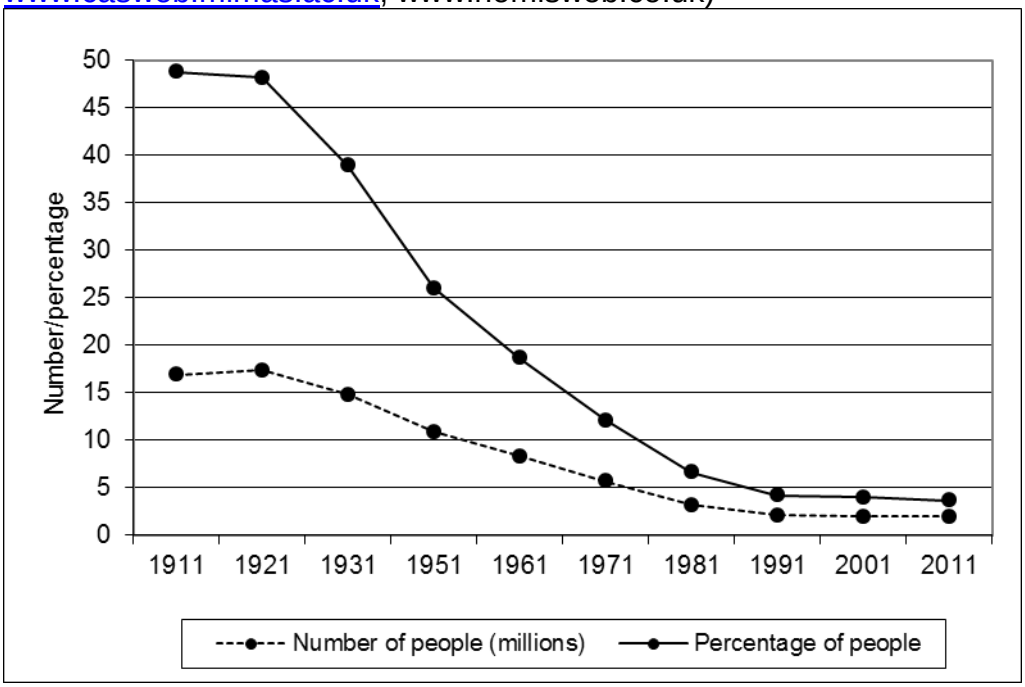
Drawing on the analogy of low relative income and income inequalities, there are grounds for thinking that low relative housing space consumption and inequalities in housing space are of interest. These may influence individual outcomes and may be implicated in social stratification. Firstly, if absolute consumption of space below certain thresholds or in certain ranges is harmful, inequalities in space that incorporate low absolute housing space consumption will create inequalities in outcomes. Numerous studies have explored correlations between 'overcrowding' and negative outcomes; from, 'immorality' to poor growth, poor health and difficulties with homework (Rowntree, 1901, Wohl, 1977, Office of the Deputy Prime Minister, 2004b, Dorling *et al*., 2005). Secondly, it is possible that inequality itself may have harmful outcomes, for example, via perceptions and their effects on behaviour, even if no-one is 'overcrowded' by an absolute standard. Again this argument is analagous to arguments made in the case of income inequality (Wilkinson & Pickett, 2009). Differences in home size are recognised and identified with social difference. For example, Engels described home sizes in Manchester as a symbol of income, wealth and class distinction (1958). More recently, both children living in a deprived housing estate and children attending a fee-paying school in England identified 'big houses' with wealth (Sutton *et al*., 2007).The idea that inequalities in housing consumption play an important role in social stratification has in fact been one of the principal justifications for the importance of housing as an area of study (especially in those societies which have overcome the worst health problems associated with low absolute consumption of housing). Academic work has focussed on the institutions and relationships through which housing is consumed, including concepts of housing classes (eg. Rex and Moore, 1967, Bell, 1977) and housing tenure (eg. Saunders, 1990, Hammnet, 1999, Malpass, 2006). The relative quantity of housing consumption would appear also to be at least a supplementary salient feature of housing consumption (eg. Dwyer, 2009).

In the next sections, this paper describes trends in low absolute housing consumption over the twentieth century. It then develops and applies measures of low relative housing space consumption and inequality in housing space consumption, to fill the gap identified here.

Trends in low absolute housing consumption 1911-2011

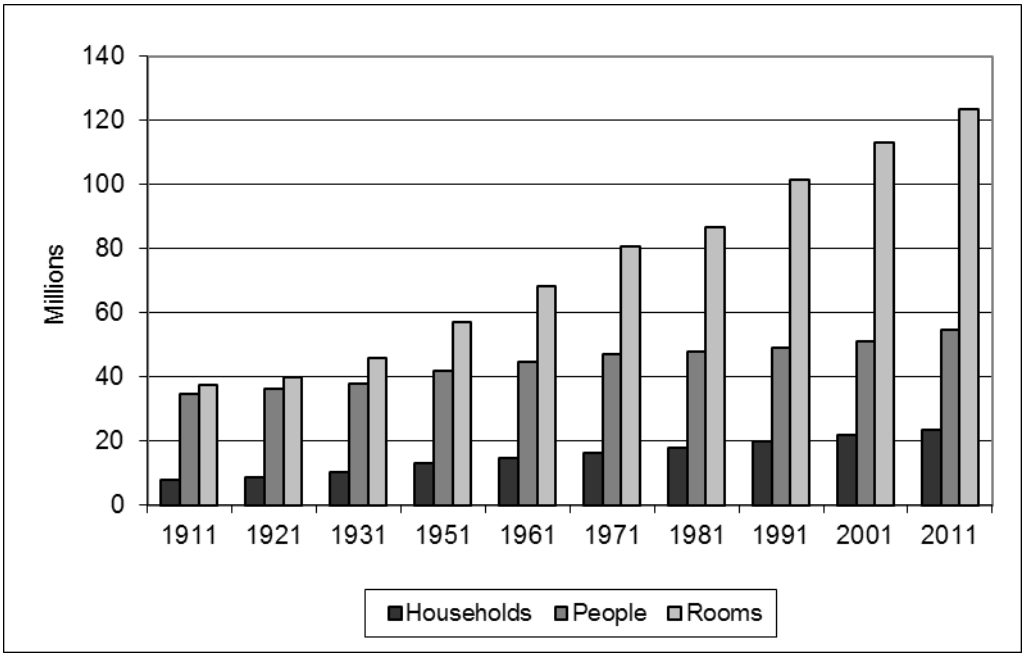
Holmans has recorded a dramatic fall in low absolute housing consumption in England and Wales over the twentieth century: *'The severity and prevalence of overcrowding have greatly diminished since the 1911 census… in that year 34.2% [of households were] at more than one person per room… In 2001, the proportion was 1.8%'* (Holmans, 2005 p81). Figure 1 uses the same data to show how this process affected individuals, rather than households. The proportion of people in England and Wales living at more than one person per room fell from 49% in 1911 to 4% in 2011 (Figure 1).

Figure 1: The growth in numbers of households, people and rooms in private households in England and Wales, 1911-2001
Sources: Censuses 1911-2001 (GRO 1913, 1925, 1935, 1956, 1964, Office of Population, Censuses and Surveys (OPCS), 1974, www.casweb.mimas.ac.uk; www.nomisweb.co.uk)



The huge reduction in absolute low housing consumption was a remarkable transformation, the outcome of other dramatic changes both in housing supply and household size and composition. Over the 100 years between 1911 and 2011, although the population increased by just 48% from 34.6m to 54.8m, the number of households in England and Wales increased by 196% from 7.9m to 23.4m, and the total number of rooms increased by 203%, from 37m to 123.3m (Figure 2).

Figure 2: Trends in mean rooms per household, people per household and rooms per person in private households in England and Wales, 1911-2001
Sources: As Figure 1



Huge private, public and social resources went into the creation of the additional homes and housing space. The state took substantial interest in housing development: it directly subsidised the building of over 5m council and housing association homes, it controlled the use and price of land, and used the tax system to encourage development and to influence occupation patterns (eg. Malpass, 2005, Mullins & Murie, 2006). The dramatic reductions in numbers and proportions of people consuming less than an absolute minimum of housing, such as one room per person (Figure1), represents a transformation in the potential impact of housing on health, on private life and on individual capabilities. As Holmans said, *'the amount of space a household has is central to their experience of home*' (2005 p57). Similar transformations in overcrowding have taken place in other countries in the twentieth century, and are continuing in the twenty first century as less developed nations industrialise and urbanise (Logan *et al*., 1999, Huang, 2003, Feng, 2008).

However, it is not clear how the extra space created in England and Wales over the twentieth century has been distributed and consumed across society; and whether the changes in absolute housing space consumption have been matched by changes in relative housing space consumption, and any change in inequalities across society. In addition, recent evidence from absolute measures show some signs for concern. Absolute low housing consumption and overcrowding continue, and rates were higher amongst particular groups including minority ethnic groups, families and children, those in social housing, and those in London (Blatt, 2002, Office of the Deputy Prime Minister, 2004a, Holmans, 2005, Shelter, 2005, Stephens *et al.,* 2010). There have also been also signs of a reversal of the historic decline in low absolute consumption of space amongst sub-groups, for example, amongst social housing tenants in London from the 1990s (Holmans, 2005).

Data and methods required to explore low relative housing space consumption

This paper aims to explore whether relative, as well as absolute, low consumption of housing space has reduced in England and Wales over the twentieth century, and whether the distribution of housing space has become more or less equal over that time. However, measuring relative consumption demands continuous concepts and data. Most studies of housing inequality have been restricted to counting numbers and proportions meeting or failing absolute minima, or to contrasting the proportions of poor and non-poor meeting minima. This has been partly due to the absence of the required data (eg. Dorling *et al*., 2005). For example, Holmans recently examined housing space inequality by considering proportions of people and households who were overcrowded, who were at or above the bedroom standard, and who were in large homes (2005). He was able to deduce an increase in interregional inequality (as London gained crowded households 1991-2011 while other parts of England lost them, given population increase in London above the national average, and greater gains for owner occupiers). On this basis, Holmans argued that inequality in housing space increased in general 1991-2011 (2005). However, data limitations meant that he was not able to demonstrate this directly, or to quantify the change.

To remedy these problems, this analysis is based on the creation of a new quasi-continuous data set for housing space consumption in England and Wales. It uses data on the number of private households with different combinations of numbers of rooms and numbers of people. This is available decennially for England and Wales from the census of population for 1911-2011, with the exception of 1941 when the census was suspended due to war. No other source provides such a long run of comparable data on housing space. Census 1891 and 1901 included data on the size and number of residents of homes with up to 4 rooms; but Census 1911 was the first to report on the size of all private households and the homes they lived in. Data for 1911 to 1971 were taken from General Register Office census reports (GRO 1913, 1925, 1935, 1956, 1964, OPCS, 1974). Data for 1981 to 2001 were extracted from the online source www.casweb.mimas.ac.uk[ii], and for 2011 from www.nomisweb.co.uk. Data are for England and Wales because it was not possible to establish a comparable run of data for the whole of Great Britain or the UK. The population was divided up into groups who were members of households living at particular average rooms per person; for example one person households living in two rooms and two person households living in four rooms were combined as a group living at two rooms per person. Groups were ordered from low to high rooms per person, creating quasi-continuous data to which a range of different definitions of inequality could be applied.

The data set is necessarily based on rooms per person rather than square metres per person. At the time of Census 1901 government statisticians noted, *'the word 'Room'… is very elastic and can be stretched'* (GRO, 1904 p39). In 1911 a 'room' was defined formally: *'count the kitchen as a room, but do not count scullery, landing, lobby, closet, bathroom, nor warehouse, office,*

shop' (GRO, 1913 p2). Very similar definitions remained in use for the period 1911-2011 (in 1951 'kitchenettes' or kitchens too small to eat in were excluded (GRO, 1956)). Thus the 'rooms' reported here include bedrooms, living rooms and kitchens, although all provide different amounts and types of space within homes. At the start of the twentieth century, statisticians bemoaned the lack of data on the 'cubic capacity' of homes (1904), and noted that the size of rooms '*obviously has a considerable bearing on the heath and comfort of the inhabitants'* (GRO, 1913 p2). However, little progress was made on this issue in the UK over the course of the century, so as Holmans said, *'the only way to assess inequality in accommodation space is to look at the number of rooms a household occupied'* (2005 p58). Rooms may vary in size (eg. GRO, 1904, Dwyer, 2009), and counting rooms *'can be misleading'* (Williams, 2009 pS84). In fact, homes in the UK are distinguished amongst others in Europe for their small internal floorspace, and Gallent *et al*. noted that, *'private builders tend to squeeze more rooms into the same space'* (2010 p17-18). However, the number of distinct internal spaces in a home remains the main measure used in the sale and purchase of private housing in the UK, and provides some guide of the ability of a home to provide privacy and to accommodate varied uses and users, as well as a proxy for overall space.

This analysis reports people rather than households living at different numbers of people per room, in order to reflect the numbers of people affected by different circumstances. It assumes that rooms are shared equally between household members, and that all people in a single household are living at the same number of rooms per person. The measure also necessarily equivalised space within the household without taking account of potential differences in space needs between people of different ages, physical ability or other characteristics, unlike the official room and bedroom standards.

Data includes only households with members present on census night, and includes both households with their own dwelling and households sharing with others. By 2008/09, 566,000 households in England owned or rented a second home, and thus had access to additional rooms not included in census data or this analysis (CLG 2009). Finally, the data exclude the 'non-household' population, including homeless people, who have no space they have a legal right to, and people in institutions, who may have no space they have sole rights to.

Given these inevitable data limitations, this analysis may tend to underestimate inequality in housing space between people. Results will be an underestimate if any of the following are true: if homes with fewer rooms tend to have smaller rooms, if space inside homes is not equally distributed between household members, if second homes tended to be owned by those with higher numbers of rooms per person in their first homes, and if the non-household population have less than average rooms per person.

Another point is that some inaccuracy is introduced because in each census the final category of number of people in the household or numbers of rooms occupied by the household is open-ended. For example, in 1911 the maximum recorded rooms per household was 10, but the group included

homes with 10 or more rooms[iii]. Calculations presented here assume that all the members of the 'x plus' terminal categories had only x rooms or people. This will have lead to some under- and over-estimation of rooms per person, and of inequality in rooms per person. In almost every case, the proportion of homes and rooms included in these open-ended categories are below 1% of the total[iv], although Atkinson *et al*. have pointed out that the situation of the top 1% by income can affect overall trends and distribution in income inequality (2011). However, sensitivity tests were carried out to explore this question of truncated categories, re-running calculations to assume firstly that all the members of the 'x plus rooms' categories had x+0.5/1 rooms or people, and secondly, that all members of the 'x plus people' categories had x+0.5 people. These suggested the truncation would not affect the overall results significantly.

The quasi-continuous data created for each census year 1911-2011 were then subject to three measures of inequality. Those exploring income inequality have noted that no one measure of inequality is entirely comprehensive or 'neutral', and some measures allow (and some purposes require) more sensitivity to certain parts of the distribution than to others (Atkinson, 1970, Hills *et al*., 2010, Atkinson *et al*., 2011). All three definitions used here have been widely used in the study of income and other social inequalities (eg. Hills et al. 2010). The first definition is the Gini coefficient, which measures how far the whole distribution departs from equality. The second and third measures are more sensitive to the lower end of the distribution. The second definition is the ratio between the incomes or housing space of those at the 90th and 10th percentile of the distribution (and other similar ratios). The distribution of the population by housing space per person was divided into ten 'deciles', which vary slightly in size between deciles and years. The '90th percentile' figure, for example is for people on the boundary between the 9th and 10th decile. The identity of the individuals making up each decile are likely to change substantially between censuses The third definition of inequality is the proportion of the population below 60% of the median number of rooms per person. This is a measure of low relative housing space consumption, and forms a potential new 'relative housing space poverty' line.

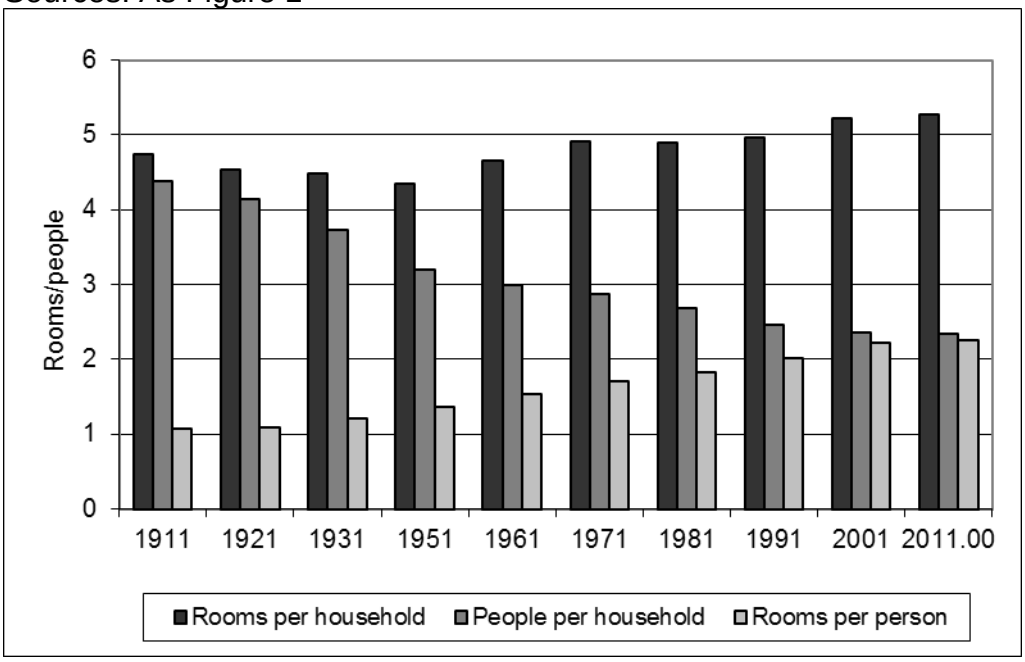
Trends in relative housing consumption and inequality in housing consumption 1911-2011

In 1911 there were 37.4m rooms in private households in England and Wales. These were shared between 34.6m residents in 7.9m households. The most frequently experienced household size and home size combination was four people living in four rooms, at a ratio of one room per person. This was the living situation for 4.3% of the total population. The second most frequently occurring combination was five people living in four rooms, at 0.8 rooms per person, making up 3.4% of the population (GRO, 1913). These two groups of households were probably mostly couples with children, but could have included households with lodgers and multi-generational families. The mean housing space per person across all households was 1.1 room per person, while the median was 0.9 rooms. At one extreme, there were three

households each with twelve people living in one room, at 0.08 rooms per person. At the other extreme, 2,639 households contained just one person living in ten or more rooms, at ten rooms per person (or more).

The total number of people grew in every decennial period 1911-2011, the number of households grew faster, and the number of rooms grew faster still (Figure 2). In 1911 the number of rooms was only just greater than the number of people, but by 1991 there were more than twice as many rooms as people. The number of rooms grew relatively slowly 1911-1921, slightly faster 1931-51, and faster still 1951-2011. The number of rooms per household was fairly stable across the twentieth century, at between four and five rooms, but the number of people per household fell rapidly, while the number of rooms per person grew steadily (Figure 3).

Figure 3: The number and percentage of people in private households in England and Wales living at less than one room per person, 1911-2001
Sources: As Figure 1



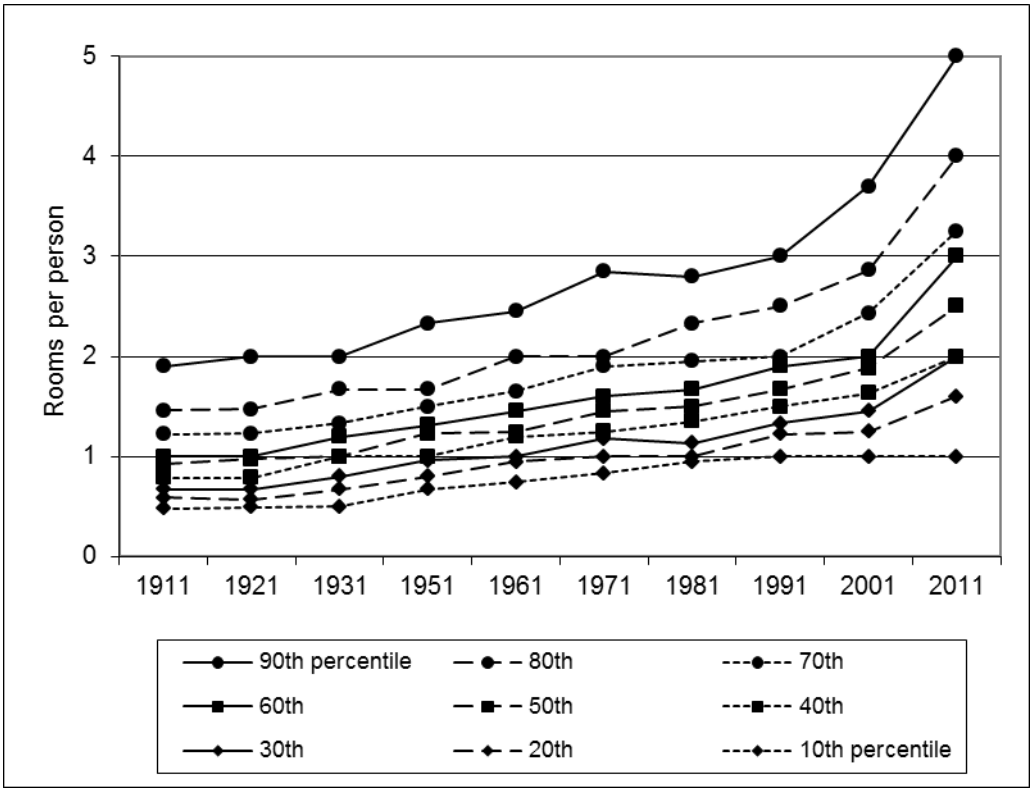
In 2011, there were 123.3m rooms available to private households in England and Wales. The rooms were shared between 54.8m residents in 23.4m households. The most frequently experienced household size and home size combination was now two people living in five rooms, at a ratio of 2.5 rooms per person. This was the living situation 7.5% of the total population. These households were probably mostly couples, but could have included lone-parent families and sharing adults. Their homes might contain a kitchen, a living room and three bedrooms. The second most frequently occurring combination was two person households living in four rooms, at two rooms per person, making up 5.8% of the population. The median resident had two rooms to themselves. At one extreme, 781 households were made up of six or more people living in one room, at 0.17 rooms per person or fewer. At the other extreme, 331,337 households were made up of one person living in eight or more rooms.

As discussed, using an absolute standard of housing space consumption, the number and percentage of people in England and Wales living at under one room per person fell dramatically over the twentieth century, from 16.9m and 48.7% of the population in 1911, and to 2.0m and 3.7% of the population in 2011 (Figure 1).

The standard definition of relative income poverty is an income of less than 60% the median equivalised household income. By analogy, we can explore housing space inequality by assessing numbers of people living at less than 60% of the median housing space. By 2011, 13.5% of the population had less than 60% of the median housing space, which worked out as 1.5 rooms per person. This sets a potential new 'low relative housing space consumption' standard. This potential standard is higher than the existing absolute statutory standards of space adequacy for some households. For example, two adults and two children aged under 16 (or under 10 if different genders) are at the 'bedroom standard' with a total of four rooms (two bedrooms, kitchen and living room), and at one room per person. On the other hand, this potential standard is below Bradshaw *et al*.'s consensual minimum adequate levels for some households, which would give the above fanily 1.25 rooms per person but a pensioner couple two rooms per person. Additional empirical research would be needed to confirm or adjust the threshold percentage most suitable for housing.

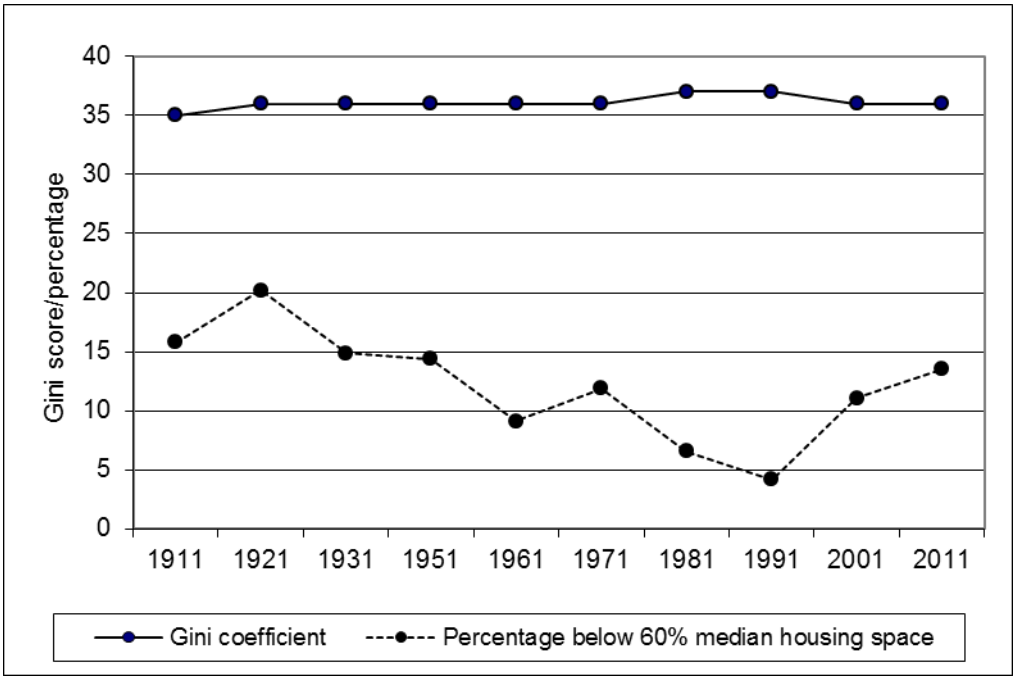
Figure 4 gives more detail on how the absolute gains in housing space were distributed across the population. It shows intercensal changes for each decile of the population, from the best housed in terms of rooms per person, to the worst housed. For almost all of the whole period 1911-2011, all deciles made gains in absolute housing space consumption and lived in gradually more roomy circumstances. In general, progress was steady across the hundred years, although 1911-1921 and 1931-51 saw slower change for all sections of the population. These periods were affected by world wars and consequent sharp reductions in housebuilding, which may at least partly explain the patterns. In 1911 only the most generously housed four deciles of the population lived in homes and households that gave them at least a room per person. However, the most generously housed decile already had nearly two rooms each or more. After particularly rapid gains 1991-2011, by 2011 the most generously housed decile had five rooms each on average. The least generously housed decile of the population only achieved one room per person as late as 1991. Thus the very substantial public and private resources out into housing across the twentieth century had a big impact on average conditions, they translated very inefficiently into better conditions for the worst off. In addition, the least generously housed decile saw no improvement in absolute space per person at all between 1991 and 2011 (Figure 4).

Figure 4: Housing space consumption by population percentile, people in private households, England and Wales 1911-2001 (the 90th percentile is the most generously housed)
Sources: As Figure1



Turning to quantified measures of inequality, the Gini coefficient for personal housing space in England and Wales was remarkably stable 1911-2011 (Figure 5). This might come as a surprise, and perhaps a disappointment, given the substantial amount of housing development, the efforts in housing policy over the period, and the dramatic change in low absolute housing space consumption already noted.

Figure 5: Inequality in distribution of rooms per person for people in private households in England and Wales, Gini coefficient and proportion below 60% median space per person, 1911-2001
Sources: As Figure 1

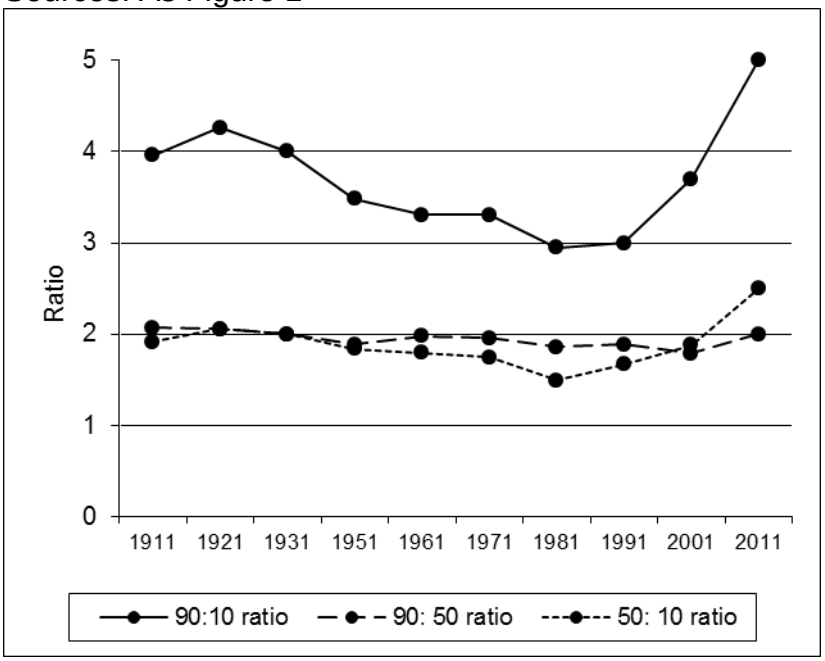


However, there is considerable variation over time for the other definitions of housing space inequality, demonstrating how two distributions with similar Gini coefficients may be different in detail (Atkinson, 1970). These other measures are particularly sensitive to the bottom end of the distribution. Allowing for a small increase in inequality 1911-1921 by some definitions, the other definitions of inequality showed increasing equality in the distribution of housing space for most of the twentieth century, with marked overall reductions. Then, however, in either 1981 or 1991 the trend is reversed. By 2011 this new trend of increasing inequality in the distribution of housing space had wiped out decades of reductions in inequality, according to some measures taking England and Wales to levels of inequality not seen at any point in the twentieth century.

Firstly, the proportion of the population living at below 60% median personal housing space saw a marked downward trend over the century from 20% of the population in 1921 to 4% in 1991. Then there was a marked increase to 11% in 2001 and then 14% in 2011, a level of inequality not seen since the 1950s (Figure 5).

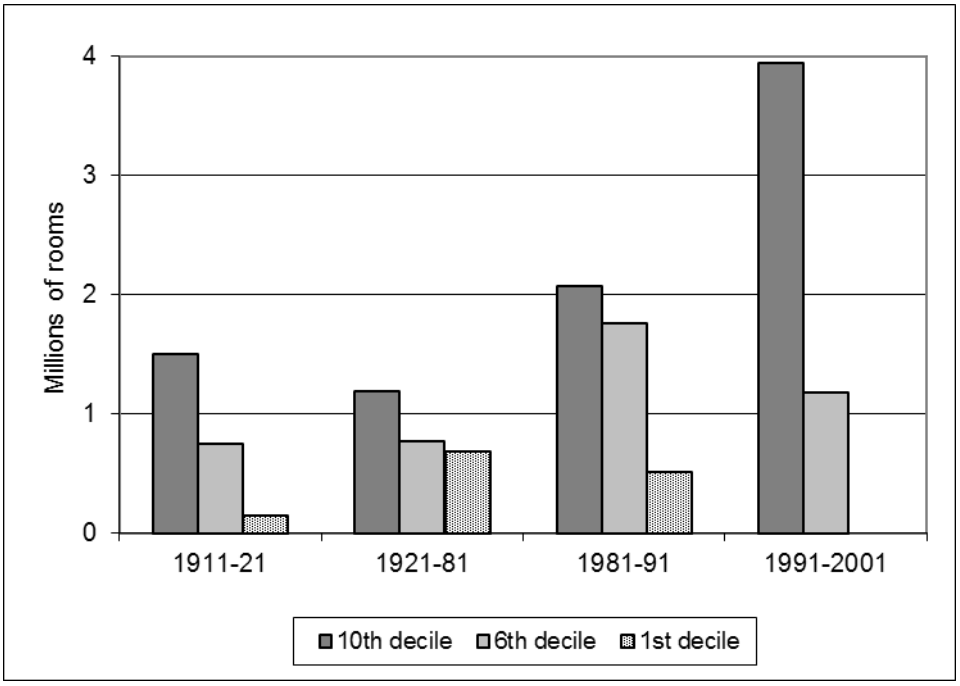
The ratios between personal housing space for those at the 90th and 10th percentiles of the population and those at the 50th and 10th percentiles fell 1921-81, and then started to rise, slowing between 1981-1991 and then faster. By 2011 all the ratio definitions had reached levels never seen in the twentieth century (Figure 6). The 90:10 ratio rose particularly sharply, because the most generously housed decile of the population saw particularly marked growth in absolute measures of housing space, while the least generously housed saw no change at all (Figure 4). By 2011 those at the 90th percentile of the distribution of personal housing space had five times as much housing space per person as those at the 10th percentile. These disparities suggest potential for very different patterns of life in different homes and households.

Figure 6: Inequality in distribution of rooms per person for people in private households in England and Wales, percentile ratios, 1911-2001
Sources: As Figure 1



Another insight into inequality can be gained by exploring who gained from the 85.9m additional rooms created in England and Wales 1911-2011. Every interdental period 1911-2011 was regressive in terms of the distribution of additional space, as those in the more generously housed deciles gained higher percentages of net additional rooms created. The period 1911-21 was the most regressive, although comparatively few net extra rooms joined the national stock in that decade which included the First World War. The period 1921-81 was closer to a progressive distribution. In these decades, the least generously housed decile gained 9% and the 6th decile (close to the centre of the distribution) gained 10% of all net additional rooms, although the most generously housed decile gained 15% (Figure 7).

Figure 7: Net rooms gained per decade by the 10th, 6th and 1st housing space deciles, England and Wales, 1911-2001
Sources: As Figure 1



In sharp contrast though, the period 1981-2011 showed a return to a clearly regressive distribution, and this was a time in which there were substantial net additions to the national stock of rooms, with 13.3m added each decade. In 1981-1991, the least generously housed decile gained 3% of all net additional rooms, the 6th decile gained 12% and the most generously housed decile gained 14% of all net additional rooms. In 1991-2011, the regressive distribution of new rooms was dramatic. The least generously housed decile gained nothing in this period, the 6th decile gained 10% of all net additional rooms, and the most generously housed decile gained 36% of all net additional rooms. In 2001-2011, the most well housed actually lost total rooms, representing downsizing by some small households in larger homes. However, this did not signal a switch to progressive distribution, as fully 45% of all new homes went to the next best housed decile, and 50% to the next group, while the sixth decile lost and the first decile gained a marginal amount.

Summary and discussion

Over the period 1911-2011, the population of England and Wales grew by half but the number of homes grew faster and the number of rooms faster still. The proportion of people living below the widely-used measure of overcrowding of one room per person, a measure of low absolute housing consumption, fell from 48.7% to 3.7%.

This production of additional homes and housing space, and the reduction in low absolute consumption of housing space, could be rated as amongst the greatest achievements of the twentieth century economy and of twentieth century social policy. For the millions who experienced it over the century, achieving first a room per person, and then two, three or more, must have had a transformative impact on family and personal life. However, to date there has been no information available for England and Wales on how the extra

space has been distributed and consumed across society, and whether the reductions in overcrowding have been matched by any change in inequalities in housing consumption across society.

This paper set out to find out whether low relative consumption of housing space has reduced in England and Wales 1911-2011, alongside the known reduction in low absolute housing space consumption, to explore how housing space was distributed across society, and to discover whether the distribution of housing space between individuals become more or less equal over that time. The paper introduced a concept and measure of 'low relative housing space consumption', analogous to the well-known and accepted measure of low relative income or 'relative poverty'. It developed one workable definition of low relative housing space consumption, the proportion of the population with fewer than 60% of the median rooms per person, and applied it, and two additional definitions of housing space inequality, the Gini coefficient and rations, to a quasi-continuous dataset of housing space in rooms per person created from census data 1911-2011.

The analysis shows that like low absolute consumption of housing space, Housing space inequality, or low relative consumption of housing space fell markedly, for most of the period. However from 1981 or 1991, housing space inequality started to increased again, and by 2011, by some measures, this had wiped out a century's worth of reductions in inequality.

The Gini coefficient measure of housing space inequality showed almost no change throughout the twentieth century, and the ratio between housing space at the 90^{th} and 50^{th} percentiles also changed little. However, the that the group who have made the greatest absolute gains in housing space 1911-2011 were the group who were most generously housed in 1911. The least generously housed decile of the population only made it over the low absolute housing consumption line of one person per room or fewer as late as 1991, and saw no improvement 1991-2011.

The low relative housing space consumption measure and measures of inequality more sensitive to the bottom of the distribution show reductions in inequality 1921-1981, followed by increasing inequality 1981-2011. The proportion of people below the low relative housing consumption fell from 20% in 1921 to 4% in 1991, but then increased, from 4% in 1991 to 14% in 2011. Similarly, the 90:10 and 50:10 ratio decreased 1921-1981, but then increased 1981-2001. By 2011 the distribution of housing space in England and Wales had returned to levels of inequality not seen since the 1970s. The 90:10 ratio was at a level not seen in the twentieth century. Thus Holmans was right to argue that housing space inequality had increased 1991-2001 (2005).

Twentieth century housing policy aimed explicitly to reduce low absolute consumption of housing space, rather than low relative consumption or inequalities in consumption, and was clearly successful in this aim. It seems plausible, though, that policy makers and campaigners assumed that the two would go together. This was true for most of the twentieth century. However, for the late twentieth century, those who thought, like Robinson *et al*., (1985),

that there might be a trade-off between increasing total housing supply and reducing inequalities, were right.

This late discovery of a trend of increasing low relative housing space consumption and growing inequality since the 1980s should provoke concern amongst housing researchers and policymakers. An analogy could be drawn with the concern provoked by the 'rediscovery of poverty' (relative poverty) which occurred in the US and UK in the 1960s and 1970s (Harrington, 1962, Townsend, 1979), and the evidence of growing income inequality in those countries from the 1980s onwards (Atkinson, 1999, Hills *et al.* 2010). The analogy with income provides grounds for thinking that low relative housing space consumption and inequalities in housing space may influence individual outcomes and may be implicated in social stratification. In addition, it should be noted that evidence here is based on data and methods which inevitably which may have a tendency to underestimate total inequality (as they exclude for example second homes and the institutional population).

Three factors might explain the trends of falling then rising housing space inequality seen 1911-2011. The first is the total amount of housing space, and how it is distributed between dwellings. For example, if there were fewer homes than households or if all homes were the same size but all households were not, this would create an irreducible inequality in space per person. The amount and mix of housing space can change through construction, conversion and demolition. The second factor is the total size of the population, and how it is formed into households. This changes over time through social and demographic processes, and might also be affected to some extent by the supply of homes. As government statisticians commented in 1935, *'family growth should not be regarded as an entirely independent and irresistible force'* (GRO, 1935 pxxi). The third factor is the way in which individual and households are distributed between dwellings, via the market or by familial or administrative allocations systems. This may also be affected by supply and demand. All three factors may be influenced to some extent by policy on development and allocation, as well as numerous other factors. Intercensal trends in numbers of total and net additional people, households, homes, and rooms, household size, and numbers of rooms per home generally show gradual transitions across the period 1921-2001 (eg. Figures 1, 2). However, there are three discontinuities which appeared in either 1981 or 1991, which might be part of an explanation for changes in trends in space inequality at that point.

Two changes might have affected housing distribution from 1981. Firstly, household incomes play a role in the ability to buy the housing space that is distributed by the market. Although UK income data information is scanty for the first decades of the twentieth century, inequality in household income measured by the Gini coefficient, appeared to fall in this period. More robust data then show continued falls from the 1930s until 1977 (Atkinson, 1999). At that point income inequality began to rise very sharply, and high levels of inequality were maintained in the 1990s and 2000s (Atkinson, 1999, Hills *et al*., 2010). Homes with more rooms tend to cost more and to command higher rents. Thus it is plausible that high income inequality would feed through at

least to some extent to higher consumption inequality, at least for the consumption of housing space distributed via the market. The impact of high income inequality on overall patterns of housing would be greater when more housing was developed and distributed via the market. Thus, in the mid 1980s, Robinson *et al*. predicted that reduced emphasis on local authority building and slum clearance and increased emphasis on home ownership would lead to rising housing inequality (1985).

Social rented housing has been developed and allocated outside the market, and allocations policies have aimed to match home sizes to household sizes at first letting, using the room standard as a minimum since 1935. Those who developed and managed social housing saw it partly as a means to end overcrowding. The number and proportion of people and households in social rented homes rose 1921-81. Then following the introduction of the Right to Buy the social rented sector declined from housing 30% of all people (rather than households) in England and Wales, to 17% in 2011.Thus a smaller proportion of the national housing stock was subject to bureaucratic allocation and home size-household size matching. The change might have caused reduced absolute space for remaining social tenants, in response to higher relative demand. These changes could have contributed to greater overall inequality, although they would not necessarily have done so. In addition, in practice, the home size-household size match in social housing has not been exact, and the very first available data on this topic reveals that some of the overcrowding of the private sector slums reappeared in early council estates, as tenants took in lodgers to help pay municipal rents (GRO, 1935). Both overcrowding and under occupation in social housing have been matters of concern throughout the twentieth century (eg. GRO, 1976, Holmans, 2005, Stephens *et al*., 2010).

Thirdly, there was a discontinuity in the nature of new housing development from 1991. Over the decade 1991-2001 there was a net increase of 1.3m homes with seven or more rooms, and 73% of all net extra rooms built were in homes with seven or more rooms. In his study of housing inequality, Holmans suggested that the growth in large homes was a consequence of income inequality and a potential cause of rather than solution to space inequality, *'this is a response to demand for more space by households who can afford to pay for it, rather than an attempt to meet the needs of large households'* (2005 p96). Other authors have suggested that increased production of larger homes might have created or exacerbated housing market segmentation (Galster, 1996).

In almost every intercensal period 1911-2011, the number of rooms in the median net additional home produced in England and Wales was within one room of the median number of rooms in existing homes at the start of the period, either one room more, or in some cases one room fewer (Table 1).

Table 1: Median size of homes, households and net additional homes and resulting rooms per person in private households, England and Wales, 1911-2001

Note 1: This figure is affected by low net gains and substantial losses of larger homes 1911-21.

Sources: As Figure 1

	1911-21	1921-31	1931-51	1951-61	1961-71	1971-81	1981-91	1991-2001	2001-2011
Median household size at start of period	5	5	4	4	4	4	3	3	3
Median number of people in net additional households in the period	3	3	2	2	2	1	1	1	1
Median number of rooms in homes existing at start of period	5	4	4	5	5	5	5	5	5
Median number of rooms in net additional homes in period	1[1]	5	4	4	6	5	6	7+	7
Rooms per person if median household moved into median existing home	1.00	0.80	1.00	1.25	1.25	1.25	1.66	1.66	1.66
Rooms per person if median household moved into median net additional home	0.20[1]	1.00	1.00	1.00	1.50	1.25	2.00	2.33+	2.33
Rooms per person if net additional new household moved into net additional home	0.33	1.67	2.00	2.00	3.00	5.00	6.00	7.00+	7

In the period 1921-81, if the median household left the existing median home and moved into the median new home, they experienced a change of only up to 0.25 additional rooms per person, which would mean a move from the 5th decile to the 6th or possibly the 7th (Figure 4). Two periods were exceptions, 1911-21 and 1991-2001. The figures for 1911-21 are affected by low net increases in numbers of homes 1911-21 (Figure 1) and substantial losses of larger homes. In 1991 the median home had 5 rooms, but the median new home produced 1991-2001 had 7 or more rooms, and may have had 8 or more (as by 2001 14% of all people were in homes with 8 or more rooms). Since 1991, if the median household left the median home and moved into the median new home, they would experience at least 0.84 more rooms per person and would go from the 5th decile in the housing space distribution to at

least the 8th (in 2001) or from the 4th to the 7th (in 2011). It is plausible that in this situation, it would be more difficult for a range of households to benefit from new development, and for 'filtering down' to occur, than in the earlier period (Galster, 1996). Following this argument, it is possible that for questions of housing space, the critical tenure and housing policy change may not have been the reduction in the amount of social housing following introduction of the Right to Buy in 1981, as considered above, but the sharp decline in social housing building from the mid 1970s. Twentieth century social housing development had been dominated by four and five roomed homes and this influenced the median size of net additional homes 1921-81.

Each of these potential explanatory factors appears likely to persist. In addition, the introduction of the so-called 'bedroom tax'??? in April 2013 will have the effect of encouraging social tenants claiming Housing Benefit and with one or more spare rooms to move to smaller homes and to encourage social landlords to let homes at rather than above the bedroom standard and to build smaller homes. All of these processes would be likely to have the effect of increasing housing space inequality.

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Tables (with captions)
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Figures
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[i] The relevant tables were Table 2 (GRO 1913), the unnumbered table on page 85 (GRO 1925), Table 5 (GRO 1935), Table 2 (GRO 1956), Table 4 (GRO, 1964), and Table 1 (OPCS 1974). Data for 1981 to 2001 were extracted from the online source www.casweb.mimas.ac.uk. The tables used were Table SAS81 14 (1981), Table SAS91 14 (1991) and Table ST051 (2001). Data for 2011 were extracted from www.nomisweb.co.uk (Table DC4404EW). Census output is Crown copyright and is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

[ii] As note i

[iii] From 1921-1961, the maximum recorded rooms per household was 15, in 1971 it was 10, in 1981 and 1991 it was 7 and in 2001 and 2011 it was 8. From 1911-1931, the maximum household size reported was 13 people, in 1951 and 1961 it was 13, in 1971 it was 10, 1981-2001 it was 7 and in 2011 it was 6.

[iv] The main exceptions are for 1911, 1971 and 2001 and 2011. In 1911, the '10 or more' rooms category included 5% of all people and 8% of all rooms. In all other cases the unspecified groups were 2% of people or rooms or less. By 2001 14% and by 2011, 16% of people lived in homes with 8+ rooms. The vast majority of these were in the better housed half of the population, so this is unlikely to have lead to underestimates of the population with low numbers of rooms per person, but may have lead to underestimates of inequality.