Communities and Local Government

Measuring Changes in Housing Wealth Inequality

Economics paper 6: Volume 2

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Delivering Changes in Housing Wealth Inequality

Economics paper 6: Volume 2

Eric Levin and Gwilym Price
Department of Urban Studies, University of Glasgow

November 2010
Department for Communities and Local Government

This research was commissioned by the previous government.

The findings and recommendations in this report are those of the authors and do not necessarily represent the views of the Department for Communities and Local Government.

Acknowledgements
We are very grateful to Bethan Thomas and Daniel Dorling for supplying us with their data on house prices. Much of the analysis would not have been possible without their assistance. We are also grateful for their helpful comments and clarifications. Any remaining errors are our own.

Department for Communities and Local Government
Eland House
Bressenden Place
London
SW1E 5DU
Telephone: 0303 444 0000
Website: www.communities.gov.uk

If you require this publication in an alternative format please email alternativeformats@communities.gsi.gov.uk

Communities and Local Government Publications
Tel: 0300 123 1124
Fax: 0300 123 1125

Email: product@communities.gsi.gov.uk
Online via the Communities and Local Government website: www.communities.gov.uk

November 2010

ISBN: 978-1-4098-2955-3

Foreword

Using evidence and analysis is at the heart of what we do in Communities and Local Government (CLG). The Department has a large and active research programme covering a wide range of policy issues, and economic analysis forms an important part of that work. We need to rigorously assess the costs and benefits of government policy, understand the choices and tradeoffs in reaching policy decisions, and consider how regulations and incentives might affect behaviour.

We are publishing a series of Economics Papers, highlighting key pieces of analytical work undertaken within or on behalf of the Department. These papers will range across the broad policy spectrum for which the Department is responsible, including spatial policies, housing, planning, migration, regeneration, cohesion, and local government.

This paper is the sixth in the CLG Economics Papers Series. Housing has become a large part of our lives and more people rely on housing investment to form their wealth assets. Volume I of this paper sets out the results of a seminar held in CLG which looked at understanding the different forms of wealth inequality and its effects on social mobility and chances. Volume II consists of an article by Gwilym Price and Eric Levin from the University of Glasgow, which examines changes to housing wealth inequality.

We hope that you find it of interest, and would be happy to receive comments and reactions to this and subsequent papers in the series.

Electronic copies of this and earlier reports can be downloaded from our website: www.communities.gov.uk/corporate/researchandstatistics/research1/economicspapers

Please contact us at analytical.services@communities.gsi.gov.uk if you wish to be added to the mailing list for these reports.

Grant Fitzner
Chief Economist and Director of Analytical Services
Communities and Local Government

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Executive summary

Recent research has suggested a strong upward trend in housing wealth inequality in the UK with high house price areas growing in value at a faster rate than housing in low priced areas. This report investigates whether this finding is dependent on the particular research methods used or whether it reflects a genuine trend.

Housing wealth inequality is important because:

- It connects to the wider debate about the pros and cons of inequality, and the consequent implications for housing and welfare policy.
- It has implications for the attractiveness of low-price areas to investors and movers.
- It has implications for the shortage of key workers in high-house price areas.
- It also has implications for the relative position of renters.

The report examines changes to housing wealth inequality using a variety of measures based on large samples (around a million observations a year are used in the house price distribution calculations, for example). Land Registry data from 1996 to 2006 and building society data from 1981 to 2003 are employed to compute a detailed and continuous picture of housing wealth inequality. Taken together, the results suggest a cyclical pattern in housing wealth inequality over the long term (1981 to 2006), with inequality falling in the most recent phase of that cycle (2000 to 2006).

Defining and measuring changes in housing wealth

Absolute or relative changes in wealth? Whilst absolute changes in housing wealth are of some interest, we should be most concerned about changes in relative housing wealth.

If there was one rate of price inflation for all houses, absolute differences between property values (and, by implication, housing wealth inequalities) would themselves rise and fall with house prices but *relative* inequalities in housing wealth would remain constant.

The real issue is whether there is a systematic and persistent difference in the *rate* of house price increase between high and low house price areas.

Net or gross housing wealth? Measuring housing wealth net of outstanding mortgage debt is problematic because:

(i) a household may appear to have high mortgage debt (and hence, low net housing wealth) because they have benefited from equity withdrawal/release, or have an endowment policy;

(ii) older households tend to cluster, which can give rise to large spatial inequalities in net housing wealth even if *all homeowners have exactly the same life-cycle earnings* (in other words, it might be an inevitable outcome of the life-cycle process).

The report argues that the relative change in gross housing wealth – differences in the rate of change in house prices across areas – is the most appropriate variable to use if one wants to measure changes in spatial housing wealth inequality.

Final period or initial period house price levels? If one is interested in how rates of change in house prices differ across low and high house price areas, one first has to decide whether an area is more or less expensive.

Using price levels calculated from the most recent year of data is problematic because areas with higher rates of price increase over the period of interest (1996-2006) will be more likely to have become an expensive area. When investigating how rates of price change vary across price levels one should always use the initial period to decide whether an area has high or low prices.

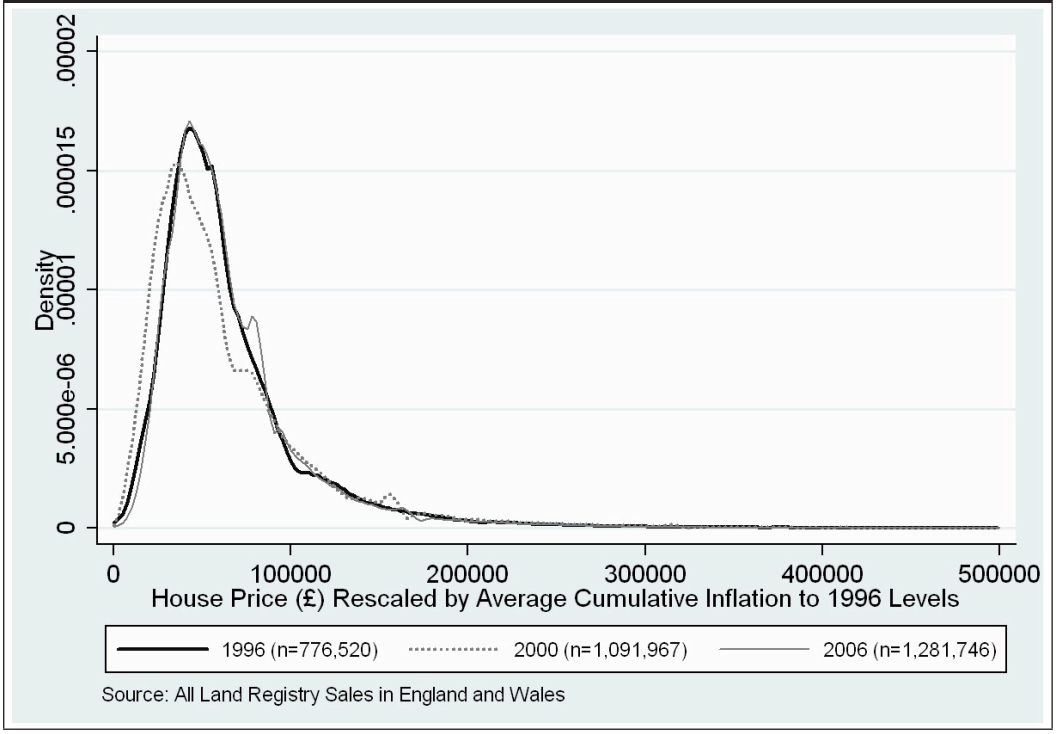
Two points or many points? Previous research has tended to consider inequalities in the growth of housing wealth between two points in time. However, this has the potential to greatly inflate (or deflate) the measurement of inequality. For example, if the start point happens to be at a trough in inequality, and the end point a peak. Meaningful results can only be obtained if one measures the change in housing wealth inequality at frequent intervals.

Which measure of inequality? Rather than using a single measure of inequality, a variety of approaches are used in order to obtain a more robust and complete picture, including: changes to overall price distribution, slope coefficients from a regression of price change on average postcode sector price levels, inflation multiples (rate of house price change in the tenth decile price *levels* to that of the first decile), and changes to Gini and Atkinson coefficients (applied both to price levels and to price changes, and applied both spatially and non-spatially).

Results

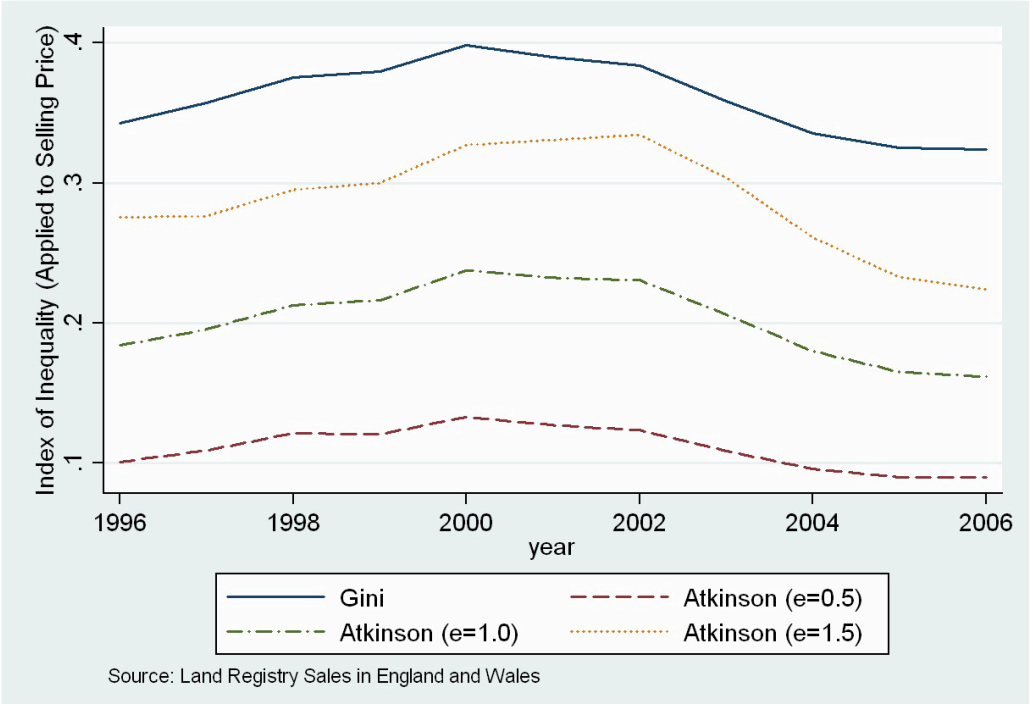
- There has not been a large change in the distribution of house prices, other than an average proportional increase in prices overall. When this average proportional increase is taken into account (see Figure 1 below), the 2006 distribution of house prices has an almost identical shape to the 1996 distribution.

Figure 1 House Prices in 1996, 2000 & 2006 with Proportionate Rescaling



- Non-spatial analysis of house prices (see Figure 2 of Gini and Atkinson coefficients below) suggests that inequality of gross housing wealth appears to have fallen in recent years (2000-2006).

Figure 2 Inequality Measures Applied to All House Prices

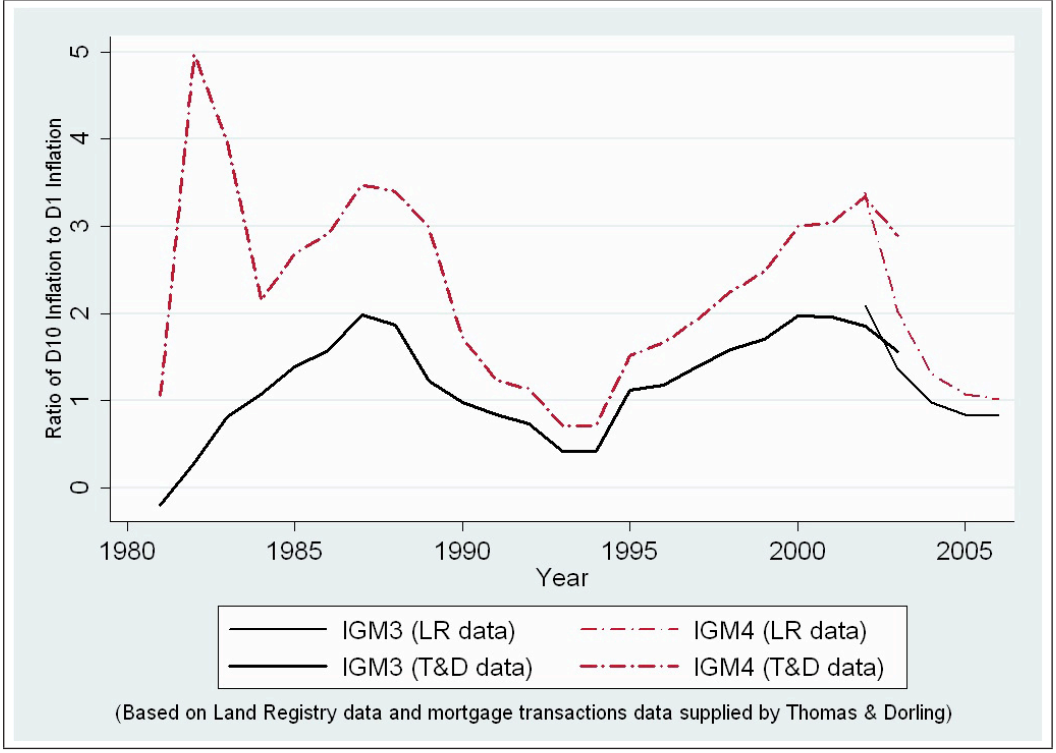


Source: Land Registry Sales in England and Wales

- There seems to be a regular cycle in housing wealth inequality – house prices in expensive areas pull away for a while, and then prices in less expensive areas catch up.

- This cyclical pattern is confirmed in Figure 3 below which plots the results of two Inequality Growth Measures (IGMs): IGM3, which is the ratio of house price inflation in the tenth decile areas of base period (t=1) price levels to that of the first decile areas; and IGM4, which uses final period (t=1) rather than base period (t=T) house price levels to compute the deciles. The results for IGM4 demonstrate how using final period price levels can lead to over-estimation of the level of inequality in housing wealth accumulation during peak years. However, both measures suggest a cyclical pattern to housing wealth inequality rather than an inexorable polarisation of housing wealth.

Figure 3 Combining Thomas and Dorling and Land Registry Data



* The Thomas and Dorling data ceased in 2004, and so Land Registry figures were used to extend the IGM3 and IGM4 home series to 2006.

- There is no unambiguous evidence of an upward trend in this cycle. For some measures (*IGM3* and *IGM4*), the latest peak in housing wealth inequality (around 2000) was actually slightly lower than the previous inequality peak 13 years earlier.

- The shift in the price distribution will by definition have widened the gap between the housing wealth of renters (zero) and the housing wealth of owners.

Implications for policy

It is perhaps not surprising that housing wealth inequality is cyclical. Researchers have long been aware of spatial lags and ripple effects in house price adjustment. As prices become prohibitively high in one area, increasing numbers of house-buyers consider adjacent, less-expensive areas. Nevertheless, it is puzzling why the time lag is so great – why does the catch-up process take a decade to complete? And, more importantly, does it matter?

Certainly, if housing wealth inequality growth is cyclical rather than secular the implications for class reproduction and wealth polarisation are far more ambiguous than previously suggested. Our results do much to allay the fears

raised in previous work about inexorable polarisation of housing wealth between expensive and inexpensive areas. The reality is more complicated and transitory.

There may still be cause for concern, however. Much has changed at a fundamental level in the housing market over the period under consideration, and future trajectories of housing wealth inequality may not correspond to past historical patterns. For example, there are reasons to expect high-density entry-level housing to face more acute downward pressures on price in the medium term.

Recommendations

Recommendation 1: there is a need to understand what causes cycles of such amplitude in housing wealth inequality, and its implications for economic efficiency and social well-being. We recommend further research into both these questions as a prerequisite to policy response.

Recommendation 2: we recommend investigating whether the methods used here in the context of homeownership can be applied across all tenures as a means of incorporating the inequality effect of the widening gap between owners and renters.

Recommendation 3: we presented a basic analysis of regional differences in mortgage interest rates (and found little spatial variation), but there is a need to explore whether there is spatial variation of interest rates *within* regions as this could affect the inequality of *net* housing wealth.

Recommendation 4: We found that spatial variation in house price *levels* only explained a tiny proportion (5%) of the spatial variation in subsequent house price *change*. This suggests that variations across space in the rate of change in house prices is largely determined by factors other than whether those areas are, on average, low price areas or high price areas. Further research is needed into what determines the remaining 95% of the variation in local house price inflation.

Chapter 1

Introduction

This report seeks to investigate the phenomena of housing wealth in some depth and to ascertain the extent to which apparent increases in geographical inequality are dependent on particular data or approaches to the topic, and the extent to which there is a genuine and persistent trend.

The existing evidence base on housing wealth inequality is inconclusive. Research in the late 1990s appeared to suggest modest increases in inequality, whereas more recent work has found a strong upward trend in housing wealth inequality in the UK since financial deregulation in the early 1980s with high house price areas growing in value at a faster rate than housing in low priced areas. Such polarity has profound implications for geographical and occupational mobility, which in turn raises issues for housing policy and service delivery more generally.

In particular, this report aims to answer the following hypothetical question:

> *Suppose someone purchased dwelling in a low house price area in 1996. Would they have fared any better or worse over the subsequent decade in terms of the percentage increase in value of their house than someone who purchased a house in a high house price area in 1996?*

Of greatest interest is the cumulative change in house prices over that period – annual fluctuations are of less interest because they may simply cancel each other out over time. The real question is whether, over the decade as a whole, those living in higher house price areas in 1996 have enjoyed a better rate of return on their property investment.

This question is of importance for at least four reasons:

1. It connects to the wider debate about the pros and cons of inequality:

   Housing has become such an important asset that changes in the distribution of house prices can have profound effects on the distribution of overall household wealth. Inequality of wealth can increase work

incentives (the aspiration to emulate the lifestyle of someone further up the ladder of affluence) but also reduce equality of life-chances (wealthy parents have the wherewithal to provide their children with better educational opportunities).

But *volatility* of wealth may be as important as *equality* of wealth. If large swings in housing equity arise because of arbitrary market processes, rather than as a result of the explicit democratic choice of society, there may be negative implications not only for social welfare and economic efficiency but also for the role of government and the capacity of policy to affect peoples' quality of life.

2. It has implications for the attractiveness of low-price areas to investors and movers:

   A finding that low house price areas tend to perform poorly (in terms of the return on every £1 invested in residential property) is likely to make those areas less attractive to investors and households. Lower rates of price appreciation in low-price areas (Thomas and Dorling 2004) may become a self-fulfilling prophecy – the vicious circle of net out-migration and falling property values will only deepen the blight of deprived areas and push the goal of mixed communities further beyond reach.

   If, on the other hand, low-house price areas tend to perform just as well in the long-term as more expensive areas, then property investors can be reassured that their money will be equally well-placed in Wales as in Knightsbridge. If this is borne out in the data, then the results should have the potential to reduce the stigma associated low house price areas.

3. It has implications for the shortage of key workers in high-house price areas:

   Cameron and Muellbauer (1998) found that "expected house price appreciation is a crucial counterweight to high house price to earnings ratios, which otherwise discourage net migration to a high priced region. Our estimates help explain why economic activity continues to be attracted to high priced but prosperous locations." (p. C110, Muellbauer 2005). This can have further perverse effects if private sector wage rates adjust to regional house price imbalances, exacerbating the public-private sector wage gap in high house price regions, leading to acute shortages of key workers in those areas.

4. It also has implications for the relative position of renters:

   Suppose there is a vicious circle of declining property values in low house price areas, with self-reinforcing rises in property values in high-house price areas persisting unabated over time. The house price terrain – where expensive areas are represented mountains and low-price areas are represented by valleys – would become more precipitous as the peaks rise higher and the troughs sink lower. Other things being equal, the implication would be a reduction in the gap between the housing wealth of renters (who have no housing wealth) and those at the low end of the market for owner-occupancy.[1]

   Suppose, on the other hand, that the rise and decline in the relative position of low and high house price areas is intrinsically temporary – part of a perpetual process of adjustment. Expensive areas pull away for a while, but this is followed by a period of catch-up as low-price areas prosper, and so on. Yes, average house prices may have increased, but this is not so much due to the effect of increasingly extreme values at the upper end but a positive shift of the entire house price distribution. That is, the entire house price terrain has been elevated. Other things being equal, the implication would be an *increase* in the gap between the housing wealth of renters (who have no housing wealth) and those at the low end of the market for owner-occupancy.

It should be noted that this report does not address the issue of changing inequality in *absolute* housing wealth. If all houses rise in value by 10% over the course of a year, owners of £1m houses will make a capital gain of £100,000, whereas owners of £50,000 houses will accumulate a gain of £5,000. One should, however, bear in mind that the converse also applies. The value of a dwelling can go down as well as up. If all houses fall by 10% then the owner of the £1m house will lose a lot more money in absolute terms than the owner of the £50,000 house. The real issue is whether there is a systematic and persistent difference in the *rate* of house price increase between areas with cheap houses and those with expensive houses.

The goals of this report are unashamedly quantitative – to ascertain what has happened in the market as whole, to identify the long term and systematic patterns across all neighbourhoods, rather than the story of any one neighbourhood or household. While there is no denying that particular individuals have made huge capital gains by selling a single expensive house at the right time, this in itself does not represent growing inequality unless

1 This is not an exhaustive list of possibilities. If one were to consider all assets (not just housing), it would be possible, for example, to have a situation where wealth inequality is growing among homeowners and, at the same time, there is a growing gulf between owners and renters. Growth in both of these categories of inequality would also occur if there were a large increase in prices in low house price areas but an even bigger increase in expensive areas.

those same individuals could not have achieved proportionally equivalent gains by selling *several cheaper houses*. One of the inefficiencies associated with housing as an investment vehicle is that it is a lumpy asset – one cannot easily purchase a share in a house. If expensive houses tended to increase in value at a faster rate than cheaper ones, this lumpiness would imply an inequality of opportunity among homeowners because lower income homeowners would be excluded from the most profitable share of the market.[2]

So, the story of relative house price change is an important one and the approach of the report will be to explore it from a variety of perspectives. The remainder of the report is structured as follows:

- **Literature review:** a brief survey of the existing work done in this area.
- **Methods:** outline of the approaches used in the analysis.
- **Distribution of house prices:** background information on individual house transactions.
- **Results:** findings from the various spatial measures of inequality.
- **Implications for policy:** ramifications of the results for housing policy.

2 The same principle applies to whether *renters* are disadvantaged by the barriers to purchasing manageable fractions of a house. They would only be disadvantaged by the lumpiness of housing if the risk adjusted net returns on housing were systematically greater than the net returns on more divisible investments (such as stocks and shares) in the long run.

Chapter 2

Literature review

The literature on housing wealth inequality in the UK is surprisingly sparse. While there is a large body of work on housing wealth *per se*, few studies look at the inequality of housing wealth, and fewer studies still look at how this inequality has changed over time. No study has applied standard measures of inequality (such as the Gini and Atkinson coefficients) on an annual basis to housing wealth and traced how these indicators have changed over a prolonged period, and no study has successfully completed a fine-grained spatial decomposition of changes in housing wealth inequality.

The lack of spatial analysis is partly explained by the fact that empirical interest in housing wealth has been driven by macro economic modelling. Prior to the 1990s, macro studies "implicitly ignored the mobility features of housing markets and emphasised how changes in aggregate demand drive housing system outcomes" (Maclennan and Tu 1998). Failure of macro models in the late 1980s to explain consumption behaviour led to a new interest in the role of housing wealth as a possible explanation (Dicks 1990; Carruth and Henley 1993; Muellbauer and Lattimore 1995).

Rapid house price inflation during the 1980s led to concern about the tendency for homeowners to pass on capital gains to their children, and so one branch of the literature considered the class reproduction implications of homeownership. Holmans (1997), however, did much to dispel those concerns by arguing that, "The forecasts made in the later 1980s … severely underestimated the length of the time scale and did not take any account of the payments for care."[3]

The first explicit, detailed study of UK housing wealth inequality using large datasets seems to have been that of Henley (1998). Henley employed General Household Survey (GHS) and British Household Panel Survey (BHPS) data to examine movements of the housing wealth distribution and changes in the determinants of household housing wealth. He presents a decomposition of housing wealth inequality by both region and age of head of household, and

3 Holmans (1997)

considers a variety of wealth measures including gross housing wealth (cumulative house price change), net wealth (gross wealth less outstanding mortgage debt), both within owner occupancy and across all tenures. Henley finds that the "level of inequality is much higher for all households than for owner-occupiers alone."[4] There is evidence of a small growth in housing wealth inequality over the period 1985-91, and this is more pronounced for gross (rather than *net*) housing wealth. Despite regional differences in house price change, "nearly all of the growth in inequality is explained by the growth of *within-region* inequality."[5] Similarly, the age-group decomposition finds that most of the increase in inequality is *within-group*.[6]

While Maclennan and Tu (1998) do not apply traditional inequality analysis to housing wealth, their study is of interest because it attempts to consider how housing equity (i.e. net housing wealth: the difference between current house value and outstanding mortgage debt) varies across household types. They considered patterns in housing equity using a variety of survey-data sources (including the BHPS) and found that "current household income was not significantly related to housing equity, largely because elderly households with low incomes had large asset stocks, nor was ethnicity and purchase via Right-to-Buy patterns."[7]

While survey data such as the BHPS allows one to approximate the net housing wealth of each household by deducting estimated outstanding mortgage debt from the house price, there are four significant disadvantages with this type of data: (1) there is typically a lack of spatial information (usually omitted to preserve the anonymity of respondents); (2) the sample is rarely evenly distributed across the country so true geographical analysis is precluded; and (3) the lack of transactions-based price data means that estimates of the value of the house in each year – crucial to the computation of housing wealth – is only very approximate in most cases;[8] (4) the mortgage variables are typically limited – current mortgage balances usually have to be approximated using amortisation equations (as in Maclennan and Tu 1998) with other simplifying assumptions.

These limitations would make it impossible to use the BHPS, for example, to conduct a fine-grain spatial analysis of housing wealth accumulation, or to achieve complete geographical coverage. House transactions data, on the other hand, while lacking mortgage information, have the potential to provide price and attribute information with a high degree of spatial precision and extensive geographical coverage.

4 Henley (1998) p336.

5 Ibid, p374.

6 Ibid, pp375.

7 Maclennan and Tu (1998), p456.

8 Only around 5-7% of properties transact in a given year. Consequently, only a very small proportion of the sample has recent price information; valuation of other properties can be approximated but with questionable levels of precision.

While such data do not typically include mortgage information, this is not necessarily a crucial loss. It is questionable whether net housing wealth is the variable of most interest, particularly if one is concerned with the implications for social inequality. Suppose households in more expensive areas have had greater rates of house price increase, and have also had greater rates of equity withdrawal. As a consequence, the net proportionate increase in housing equity is no greater than for home owners in low price areas. But the apparent uniformity in housing equity growth in this example masks the growing inequality that has occurred over time in the benefits of living in high house price area relative to living in a low house price area. Relative house price growth across different geographical or social classifications is, in many respects, the most important variable.

The only obvious distortion contained in gross housing wealth calculations is the possibility that homeowners in some areas may, on average, be paying higher rates of mortgage interest than in others. However, for this to occur, there have to be higher rates of new mortgages in some areas than others, significant interest rate changes in the preceding period, and a prevalence of fixed rate mortgages among existing mortgages (otherwise the interest rate changes will affect existing and new mortgages equally).

Another possible cause of spatial patterns in interest rates might be due to geographical differentials in risk premia, reflecting the concentration of higher risks (e.g. higher loan-to-value ratios) in certain locations. It is unlikely, though, that geographical differences in interest rates will have a major impact on the spatial pattern of housing wealth. For example, for new mortgages 2003, the average variation *between* English regions in the mean regional interest rate was just 0.04 percentage points, whereas the average deviation[9] *within* these regions was almost 0.7 percentage points (note how similar the interest rate distributions are for these two regions in the graph below, even though they represent the two extremes of regional interest rates in the UK).[10] It would be interesting and important, but beyond the scope of the present study, to explore whether the variation of interest rates within each region has a stronger spatial component.

Gross housing wealth differentials, measured using relative rates of change between high house price areas and low house price areas, are therefore of particular importance, and the best way to examine this effect is to use transactions data, such as that provided by HM Land Registry or building societies.

9 That is, the standard deviation.

10 Note also that a regression of interest rates on regional dummies explains just 5% of the variation of interest rates on new mortgages. This suggests that the almost all the variation in interest rates is non-spatial. The average interest rate in London was 4.16 (standard deviation of 0.67), whereas the average interest rate in Yorkshire and Humberside was 4.28 (standard deviation of 0.68).

This is the basis of the approach taken by Thomas and Dorling (2004) in a widely cited study that yielded spectacular findings about the apparent rate of housing wealth polarisation between high and low price areas. They find that:

> "In the 25 areas where property is now most expensive it has risen in value in the last 20 years at least seven fold. At the extreme, in the most expensive area, it has almost risen 20 times in value from 1983 to 2003. In comparison, in the 25 areas where prices are now the lowest some have barely doubled in these 20 years and at most they have increased five fold (from a very low base in 1983) … Over the period as a whole the percentage increase in property values for the best off tenth of the population (644 per cent) was almost twice that for the worst off tenth of owners (328 per cent) … The last decade, the 1993-2003 period of change, was the most important – absolute average price rises for the best-off tenth of areas at £268,784 were more then ten times those of the worst-off tenth."[11]

This leads to a fairly startling conclusion:

> "… the major underlying trend in the data … shows ever growing inequalities in wealth being generated through the operation of the housing markets in Great Britain. These levels of housing wealth inequality are unprecedented and, we argue, almost insurmountable by individuals, whatever efforts they might make to improve their relative situation through, for instance, employment."[12]

Note, though, that while Thomas and Dorling use transactions data, their findings are not based on *gross* housing wealth – they attempt to calculate *net* housing wealth based on "the simple ratio of outright owners to buyers," where information on outright owners is gleaned from Census data.[13] However, in addition to the problems noted above of attempting to estimate net housing wealth as the basis of inequality measurement (namely, a person may have high mortgage debt because they have benefited from equity withdrawal) there may be further drawbacks when using Census data and when computing area averages.

First, there is the problem that many homeowners over the past 20 years have taken out endowment and interest-only mortgages. The implication here is that, at a given point in time, many borrowers will have very large *gross* debt (nothing repaid on their mortgage), but insignificant *net* debt (because their endowment policy is close to maturity). In other words, rates

11 Thomas and Dorling (2004) p4-5.

12 Ibid, p9.

13 Idid, p20.

of outright ownership are a crude measure of indebtedness, and therefore lead to potentially biased measures of net housing wealth.

A second, and more acute, problem arises when outright ownership rates are used to examine geographical variation in wealth. Older, lower-debt/higher-wealth, households tend to concentrate in particular areas, so this can give the impression that there is spatial inequality in net housing wealth, an impression that is somewhat misleading because it may be the natural outcome of the life-cycle and housing-careers process. Young homeowners tend to purchase their first property in entry-level housing (which is typically clustered in particular areas) and do so with high debt-gearing (loan to value ratios close to 100%). As time passes, they progress up the income scale, and pay-off more of their mortgage debt (or their endowment policy matures), until they own outright.

Over the course of this income and debt cycle, housing needs change. In particular, older homeowners tend to relocate to "mature areas" – quieter neighbourhoods inhabited by owners at a similar stage in their lifecycle. Note that this process would imply spatial inequality in net housing wealth *even if all homeowners had exactly the same life-cycle earnings*. Using *net* housing wealth only leads to confusion because we do not know whether changes in net housing wealth inequality across space are due to changes in life-cycle and housing careers behaviour (which may be innocuous – e.g. older homeowners increasingly wanting to live near neighbours at a similar life-stage) or whether the changes are due to systematic changes in the spatial pattern of housing wealth accumulation. While the former is not problematic, the latter may well be (if, for example, flows into "mature areas" were determined by a growing gulf between low-and high-price areas in the rate of increase of value housing over the course of a lifetime). Therefore, the simplest and most pertinent way to measure changes in housing wealth inequality across space is to use a measure of gross (rather than net) housing wealth.

There are two further problems with the Thomas and Dorling approach: (i) the use of final period price levels to decide on whether houses were in a low or high house price area; and (ii) many of the results reported on inequality growth are based on two points in time (to coincide with Census dates), rather than at every point, which has the potential to greatly inflate the measurement of inequality. For example, if the start point happens to be at a trough in inequality, and the end point a peak. Both are common (but serious) methodological weaknesses, so the errors are understandable. However, they do leave an important omission in the UK research literature and an outstanding requirement to compute spatially fine-grained estimates of housing wealth accumulation inequalities.

Chapter 3

Methods

Two broad approaches to measuring inequality are considered below. First, *non-spatial* methods, based on all house transactions in England and Wales over the 1996 to 2006 period. These indicators will tell us whether house prices overall have become more or less unequal, but will not reveal the spatial patterns in the changes in inequality.

The first measure is the Gini coefficient, which is by far the single most popular indicator of inequality. It takes on a value between zero and one, and can be represented as a percentage. If wealth is perfectly equally distributed, the Gini coefficient will equal zero. In a perfectly unequal society, where all wealth is owned by one person, the coefficient will equal one. The second measure of housing wealth inequality is the Atkinson coefficient which allows the user to specify a sensitivity value, *e*, to capture how concerned the researcher is about those in the sample with lowest wealth. *e* can be specified to lie at any point range zero to infinity, the higher the value, the greater the sensitivity of the index to inequalities at the bottom of the wealth distribution. Atkinson coefficients are conventionally computed for the a variety of values of *e,* typically *e* = 0.5, 1, 1.5 and 2. The coefficient of variation is also considered, which is simply the standard deviation of house prices as a proportion of the mean house price.[14]

Four *spatial* inequality growth measures are also considered, which are denoted *IGM*s. The first two spatial measures (*IGM1* and *IGM2*) are the slope coefficients obtained from a regression of average postcode sector house price *change* on average postcode sector house price *levels*. For example, *IGM1* = β , where β is the slope from the following regression across areas (denoted by *i*) of house price inflation on initial period prices, *P*:

$$Inflation_i = \alpha + \beta P_{i,t=1996},$$

The advantage of this approach is that it uses the entire price distribution (rather than looking only at postcode sectors with very low or very high

14 see Daio 2007 p. 850.

house prices). Note that in constructing the house price levels variable, one has to decide whether to use the initial period (such as 1996) to measure whether a postcode sector has a low or high house price levels, or whether one should use the final period (such as 2006). *IGM1* is based on the former, as in the equation above, whereas *IGM2* is based on the latter, as in the equation below: $IGM2 = \gamma$, where γ is the slope from the following regression of house price inflation on initial period prices:

$$Inflation_i = a + \gamma P_{i,t=2006},$$

Clearly, one should use measures based on β (*IGM1*) rather than γ (*IGM2*) because it is tautological to say that areas that have experienced high house price gains relative to others will, at the end of that period, be more likely to be ranked as a high house price area. Consequently, *IGM2* is presented below only as a means of demonstrating the distortions that can arise from using final period ranking.

The second batch of inequality growth measures (*IGM3* and *IGM4*) are based on inflation multiples, defined simply as the ratio of price growth in high house price areas, relative to price growth in low house price areas. For example, suppose the inflation multiple was calculated to be exactly equal to one. This would suggest that the percentage change in house prices in high house price areas was no more and no less than price changes in low house price areas. One might then conclude that house price inequality had remained stable – neither risen nor fallen – over the intervening period.

On the other hand, suppose the inflation multiple was greater than one, say 5, then this would imply that house prices in high house price areas had risen in value at five times the rate of price increase in low house price areas. As with the slope coefficient based measures (*IGM1* and *IGM2*), one has to decide whether one should use the initial period (*IGM3*) or final period (*IGM4*) to categorise areas as having low or high house prices, and again the fallacy of using the final period to measure price levels makes *IGM4* a faulty measure.

Finally, Gini (*IGM5*) and Atkinson (*IGM6*) measures of inequality are applied to area averages, and then to the estimated capital gains in each postcode sector (*IGM7* and *IGM8*).

Chapter 4

The distribution of house prices

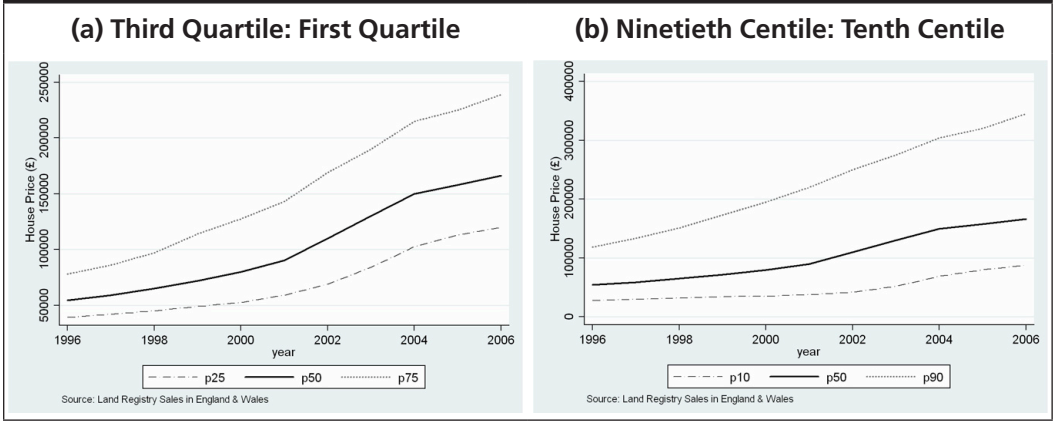
Before proceeding with spatial Inequality Growth Measures it is worth familiarising ourselves with the shape of the house price distribution and how it has changed over time. This exercise will not answer the core research question posed in the introduction because it will not reveal which areas have done well relative to others — it will merely reveal whether the UK distribution has *shifted*, and whether it has *changed shape* (become flatter or more peaked).

In this section various methods for examining changes to the house price distribution are considered. First, basic summary statistics on house prices since 1996 are presented. Second, the distribution of prices is estimated in an attempt to represent graphically changes in overall patterns of inequality. Third, estimates of two standard measures of inequality are considered – the Gini Coefficient and the Atkinson Index – as applied to all house prices in the data.

4.1 Summary statistics on house prices since 1996

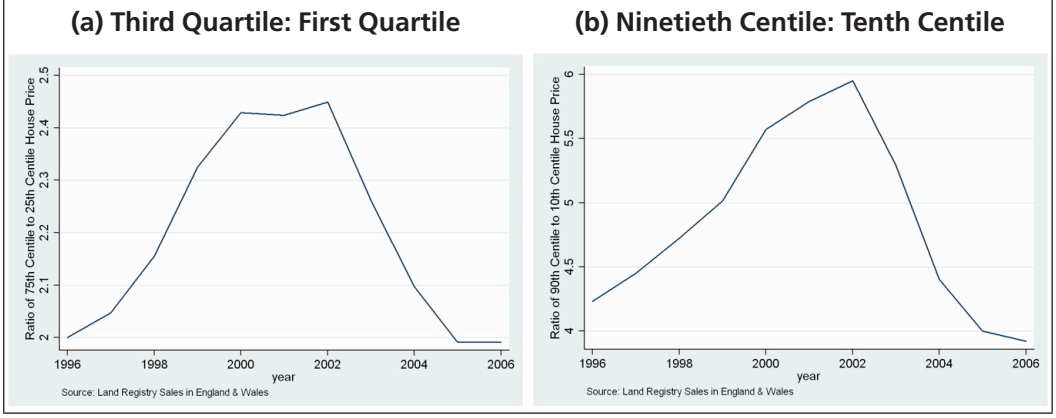
The two line graphs in panel (a) of Figure 4.1 show that the gap between the 75th centile (P75) and the 25th centile (P25) has increased as one might expect, but the question is whether there has been a *relative* increase, not just an *absolute* increase. Similarly, the 10th and 90th centile have clearly drifted apart (panel (b)), but this would be true even if all house prices increased at the same rate. In other words, if all dwellings increased in value at 20% a year, the 10th (P10) and 90th centile (P90) would drift apart in absolute terms, but would be constant as a proportion of each other.

Figure 4.1 House Price Trends in England and Wales



Both sets of ratios in figure 4.2 tell a similar tale: the top end of price distribution pulled away from the bottom end of the distribution in relative terms at the turn of the millennium, but in the last three years, prices at the bottom end of the distribution have enjoyed an equally noticeable catch-up. These results suggest that house price inequality is lower now than it was a decade ago. They also raise the question of whether it matters that housing wealth inequality increased temporarily during 1996-2002. There is no obvious reason why transitory increases in inequality of this kind should be a major cause for concern – they may simply imply a lag in the house price adjustment process.

Figure 4.2 Ratio of Upper to Lower House Centiles



Of course, this tells us nothing about how the distribution of prices has changed across space – one does not know if low price areas in 1996 have remained low price areas or whether some have swapped places with localities previously considered to have higher house prices. Nevertheless, the results indicate that something fairly dramatic has occurred in the housing market, and that one cannot assume that housing wealth inequality has been rising inexorably.

4.2 Changes in the distribution of house prices

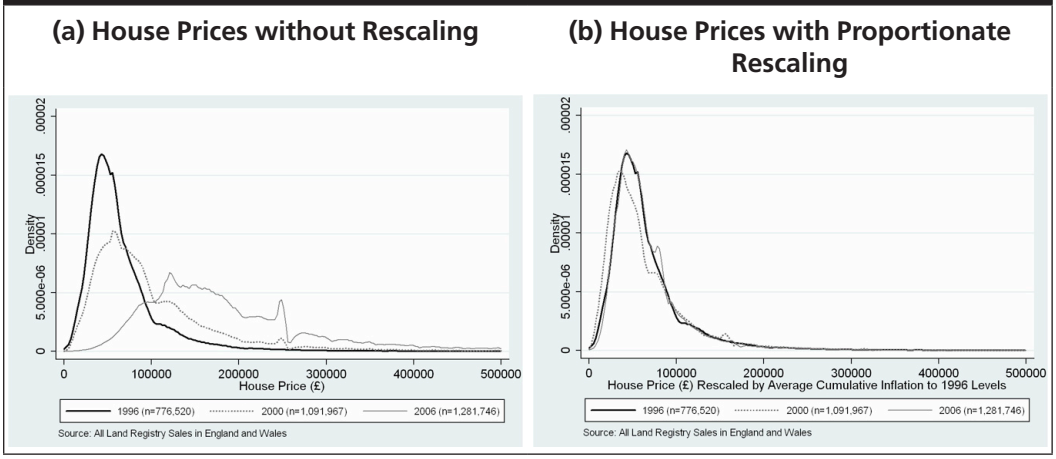
Consider now two particular questions raised in the Introduction about the distribution of house prices: (i) whether the distribution has shifted to the right (all homes become more expensive), and (ii) whether it has become more stretched-out – less "peaked" (expensive homes increased in value by a proportionately larger amount).

The first of these questions has already been answered by the simple descriptive statistics above – shifts in the mean price over time are likely to represent shifts in the distribution – the only other explanation is that values at the top end have become more extreme and have, as a result, pulled up the average. So the two questions are linked – if the distribution has become more extreme, then the mean price will have increased, and the allocation of housing wealth is likely to have become less equal.

If, on the other hand, the distribution has retained its shape but simply shifted to the right over time, then all owners would have benefited by similar proportionate amounts. Under this scenario, the gap between the wealth of renters who have no housing wealth and those at the low end of the market for owner-occupancy is also likely to have increased.

Figure 4.3, panel (a), plots the estimated relative density curve for house prices in 1996 against the density curves for 2000 and 2006. To control for the effect of proportionate scaling (i.e. even if all houses increase in value by the same amount, the distribution will appear to change shape), Figure 4.3 (b) rescales the prices in 2000 so that they have the same mean price as 1996 prices (i.e. all prices in 2000 are divided by $1 + \pi_{1996, 2000}$, where $\pi_{1996, 2000}$ = cumulative proportionate change in the mean house price between 1996 and 2000). Prices in 2006 are similarly rescaled by a constant factor (i.e. all prices in 2006 are divided by $1 + \pi_{1996, 2006}$ where $\pi_{1996, 2000}$ = cumulative proportionate change in the mean house price between 1996 and 2006).

Figure 4.3 Changes in the House Price Distribution



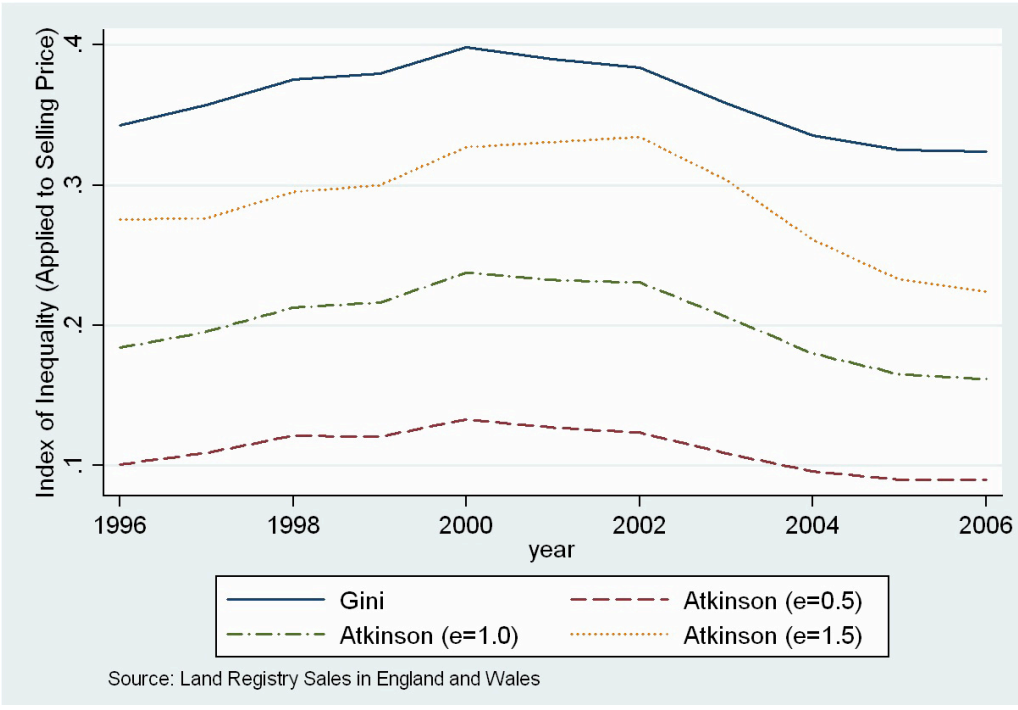
Interestingly, when the mean of the 2006 distribution is rescaled to equal the 1996 mean (as in Figure 4.3), the distribution has an almost identical shape to the 1996 distribution. The same is not true of the rescaled 2000 distribution, which is noticeably more skewed than the 1996 distribution.

Now consider changes in the "inequality" in house prices, as measured by the Gini and Atkinson Coefficients. Figures listed in Table 4.1 and plotted in Figure 4.4 suggest that inequality of house prices rose during the late 1990s but has been declining since the turn of the Millennium. That decline is most pronounced for Atkinson coefficients with higher levels of sensitivity to the bottom end of the house price distribution. All the measures calculated suggest that house price inequality was lower in 2006 than it was a decade earlier. The coefficient of variation follows a similar pattern suggesting that house prices are now less variable than they were in 1996.

Table 4.1 Inequality Measures Applied To All House Prices

Year	Coefficient of Variation	Gini Coefficient	Atkinson e = 0.5	Atkinson e = 1.0	Atkinson e = 1.5	Atkinson e = 2.0
1996	0.91	0.34	0.10	0.18	0.28	0.76
1997	1.16	0.36	0.11	0.20	0.28	0.59
1998	3.93	0.38	0.12	0.21	0.30	0.61
1999	1.34	0.38	0.12	0.22	0.30	0.56
2000	1.14	0.40	0.13	0.24	0.33	0.47
2001	1.10	0.39	0.13	0.23	0.33	0.66
2002	0.98	0.38	0.12	0.23	0.33	0.71
2003	0.86	0.36	0.11	0.21	0.30	0.64
2004	0.81	0.34	0.10	0.18	0.26	0.49
2005	0.82	0.33	0.09	0.17	0.23	0.30
2006	0.86	0.32	0.09	0.16	0.22	0.28

Figure 4.4 Inequality Measures Applied to All House Prices



Source: Land Registry Sales in England and Wales

Chapter 5

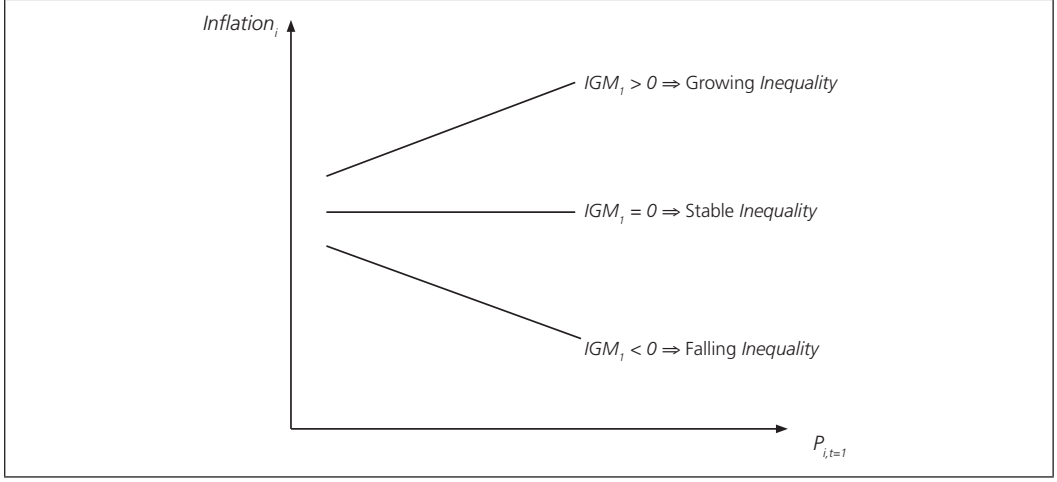
Results for *IGM1*: Base period slope coefficients

Inequality Growth Measure 1 is the slope coefficient obtained from running an ordinary least squares regression of house price change on initial period house price levels. As noted earlier, the advantage of this approach, over say the inflation multiple methods considered below (*IGM3* and *IGM4*), is that it uses the entire price distribution (rather than just the first and last decile).

If the slope coefficient were to come out as zero, one would conclude that proportional capital gains in low house price areas in 1996 pretty much kept pace with the proportional capital gains in areas categorised as high house price localities in 1996. As such, other things being equal, housing wealth inequality would neither have increased or decreased in proportionate terms. This scenario is represented by the horizontal line in Figure 5.1.

Conversely, an upward sloping line relating price *change* and price *levels* would mean that *IGM1* is positive, as in the line $IGM1 > 0$ in Figure 5.1. A slope coefficient greater than zero would imply that proportional capital gains in areas categorised as low house price areas in 1996 subsequently lagged behind the gains made in areas categorised as high house price localities. Housing wealth inequality would have increased.

Figure 5.1 Schematic Diagram Depicting the Three Categories of *IGM1* Values



In the event, the estimate of the slope coefficient came out as negative (-2.1), which suggests that over the period 1996 to 2006 house price inflation was greater for those areas that started with low average house prices. The regression (based on 6,201 post code sectors with greater than 30 observations in both 1996 and 2006) revealed a high t-ratio on the price levels coefficient, ensuring that the 99% confidence interval did not span zero, which allows us to say that the slope estimate is significantly less than zero. However, the R^2 was only 5% suggesting that spatial variation in house price *levels* only explained a tiny proportion of the spatial variation in subsequent house price *change*. This suggests that variations across space in the rate of change in house prices is largely determined by factors other than whether those areas are, on average, low price areas or high price areas. Put another way, inequality in the rate of housing wealth accumulation is *not* adequately explained by inequality between local price levels.

Note that house prices used in the regression were measured in £m. One can use the model (albeit tentatively, given its poor explanatory power) to calculate the cumulative inflation associated with an area with a particular average house price. Simply multiply the average price (measured in £m) by the slope coefficient (in this case -2.1) and add the intercept term (2.3). For example, if you purchased a house in an area where the average price in 1996 was £50,000, to work out how much the property would have risen in value by 2006, you would make the following calculation to arrive at a figure of **219%**:

% change since 1996 in a **£50k area** = 100 × (2.3- (2.1 × £0.05m))

= 100 × (2.3 – 0.104)

= 219.1%

On the other hand, if you purchased a house in an area where the average price in 1996 was £200,000, the property would have risen in value by a rather less impressive **188%**, a difference in growth rates of **31 percentage points**:

% change since 1996 in a **£200k area** = 100 × (2.3 – (2.1 × £0.2m))

= 187.81%

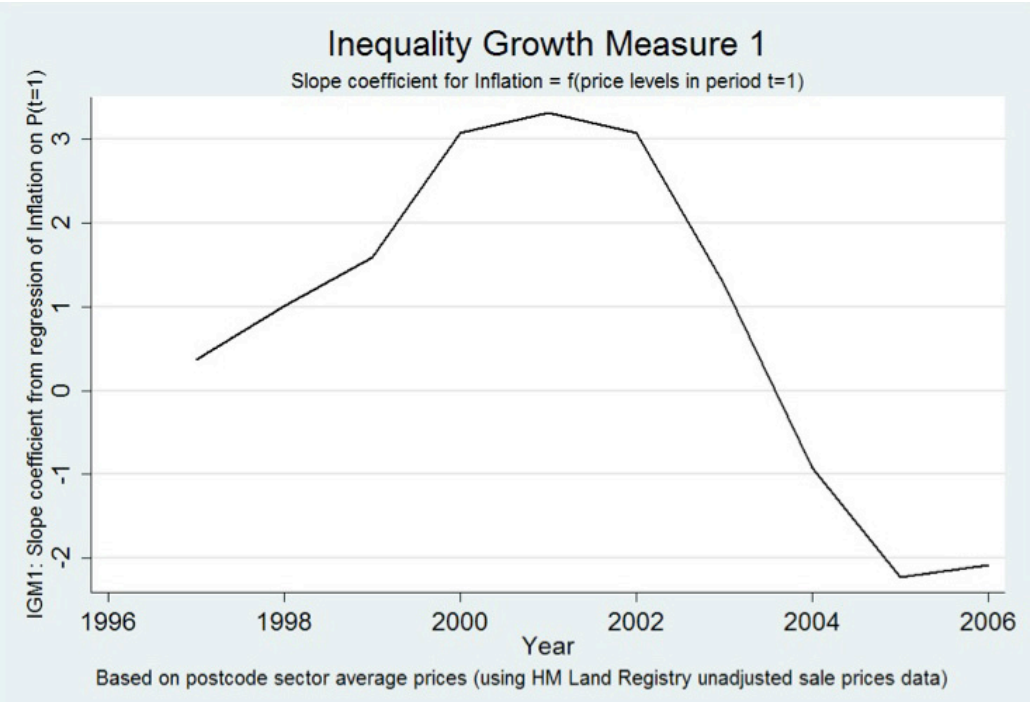
Shifts over time in the sensitivity of price changes to price levels:

A marked difference in the slope coefficient for the comparison of the 1996/2004 regression with that estimated from the 1996/2006 regression, led us to investigate how this slope coefficient had changed incrementally as the period for cumulative capital gains extends from one year (1996 to 1997) to two years (1996 to 1998) to three years (1996 to 1999) and so on.

The results of repeating for each individual year the process of calculating average prices in each postcode sector in England and Wales, computing the cumulative percentage increase since 1996 in each sector, and running regression of this percentage increase on 1996 prices, are presented in the line graph shown in Figure 5.2. The vertical axis measures the value of the slope coefficient estimated for each year. The hump-like shape suggests that housing wealth inequality rose significantly in the late 1990s, but peaked in 2001 and then fell in every successive year until 2005 where it bottomed out.

In other words, if you had bought a house in a low house price area in 1996, things were looking rather bleak by 2001, since although the cumulative proportionate increase in value in your property had been positive, it was a lot lower than the cumulative proportionate increase you would have received if you had purchased a property in a high house price area in 1996. However, if you had the courage to hold on to your property, by 2004 the cumulative proportionate increase would have caught up with that in high house price areas, and by 2006 would have significantly exceeded it.

Figure 5.2 *IGM1* Over Time



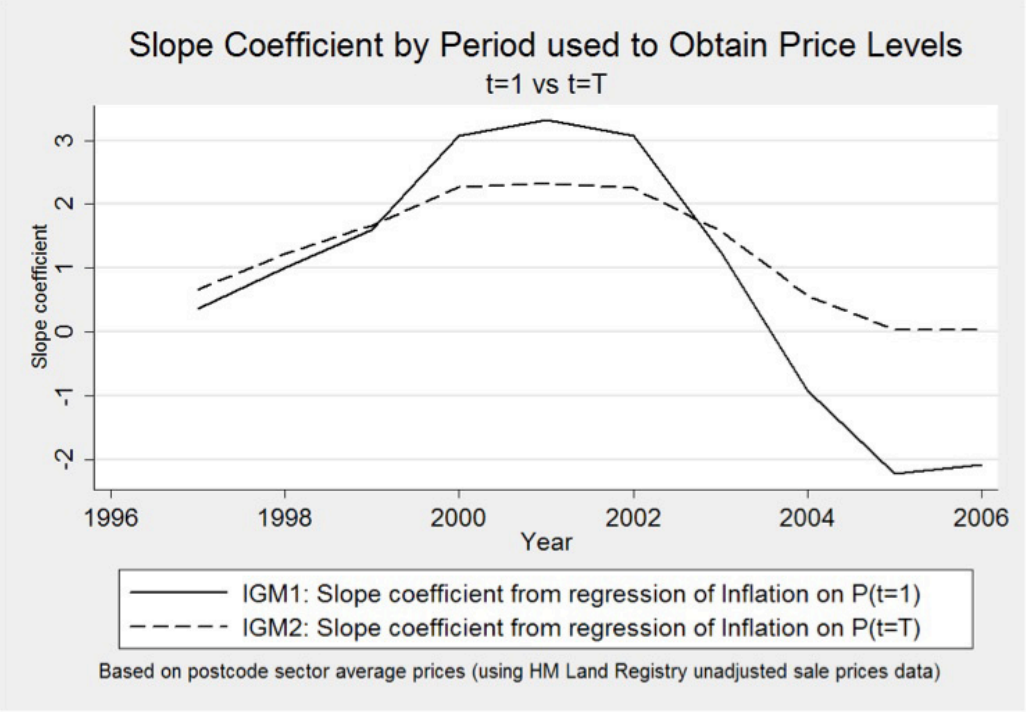
Chapter 6

Results for *IGM2*: Final period slope coefficients

As noted in the Methods section, use of *IGM2* would be incorrect because it uses final period house price levels as the explanatory variable. A more meaningful approach would be to use initial period price levels as the explanatory variable (as in *IGM1*). Therefore, the *IGM2* results are presented for illustrative purposes only.

Figure 6.1 compares the *IGM1* and *IGM2* results for each year using Land Registry data. Interestingly, the *IGM2* estimates actually fall below the *IGM1* coefficients for the peak years (this may be due to random variation). Crucially, however, unlike the *IGM1* measure, the *IGM2* coefficients do not fall substantially below the 1997 values, even in the final two years of the data (2005 and 2006).

Figure 6.1 Comparing *IGM1* and *IGM2*



Chapter 7

Results for *IGM3* and *IGM4*: Inflation multiples

Consider now the results for *IGM3*, the cumulative ratio of house price inflation in the tenth decile of base period (t=1) price *levels* to that of the first decile (Figure 7.1) plots these results, along with those for *IGM4*, which uses final period (*t*=*T*) rather than base period (*t*=1) house price levels to compute the deciles. The graph is based on the Thomas and Dorling (2004) building society data, (Table 7.1), combined with results from the last four years of the Land Registry data in an attempt to create a graph from 1981 through to 2006.

The graph measures inequality in gross housing wealth. A value of one indicates that house price inflation in more expensive areas is no greater than house price inflation in low-price areas. A value greater than one, on the other hand, indicates that there is a greater rate of house price growth in more expensive areas. Conversely, a value less than one occurs when houses in low-price areas are rising in value at a faster rate.

It is clear from the graph that *IGM4*, the approach used by Thomas and Dorling (2004), significantly over-estimates the level of inequality in housing wealth accumulation during peak years.[15] This overshoot arises entirely because of the bias caused by using final period prices to compute the deciles.

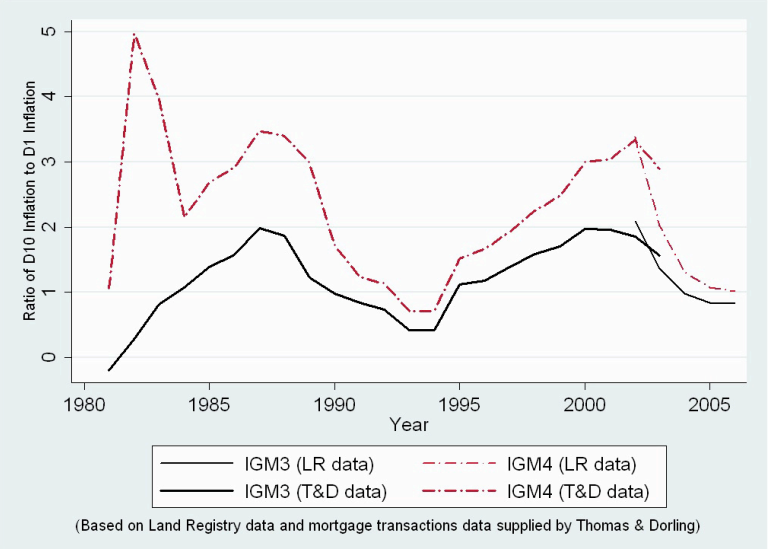
Is there an upward trend in the values of IGM3 that exceed unity? It is not obvious that there is. There appear to be two clear peaks in *IGM3*: one in 1987 (*IGM3* = 1.99) and one in 2000 (*IGM3* = 1.98). Note that it is not really possible to tell whether the troughs have risen because the current trough (2006) is estimated using a different dataset.

15 Note that Thomas and Dorling (2004) also attempt to control for outstanding mortgage debt by adjusting their measure to estimate the housing wealth of mortgage-free households. We argue that this approach is problematic – see the Literature Review section above. Nevertheless, our finding that housing wealth inequality is cyclical should remain fairly robust to whether or not one attempts to control for outstanding debt, particularly given the amplitude of the cycle. Note that Thomas and Dorling find that "both absolute housing wealth and the change in housing wealth have been mainly driven by the increase in house prices and, not surprisingly, wealth has increased most where prices have risen the most" (p.20).

Table 7.1 *IGM3* vs *IGM4*: Thomas & Dorling Data Combined with LR results

Year	IGM3	IGM4
1981	–0.20	1.06
1982	0.27	4.97
1983	0.82	3.95
1984	1.08	2.15
1985	1.38	2.69
1986	1.57	2.91
1987	1.99	3.47
1988	1.86	3.40
1989	1.23	2.99
1990	0.98	1.72
1991	0.84	1.23
1992	0.74	1.13
1993	0.42	0.71
1994	0.42	0.72
1995	1.12	1.52
1996	1.17	1.66
1997	1.39	1.93
1998	1.58	2.25
1999	1.70	2.48
2000	1.98	3.00
2001	1.96	3.04
2002	1.85	3.33
2003	1.56	2.89

Figure 7.1 Combining Thomas & Dorling and LR Data



Chapter 8

Results for *IGM5* and *IGM6*: Area average prices

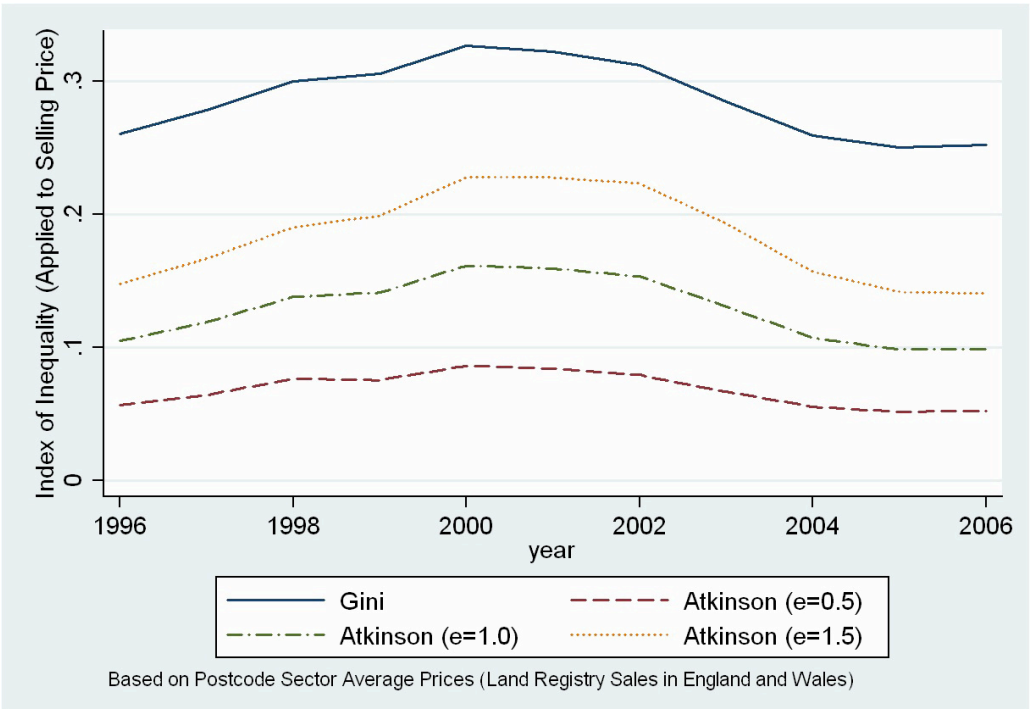
In using postcode sector averages a spatial dimension has been added to the data. It would be interesting, therefore, to consider how standard inequality measures (Gini and Atkinson coefficients) applied to the postcode averages compare with the aspatial equivalents presented in chapter 4 above. Comparing Figure 4.4 with Figure 8.1 and Table 8.1 one can see that the spatial inequality measures all tend to be lower, but that the shapes of the trajectories over time are almost identical. All of the inequality indices point to the distribution of house prices being slightly less unequal in 2006 than a decade ago, and suggest a peak in inequality in the year 2000.

Table 8.1 Inequality Measures Applied to Postcode Sector Level Average Land Registry Prices (n>30)

Year	Coefficient of Variation	IGM5 Gini Coefficient	IGM6 Atkinson e = 0.5	IGM6 Atkinson e = 1.0	IGM6 Atkinson e = 1.5	IGM6 Atkinson e = 2.0
1996	0.58	0.26	0.06	0.11	0.15	0.19
1997	0.62	0.28	0.06	0.12	0.17	0.21
1998	0.92	0.30	0.08	0.14	0.19	0.24
1999	0.65	0.31	0.08	0.14	0.20	0.25
2000	0.71	0.33	0.09	0.16	0.23	0.29
2001	0.68	0.32	0.08	0.16	0.23	0.29
2002	0.64	0.31	0.08	0.15	0.22	0.29
2003	0.57	0.28	0.07	0.13	0.19	0.25
2004	0.53	0.26	0.06	0.11	0.16	0.21
2005	0.53	0.25	0.05	0.10	0.14	0.18
2006	0.54	0.25	0.05	0.10	0.14	0.18

* The Gini and Atkinson spatial inequality measures were labelled IGM5 and IGM6 respectively.

Figure 8.1 *IGM5* and *IGM6* Applied to Land Registry Selling Price (Area Averages)



IGM5 and *IGM6* were also computed for the Thomas and Dorling (2004) data (Table 8.2). The results confirmed the cyclical nature of housing wealth inequality, but unlike the other measures, there appears to be a possible hint of an upward trend in inequality, albeit one that is dominated by the amplitude of the cycles.

Table 8.2 *IGM5* and *IGM6* Applied to Thomas & Dorling Census Tract Average Prices

Year	Coefficient of Variation	IGM5 Gini Coefficient	IGM6 Atkinson e = 0.5	IGM6 Atkinson e = 1.0	IGM6 Atkinson e = 1.5	IGM6 Atkinson e = 2.0
1980	0.317	0.174	0.024	0.047	0.069	0.091
1981	0.307	0.170	0.022	0.044	0.066	0.086
1982	0.315	0.174	0.023	0.046	0.069	0.090
1983	0.339	0.187	0.027	0.054	0.079	0.104
1984	0.358	0.196	0.030	0.059	0.086	0.112
1985	0.391	0.213	0.035	0.069	0.101	0.131
1986	0.429	0.232	0.042	0.081	0.117	0.151
1987	0.497	0.269	0.055	0.107	0.155	0.198
1988	0.498	0.276	0.059	0.115	0.168	0.217
1989	0.446	0.248	0.048	0.095	0.140	0.183
1990	0.388	0.208	0.034	0.066	0.096	0.124
1991	0.340	0.183	0.026	0.051	0.074	0.096
1992	0.310	0.167	0.022	0.043	0.063	0.082
1993	0.194	0.110	0.010	0.019	0.029	0.039
1994	0.195	0.111	0.010	0.020	0.030	0.040
1995	0.421	0.207	0.035	0.066	0.095	0.121
1996	0.442	0.214	0.038	0.071	0.101	0.128
1997	0.498	0.242	0.047	0.089	0.126	0.160
1998	0.544	0.265	0.056	0.105	0.148	0.187
1999	0.566	0.278	0.062	0.116	0.163	0.205
2000	0.620	0.304	0.073	0.137	0.193	0.243
2001	0.605	0.302	0.072	0.137	0.195	0.246
2002	0.600	0.304	0.073	0.139	0.199	0.252
2003	0.541	0.281	0.063	0.122	0.177	0.228

Chapter 9

Results for *IGM7* and *IGM8*: Area average capital gains

One way to think of house price inflation is as a stream of income to owners. Since income from capital gains is untaxed, the assumption of "other things being equal" is not unrealistic in terms of the inequality implications. As Lambert (1993) demonstrates, the idiosyncrasies of the tax system add enormous complexity to the problem of estimating income inequality. By looking only at hypothetical income earned from capital gains on housing one can hopefully avoid most of these complications without loss of rigour.

Having calculated the cumulative nominal hypothetical income from capital gains (computed simply as the postcode sector average value in 2006 minus the postcode sector average value in 1996) the next step is to examine whether the this income is equally distributed across postcode sectors. The Gini Coeffiicient (*IGM7*) and Atkinson Index (*IGM8*) are then calculated as measures of inequality. This is repeated for each intervening year. That is, capital gains income and associated inequality coefficients are calculated for the intervals 1996-1997, 1996-1998, 1996-1999 and so on. Note, however, that these measures say nothing about whether any apparent inequality arises because it is high house price areas that have performed better or whether the unequal income flows are due to the above average performance of low house price areas.

It can be seen from Table 9.1 below that both the income-based measures of inequality (Gini Coefficient and Atkinson Index) suggest that inequality of cumulative income from capital gains since 1996 has fallen since 1997.

Table 9.1 *IGM7* and *IGM8* Applied to Land Registry Data

Year	Coefficient of Variation	IGM7 Gini Coefficient	IGM8 Atkinson e = 0.5	IGM8 Atkinson e = 1.0	IGM8 Atkinson e = 1.5	IGM8 Atkinson e = 2.0
1997	1.58	0.66	0.26	0.21	0.29	1.39
1998	3.40	0.53	0.24	0.33	0.53	0.89
1999	0.99	0.47	0.18	0.31	0.48	0.63
2000	0.99	0.46	0.18	0.33	0.50	0.54
2001	0.88	0.42	0.16	0.30	0.47	0.65
2002	0.74	0.37	0.12	0.24	0.38	0.10
2003	0.61	0.31	0.08	0.17	0.27	0.40
2004	0.54	0.27	0.06	0.12	0.18	0.24
2005	0.52	0.25	0.05	0.10	0.15	0.19
2006	0.55	0.25	0.05	0.10	0.14	0.18

Chapter 10

Implications for policy

Taken together, the results suggest that inequality in housing wealth is cyclical. Upon reflection, this is perhaps not surprising. Anecdotally, at least, one is aware of spatial lags and ripple effects in house price adjustment. As prices become prohibitively high in one area, increasing numbers of house-buyers consider adjacent, less-expensive areas. Nevertheless, it is puzzling why the time lag is so great – why does the catch-up process take a decade to complete? And, more importantly, does it matter?

Certainly, if housing wealth inequality growth is cyclical rather than secular the implications for class reproduction and wealth polarisation are far more ambiguous than previously suggested. The results do much to allay the fears raised by Thomas and Dorling (2004) about inexorable polarisation of housing wealth between expensive and inexpensive areas. The reality is more complicated and transitory than that.

There may still be cause for concern. Much has changed at a fundamental level in the housing market over the period under consideration, and future trajectories of housing wealth inequality may not correspond to past historical patterns. For example, there are reasons to expect high-density entry-level housing to face more acute downward pressures on price in the medium term. These reasons are listed below, but one should be clear they are only illustrative conjectures about possible future trajectories, rather than predictions that follow from the preceding analysis:

1. Migration: housing demand has been fuelled by in-migration of workers from the EU. However, the combined effect of any economic slowdown in the UK and the compulsory opening up of labour markets in France and Germany in 2011 could result in a significant out-migration of Poles and other migrants from the UK. This in-migration flow has been spatially concentrated, as would be the effects of its reversal. Prices and the demand for high-density, entry level housing are likely to be volatile in those areas with higher concentrations of EU workers.

2. Mortgages and household debt: if the Buy-to-Let (BTL) sector goes into decline, the impact could be concentrated in high-density, entry level urban housing (few BTL mortgages are four bedroom detached farmhouses...). BTL has grown, even in areas where rental demand is low – landlords have been willing to hold properties vacant in the anticipation of rising house prices (see Sprigings *et al* 2006). Urgent selling and repossessions could occur in those areas as expectations of capital gain from rising prices are not realised. The spatially concentrated impact on house prices could lead to an increase in housing wealth inequality (though the effect may only be temporary – the BTL sector is likely to recover with the market).

3. Dominance and spatial concentration of high-density new build: the great majority of new-build in recent years has been high-density, much of it vacant and greatly over-priced (e.g. recent Manchester developments). When the market adjusts, 1 and 2 will exacerbate any downturn in this sector.

4. Long-term interest rate movements: much of the increase in demand for UK housing has been speculative, driven by falling long-term real interest rates – investors have switched their funds from interest bearing assets to property because the returns have been greater. If that situation reverses, either due to falling returns on housing and/or rising real long-term interest rates triggered by rising domestic inflation, demand and prices are likely to fall. This could have major implications for those relying on property as their pension fund.

If these factors have an asymmetric effect on the housing system – hitting the low-end of the housing market the hardest – there could be fairly large combined spatial effects on housing wealth inequality at sub-regional level, but it is not clear whether the long-term trend line UK levels of spatial inequality would be affected. One possible implication is that the recent fall in housing wealth inequality is actually illusory – a symptom of over-priced housing at the low-end of the market. Construction of, and BTL investment in, properties in areas with limited demand may have given an inflated picture of house price growth. Moreover, the impact of high-density new-build developments will have implications beyond the current cycle. Such developments may have profoundly affected the structure of the housing market at the local level and may have a permanent affect on the trajectory of prices in those areas.

Perhaps the most important aspect of the findings, however, is not the long term trend (or lack of it), nor the cyclical nature of housing wealth inequality, but the enormous *amplitude* of that cycle. How concerned should one be

about the massive variation in relative wealth that appears to arise over relatively short periods due to the swings and arrows of market fortunes? Housing has become such an important asset that changes in the distribution of house prices can have profound effects on the distribution of overall household wealth. In the Introduction it was argued that volatility of wealth may be as important as equality of wealth – if large swings in housing equity arise because of arbitrary market processes that bear no relationship to work effort, entrepreneurship, or explicit democratic choice of society, there may be negative implications not only for economic efficiency but also for the role of government and the capacity of policy to affect peoples' lives. One particular concern is that large swings in housing wealth may distort labour supply decisions. Textbook labour supply theory suggests that capital gains will "reduce the incentive to supply labour as they reduce an agent's marginal utility of wealth…" (Henley; 2004, 439-40). Henley's (2004) estimation of the impact of windfall gains arising from increases in housing equity finds significant reductions in hours worked follow real housing gains.

What should the policy response be? A prerequisite for answering this question is a clear understanding of what causes the cyclical variation in housing wealth inequality to have such amplitude. Is it a function of market failure, such as information failures causing bottlenecks in the arbitrage process? Does supply unresponsiveness and the non-neutrality of housing taxation catalyze the cyclical process, or does the phenomenon arise largely from the interface between housing and labour markets? These are deep and complex questions, and it is beyond the scope of this report to address them.

Perhaps the clearest implication for policy at this point is that the case for radical intervention in the residential property sector to prevent inexorable escalation of housing wealth inequality (as suggested in Thomas and Dorling, 2004) is profoundly undermined by the findings. There is no long-term, unambiguous upward trend in housing wealth inequality and government should hold fire until a clearer picture emerges.

A second implication is that the relative position of renters has almost certainly deteriorated. The entire distribution of house prices has shifted to the right: home-owners in both low-priced and high-priced areas have benefited from significant housing wealth gains. The gulf in housing wealth between renting and owning will most probably have widened in most areas. There will be a cyclical component to this divide – during slumps, housing wealth for some owners will actually be negative – but also a strong upward trend as the proportionate secular shifts in the entire distribution dominate the temporary swings of cyclical variation. More work is needed to verify these anticipated effects and to gauge housing wealth inequality across all tenures (not just owner occupancy).

Chapter 11

Summary and recommendations

- Inequality of gross housing wealth appears to have fallen in recent years (2000-2006).
- This seems to be part of a regular cycle in housing wealth inequality – house prices in expensive areas pull away for a while, only for prices in less expensive areas to catch up.
- There is no unambiguous evidence of an upward trend in this cycle. For some measures (*IGM3* and *IGM4*), the latest peak in housing wealth inequality (around 2000) was actually slightly lower than the peak thirteen years earlier, whereas other measures (*IGM7* and *IGM8*) suggest the opposite.
- The shift in the price distribution is likely to have widened the gulf between the housing wealth of renters (zero) and the housing wealth of owners.

Recommendation 1: there is a need to understand what causes cycles of such amplitude in housing wealth inequality, and its implications for economic efficiency and social well-being. Further research into both these questions should be a prerequisite to policy response.

Recommendation 2: there is a need to investigate whether the methods used here in the context of homeownership can be applied across all tenures as a means of incorporating the inequality effect of the widening gap between owners and renters.

Recommendation 3: this report included only a rudimentary analysis of regional differences in mortgage interest rates (and found little spatial variation), but there is a need to explore whether there is spatial variation of interest rates *within* regions as this could affect the inequality of *net* housing wealth.

Recommendation 4: spatial variation in house price *levels* were found to explain only a tiny proportion (5%) of the spatial variation in subsequent house price *change*. This suggests that variations across space in the rate of change in house prices is largely determined by factors other than whether those areas are, on average, low price areas or high price areas. Further research is needed into what determines the remaining 95% of the variation in local house price inflation.

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Annex A

Technical Appendix on *IGM1*, *IGM2*, *IGM3* and *IGM4*

This appendix provides further details on technical issues associated with the first four inequality growth measures.

Inequality Growth Measure 1: Slope coefficient on initial period price levels

The question of interest is whether price *change* is related to price *levels*, and whether this relationship is materially affected by whether one measures price levels at the first or final period. Let t be the set of time periods over which data are available on house price *levels*, P, across areas i:

$$t = \{t: t = 1, 2, 3, \ldots, \tau\}$$

where τ is the final period in the data. Price *inflation* for area $i \in I$ between the first and last time periods where $\tau > 1$, is calculated as:

$$Inflation_i = \%\Delta P_i = (P_{i,t=\tau} - P_{i,t=1})/P_{i,t=1}$$

Since the question of interest is whether price *change* is related to price *levels*, it makes sense to define a simple measure of the relationship, $Inflation_i = f(P_{i,t=1})$. The simplest and most obvious measure, labelled *IGM1* (Inequality Growth Measure 1) is the slope of the line connecting these two variables. So, assuming this line is approximately linear,

$$Inflation_i = \alpha + \beta P_{i,t=1},$$

and $IGM1 = \beta$. The research involved estimating *IGM1* for England and Wales using a variety of spatial units, time periods, and different definitions of housing. In each case, $Inflation_i$, the percentage change in house prices between the first and last period in each of the areas in the data, will be graphed in a scatter plot against $P_{i,t=1}$, the average price of housing in each of those areas in the first period. Ordinary Least Squares regression is then

used to estimate the line of best fit for this scatter plot of price *change* is against to price *levels*, as depicted in the hypothetical case of growing inequality in the figure below. *IGM1* is therefore estimated as follows:

*IGM1*hat = estimate of Inequality Growth Measure 1

= slope coefficient from regression of house price inflation on **first** period average house price levels.

Inequality Growth Measure 2: Slope coefficient on final period price levels

*IGM2*hat = estimate of Inequality Growth Measure 2

= slope coefficient from regression of house price inflation on **final** period average house price levels.

This measure is problematic. Suppose one calculates the average house price, P, for eleven areas in period 1 and then for period 2. Then calculate the rate of inflation = proportionate change in prices in each area. Suppose that all areas have had zero inflation except area *a*, the lowest priced area in period 1, which enjoys a 200% price rise (see table below).

Table A1 Hypothetical Example of Final Period Bias

Area	Pt=1	Pt=2	Inflation
a	£ 50,000	£ 150,000	200%
b	£ 60,000	£ 60,000	0%
c	£ 70,000	£ 70,000	0%
d	£ 80,000	£ 80,000	0%
e	£ 90,000	£ 90,000	0%
f	£ 100,000	£ 100,000	0%
g	£ 110,000	£ 110,000	0%
h	£ 120,000	£ 120,000	0%
i	£ 130,000	£ 130,000	0%
j	£ 140,000	£ 140,000	0%

Intuitively, one would understand inequality to have fallen overall because the lowest price area in the first period has become the most expensive by period two. Indeed, if one runs a scatter plot of inflation on Pt=1, one obtains a downward sloping line, indicating that *IGM1*hat < 0, which confirms the anticipated fall in inequality.

However, if one runs a scatter plot of inflation on Pt=1, one gets he opposite effect – an upward sloping line, indicating that *IGM1*hat > 0, which suggests, incorrectly, that inequality has been rising.

The problem is that the different levels of inflation across areas has changed the ordering of areas and those areas that have had the largest price increase, even if they started off as among the lowest priced areas (as in this example), will become ranked among the highest house price areas in the second period, provided that price increase has been large enough. It becomes tautological then to say that areas with the highest house prices in period 2 have had the highest rates of inflation because it is the higher rates of inflation that have made those areas have high house prices in period 2.

This does not mean that if *IGM2* suggests growing inequality then *IGM1* will show falling inequality. It simply means that *IGM2* will always overestimate any growth in inequality (or underestimate any fall in inequality). And the greater the variability in inflation relative to initial price levels, the greater the distortion caused by *IGM2*.

Simulating the bias associated with IGM2

To understand better the relationship between the bias caused by *IGM2,* Monte Carlo simulation methods were employed to estimate the relationship between *IGM2* and the variability of inflation.

The goal of the simulations is to estimate the relationship between the variability of inflation across areas (measured using the coefficient of variation = standard deviation of inflation/mean inflation) and the bias introduced by using final period (rather than initial period) price levels to gauge whether an area has high or low prices. If there were no bias introduced by final period categorisation, then a purely random distribution of house price inflation rates across areas (i.e. no systematic tendency for high or low house price areas to perform any better or worse) would result in a slope coefficient of zero when regressing price change against price levels.

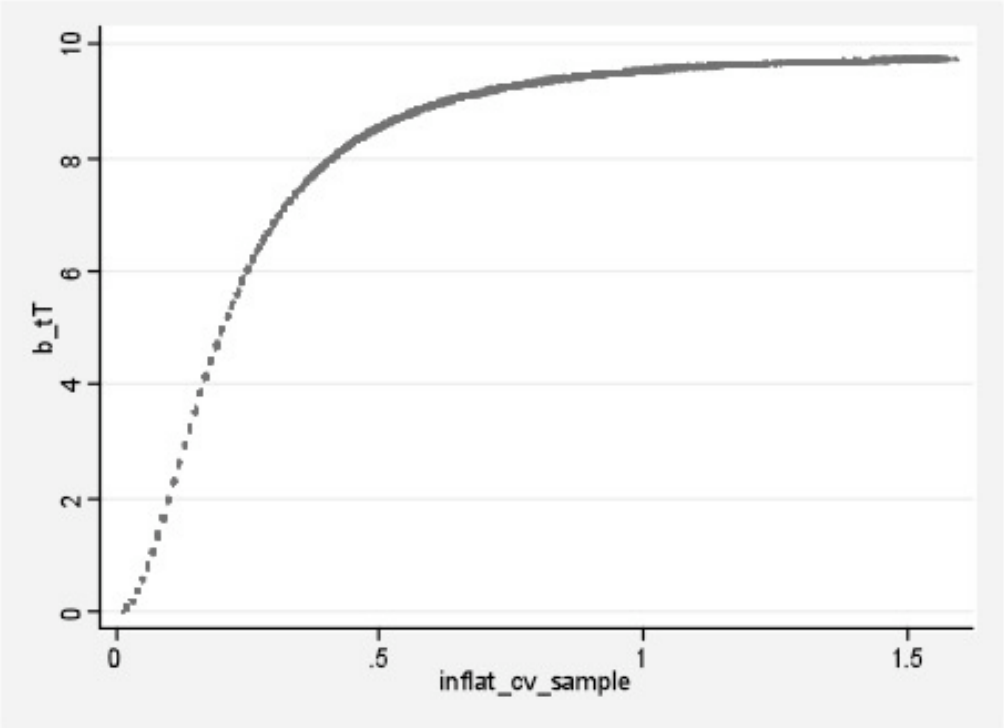
The SHWIM simulator, developed at the University of Glasgow, was used to run these simulations. SHWIM starts off with a normally distributed sample of 30,000 hypothetical average house prices (representing 30,000 areas) in

period $t = 1$. It then generates a random house price inflation value for each of these 30,000 areas over the period t=*1* to t=*T*, and calculates the new average house price in each area in period *t*=*T*. This inflation rate is random normally distributed with mean 1 and sd = 0.1.

It then uses this sample to run a regression of inflation against period T house prices. Of course, because the inflation variable has been created to be purely random, the slope coefficient should be zero, but will nevertheless vary from sample to sample due to sampling variation. To deal with the issue of random sampling variation (the spurious result that the slope coefficient comes out as being different to zero simply by chance) the whole procedure is repeated 100 times using the same random process.

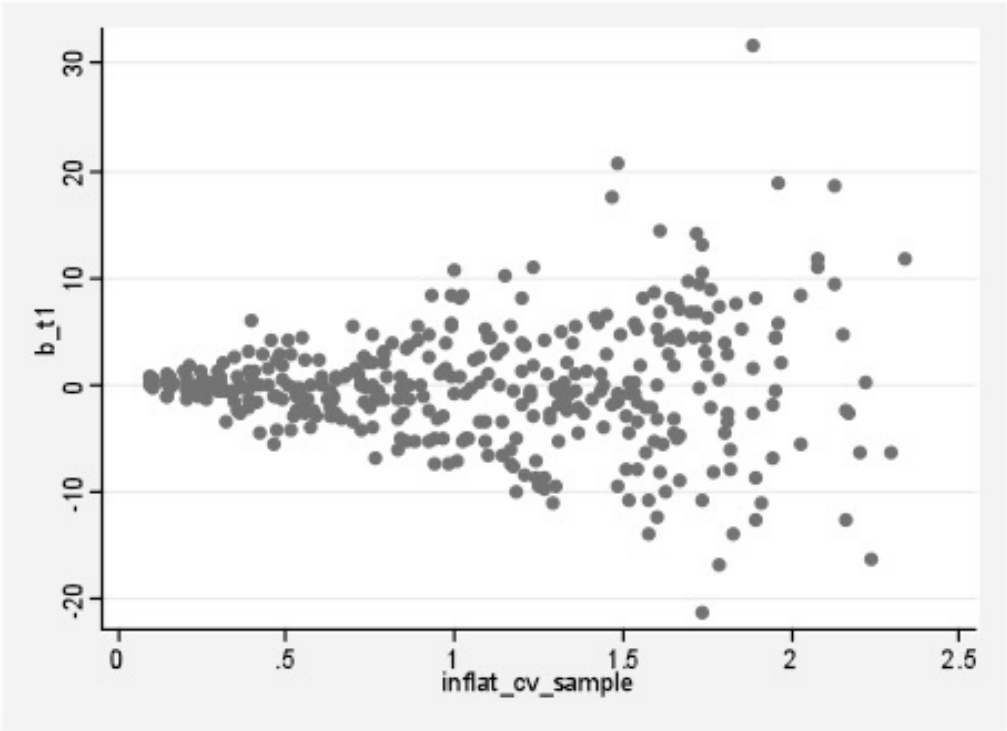
To see what happens if the mean and standard deviation of the random inflation variable change, both were incremented and the entire process repeated. Finally, the following scatter plot was obtained of the estimates of the slope coefficient (from the 100,000 regressions of inflation against final period prices) on the coefficient of variation in each sample. The graph clearly shows a systematic tendency for the slope coefficient to increase non-linearly with the coefficient of variation, rising steeply at first and then reaching a plateau.

Figure A1 Scatter Plot of Final Period Slope Coefficients on the Coefficient of Variation



If there were no bias implied in using final period price levels to categorise areas as low or high price localities, this scatter plot would have no particular trend – the observations would be scattered around $b = 0$. To confirm this, consider the scatter plot below of the slope coefficient obtained from the same simulated samples but using the initial period price levels to categorise areas. As one might expect, there is positive heteroscedasticity – increasing variation in the values of b – as the coefficient of variation increases, but the mean is approximately zero.

Figure A2 Scatter Plot of Initial Period Slope Coefficients on the Coefficient of Variation



The difference between b_tT and b_t1 gives us the bias. Since, in this experiment, the average of b_t1 equals zero, the bias associated with final period based inequality growth measures is simply equal to b_tT – 0 which equals b_tT.

Inequality Growth Measures 3 and 4

An alternative to using the slope coefficient from a regression of price *changes* on price *levels* to measure inequality growth, is to monitor how the differences in average prices between first and last deciles change over time. Again, however, it matters profoundly whether one measures price levels at the first or final period; that is at $t = 1$ or $t = \tau$. To demonstrate this, *IGM3* was calculated using the percentage change in decile differences using period 1 price levels. This was then compared to *IGM4* which is the same as *IGM3* but calculated using final period price levels.

IGM3 is ratio of average house price inflation in the tenth decile, D10, to the first decile, D1, where the deciles are not from the distribution of inflation, but from the distribution of house price *levels* in the first period:

$$IGM3 = (1/n_j)\,(\Sigma_j\ \%\Delta P_{j,t=1}\,) \,/\, (1/n_k)\,(\Sigma_k\ \%\Delta P_{k,t=1}),$$

= ratio of average inflation in areas in the tenth decile of house prices to average inflation in areas in the first decile, where deciles are derived from *initial* period prices.

j = $\{i: i \in D1(P_{t=1})\}$ = areas that belong in the tenth decile of house prices in period t=1

k = $\{i: i \in D10(P_{t=1})\}$ = areas that belong in the first decile of house prices in period t=1

n_j = number of areas in the tenth decile = N/10, where N is the total number of areas.

n_k = number of areas in the first decile = N/10, where N is the total number of areas.

IGM4 is the approach used by Thomas and Dorling (2004). It compares the average price change of D10 areas (those in the tenth decile of *P*it) with the average price change in D1 areas (those in the first decile of *P*it). The key difference between this measure and *IGM3* is that Thomas and Dorling calculate this decile ratio using *final* period house prices ($t = \tau$) rather than *initial* period house prices ($t = 1$):

$IGM4$ = $(1/n_j)\,(\Sigma_j\ \%\Delta P_{j,t=\tau}) \,/\, (1/n_k)\,(\Sigma_k\ \%\Delta P_{k,t=\tau})$,

= ratio of average inflation in areas in the tenth decile of house prices to average inflation in areas in the first decile, where deciles are derived from *final* period prices.

n = number of areas.

j = $\{i\colon i \in \Delta 1(P_{t=\tau})\}$ = areas that belong in the tenth decile of house prices in period $t=\tau$

k = $\{i\colon i \in D10(P_{t=\tau})\}$ = areas that belong in the first decile of house prices in period $t=\tau$

n_j = number of areas in the tenth decile = $N/10$, where N is the total number of areas.

n_k = number of areas in the first decile = $N/10$, where N is the total number of areas.

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ISBN: 978 1 8511 2955 3

ISBN 978-1851129553
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