

West Midlands Regional Housing Strategy HMA Refresh 2009

Technical report



The
University
Of
Sheffield.

The University of Sheffield



Town and Regional Planning

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1 Forward

- 1.1 The West Midlands Leaders Board is grateful to Peter Bibby of the University of Sheffield for his expert work and advice on the sub regional housing market areas in this Region. At the time of publication a brief word of explanation is relevant for those wishing to use this report and to understand how it relates to the emerging regional and sub regional governance arrangements for the West Midlands
- 1.2 In 2004 the Government asked its own Regional Housing Boards to identify sub regional housing market areas for policy purposes in developing Regional Spatial and Housing Strategy. On this basis future strategy was to be built up, and the development of partnership working was encouraged to support and deliver the policies that followed.
- 1.3 With the advent of new arrangements for new regional strategy development following the passing of the Local Government, Economic Development and Construction Act 2009, along with other commissions to refresh the evidence base, it was felt appropriate to revisit the original work by the University of Sheffield which lead to the identification of the sub regional housing market areas. These were published by the West Midlands Regional Assembly and Government Office for the West Midlands in the Regional Housing Strategy 2005. However, the Government's approach to Regional Strategy has moved on and so too must our approach to defining sub regions to operate successfully in a new era.
- 1.4 Given the need to adopt a set of sub regional arrangements that serve a wider purpose than that was formerly asked of the sub regional housing market areas, the West Midlands Leaders Board have set in place a sub regional grouping of local authorities. This report was commissioned prior to the changes to the sub regional arrangements which have now been put in place and which will form the basis of a wider range of policy development under the 'Strategy for the West Midlands'. The new set of sub regional arrangements reflect the changing political arrangements.
- 1.5 The WMLB acknowledges the need to meet the requirements of Planning Policy Statement 3, associated Government policy documents on Housing, and looks forward to continuing close working with the Homes and Communities Agency. All these can be expected to require studies, policy, interventions and monitoring across and between these new sub regional groupings to address the dynamics of the housing markets of the West Midlands.



Olwen Dutton
Chief Executive
West Midlands Leaders Board

2 Introduction

- 2.1 As part of the programme of research underlying the 2005 Regional Housing Strategy, the University of Sheffield undertook a body of work to support the identification of subregional Housing Market Areas (HMAs). On this basis, Government Office for the West Midlands, the former Housing Corporation and the Centre for Urban and Regional Studies at the University of Birmingham suggested the definition of four housing market areas which were subsequently adopted by the Regional Housing Partnership and Board. The present document reports on work commissioned from the University of Sheffield by the West Midlands Regional Housing Executive in 2009 which uses similar methods to update the previous analyses.
- 2.2 As with the earlier study, the current work has two principal elements. The first is concerned with the degree of stability and change in sub-regional housing market outcomes across the West Midlands Region, while the second profiles the current character of the HMAs and of variation within them.
- 2.3 It must be stressed that a broad range of data was used in the work underlying the 2005 HMA definitions, much being derived from the 2001 Census. Only data from the decennial Census can allow for adequate update of the interaction information (work travel and migration) deployed or the fine-grained socio-demographic information used. Only partial updating is therefore possible. The more recent work, is able to draw on updated price data for individual dwelling transactions in the owner-occupied sector to June 2009, detailed information about the location of new residential construction and information about new RSL stock.

Geographic Housing Markets: Same Good- Same Price?

- 2.4 The current work seeks to ascertain whether the subregional housing market geography underlying the 2005 Strategy remains valid. Its conclusion is that it remains substantially unchanged.
- 2.5 As the work described here has sought to review the evidence for the pattern of geographic housing markets within the Region, it is important that the rationale for their definition is understood. Although the current framework of government policy refers to geographically delimited housing markets, actually identifying such areas is a significant challenge both conceptually and in practical terms. There is no agreed method, although guidance on alternative approaches is provided by CLG (2007).
- 2.6 The work undertaken in support of the 2005 Strategy started from a very specific definition of housing markets. In economics, a market is traditionally thought of as a conceptual region in which free communication ensures that identical goods command identical prices (cf Cournot 1838). Identification of HMAs thus depended first of all on identifying areas across which similar properties have tended to exchange for similar prices. Following the application of this approach in the Region, it was recognised by central government and the West Midlands approach forms part of the advice provided by CLG (2007). More recently, the National Housing and Planning Advice Unit (NHPAU) have commissioned work to develop a sub-regional

housing market geography of England, which also embraces the broad conceptual principle, although implementation is not complete.

- 2.7 The present analyses share the conceptual starting point of the previous work. To make any approach of this sort operational, it is necessary to clarify the sense in which different dwellings may be considered identical (or at least similar). Housing is far from being a uniform good. Dwellings themselves may be differentiated by property type, bedroom size, plot area and a battery of further characteristics (such as those considered in so-called 'hedonic' price estimation). Data issues notwithstanding, it is clear that a portfolio of property representing all combinations of these characteristics cannot be found in each location.
- 2.8 The problem posed by the heterogenous nature of the housing stock becomes more complex when the varying characteristics of neighbourhoods are considered. In a sense, the price of a dwelling might be thought of as reflecting first a valuation of the dwelling itself and second a valuation of its immediate 'neighbourhood'. Indeed the earlier work attempted to estimate a '**neighbourhood price**' component of the sum paid for each property. This was calculated by examination of the statistical relationship between the total price paid and to social mix of the immediate neighbourhood (ie the Census Output Area). The present work estimates, neighbourhood price in two different ways. The first is to use unadjusted 2001 Census data, while the second estimates an 'aspirational' neighbourhood price taking account of change at neighbourhood level in the dwelling stock and tenure mix since 2001.
- 2.9 Given this pattern of heterogeneity, the identification of conceptual 'regions' (in Cournot's spirit) is challenging. Strictly, it might be argued that place-to-place variation in the mix of dwellings and of neighbourhoods means that identifying identical housing goods is impossible, and so the question of whether such goods have identical prices is irrelevant. One might, rather than asking whether particular dwellings are perfect substitutes for one another, ask whether they are partial substitutes. This might entail considering various aspects of a potential purchase (dwelling type, neighbourhood characteristic etc) and positing a *structure of relative prices* (such as a detached dwelling 'supplement') pertaining to that market. This is the approach taken here; the structures of relative prices being derived statistically.
- 2.10 If such consistency is allowed as evidence that properties fall within the same market, then it becomes possible to infer that prices realised in two transactions are products of the same market even if the respective properties and their immediate neighbourhoods are very different. The pertinent question is whether the structure of price relatives is the same. It is therefore possible for areas within the *same* geographic housing market to have very *different* property mixes. It would, of course, also be true that a geographic housing market so defined might embrace similar properties in neighbourhoods of similar character but widely separated geographically (suburban properties in Solihull and Sutton Coldfield for example) whatever the character of the intervening areas.
- 2.11 Examination of the prices paid for particular types of property therefore provides the key to identifying geographic housing markets. It is nevertheless possible that (say) similar properties in similar neighbourhoods in widely disparate localities (such as the

Black Country and South Wales) will command similar prices as a result of quite distinct price formation processes. It is suggested, therefore, that identification of geographic housing markets requires two tests. First, prices should be consistent with the same structure as discussed above. Second, there should be sufficient evidence of functional connection (demonstrated through interaction information– predominantly travel to work data).

Structure of the Report

- 2.12 Given that geographic housing markets are an idealisation of reality and that crisp boundaries should not necessarily be expected, the previous work sought to identify broadly consistent patterns of house-price formation on a range of bases. The variety of methods used in the present work is somewhat narrower (as approaches found to be unsatisfactory in the earlier work have been discarded). For the purposes of the ‘refresh’ exercise, house prices for two periods (2000-2004 and 2005-2009) have been analysed separately, with the specific intention of assessing whether either the nature of house price formation or the pattern of market outcomes has changed. Most of this report (Sections 2 and 3) is concerned with evidence for subregional house price formation effects.
- 2.13 **Section 2** forms the analytic core of the report. It reports a series of attempts to model house prices across the region at individual property level, in each case examining the residual (unexplained) variation. It attempts for the two periods to partition house prices into a series of components attributable to variation at the property, neighbourhood and subregional level. By using geographic averaging on the residuals at different scales, sub-regional house price formation effects are revealed. These analyses are supplemented by examination of travel to work data. **Section 3** compares the patterns of variability at the sub-regional scale evident in the two periods
- 2.14 The second principal element of the work reported here is concerned with the varying character of property and neighbourhoods *within* these four HMAs and the market valuation of ‘neighbourhoods’. The previous work examined variation at this scale by reference to **settlements** in the rural areas (defined consistently with the Rural Settlement Gazetteer produced for the former Housing Corporation and a set of **zones** within the urban areas, specifically created for that work). **Section 4** of the present report describes the methods used to allow partial updating of that work in the absence of additional Census data.

3 Variation in Housing Market Across the Region: Analysis of House Prices

- 3.1 The previous work sought to identify areas across which patterns of house price formation are such that *similar* dwellings in *similar* neighbourhoods command *similar* prices. It identified different ‘currents’ in house price formation: a tendency to consistency across the Region lending uniformity to a Central HMA, a distinct set of house-price relations evident in and around the North Staffordshire conurbation (the Northern HMA), and a third current leading to higher prices in much of the south east of the Region but stretching to the south of the conurbation and justifying the recognition of a Southern HMA. Finally, a geographically extensive western HMA was identified embracing distinct urban areas and a range of rural contexts showing a specific concern with second homes.
- 3.2 This section describes how the analyses undertaken in support of the 2005 Strategy were reworked firstly for the period for 2000-2004, and secondly for the period 2005-2009. The purpose of undertaking quite separate analyses for the two time periods was to ensure that any change in the configuration of geographic housing markets was exposed. In outline the method adopted was as follows:
- i) house price data relating to individual transactions across the Region were converted to a standardised form to remove the effect of inflation
 - ii) multiple regression (a statistical technique) was used to find equations that could be used to ‘forecast’ or ‘model’ individual house prices a) for the period 2000-2004 and b) for the period 2005-2009 on the basis of property type and neighbourhood characteristics
 - iii) for each time period, the differences between each actual transaction price and the corresponding modelled prices (from step ii) were calculated, and these ‘residuals’ assigned to a hectare grid covering the Region on the basis of the full postcode of the transferred property
 - iv) for each time period, geographic running means were used to express the average residual within 10kms of each cell of the grid. These were then adjusted for dwelling plot size to generate a grid showing the subregional component of house price as a sum per hectare.
 - v) the grids showing the subregional component of house price for the two time periods were compared and the implications of these comparisons assessed.
- 3.3 Paragraphs 2.4 to 2.25 describe these procedures in more detail. Figure 2.3 shows the subregional price grids for the two sub-periods and these are compared in para 2.27 to 2.29.

Price Decomposition 2000-2004

- 3.4 Assessment of similarity of the housing offer must have regard to the characteristics of a property itself, of its neighbourhood and of broader market conditions, and it is assumed that all of these will be reflected in price. To assess the geographic scale effect it is necessary to have access to individual transaction data. Data from Her Majesty's Land Registry (HMLR) were used referring to 523,521 individual transactions in the Region recorded over the period 2000-2004. These data include property type (but not bedroom size), price and full unit postcode eg B74 4RJ. This time period overlaps substantially with that on which the earlier work was based, but extends those analyses for a further year.
- 3.5 Obviously, house prices vary over time, and the period between 2000 and 2008 was characterised by steeply rising house prices. This effect must be removed before the analysis can begin. This was done by expressing the price recorded for any transaction relative to the mean and standard deviation of all prices recorded across the Region in the same quarter (eg 2005 QII). Each price is thus expressed as a standard score. Subsequent steps in the analysis use the standard scores. Standard scores can be converted back to 'quasiprices' by scaling by the mean and standard deviation for any particular quarter (eg 2009 QII).
- 3.6 Analytically, the first task is to estimate the neighbourhood component of price. This has been achieved by using a statistical procedure (multiple regression) to attempt to 'forecast' or 'model' individual house prices. The procedure is used to find a formula (equation) which expresses the arithmetic relationship between the price of an individual house, dwelling type and a bundle of indicators of the demographic and social character of the neighbourhood in which it lies. The majority of these indicators (such as the proportion of 'heads of household' working in professional occupations) are drawn from the 2001 Population Census results at the Output Area (OA) scale and are listed in Appendix 2. (Output Areas are the smallest units for which 2001 Census Data are released and typically include about 150 households). The remainder are at a variety of scales and are also summarised in Appendix 2.
- 3.7 The role of the Census variables is to try to capture those aspects of the general socio-demographic character of a neighbourhood that affect the sum that potential purchasers would be willing to bid for a property within it. Many different combinations of Census variables might capture the essential 'character' of a neighbourhood almost equally well. The statistical procedure used to find an appropriate formula is called 'stepwise regression.' It has been used to find the combination of the variables listed in Appendix 2 with the strongest statistical relationship to dwelling price. Having found a formula which shows the strongest statistical relationships to price, other slightly different combinations of variables have been used to provide variant 'forecasts' of price and to check the robustness of results.
- 3.8 The following paragraphs list the census variables that were found to have the strongest relation to prices over the period 2000-2004. More detailed information about the statistical relationships is provided in Appendix 3.

3.9 The neighbourhood-level social and demographic indicators which were found in the ‘refresh’ work to have the strongest relation to property price include measures of occupational composition, and the mix of values of property in the rather broader environs of the ward (as indicated by the mix of Council Tax bands). The key variables drawn out were:

- the percentage of properties in the ward in Council Tax band G,
- the percentage of the economically active in routine occupations,
- the percentage of the economically active who are self-employed,
- the percentage of the economically active who are small employers,
- the percentage of the economically active in professional occupations,
- the percentage of dwellings in the ward in Council Tax band A,
- the percentage of households in owner occupation with a mortgage and
- the percentage of the economically active in managerial occupations.

3.10 These overlap to a considerable extent with the group of neighbourhood attributes found to have the closest relationship to property prices in the earlier work:

- the percentage of the economically active in managerial occupations,
- the percentage of properties in the ward in Council Tax band G,
- the percentage of the economically active in professional occupations,
- the average number of rooms per household,
- the percentage of persons aged 30-44,
- the percentage of dwellings in the ward in Council Tax band A,
- the percentage of households living in undivided detached properties and
- the percentage of the economically active who are self-employed.

3.11 Although there are some differences in detail, the two statistical analyses tend to highlight the same general influences. (These are the overall occupational mix of residents in an area and an aspect of demographic structure captured either by the proportions in the younger years of middle age or the proportion of households in owner occupation with outstanding mortgages).

3.12 The earlier work in support of the 2005 Strategy included variables showing the mix of properties by Council Tax band at ward level within the formula for estimating house prices at Output Area level. In undertaking the ‘refresh’ work there was a particular concern to ensure that such ward-level measures did not obscure effects at the neighbourhood (ie Output Area) scale. For this reason, the ‘refresh’ work included running a further series of regressions with the ward-level Council Tax variables excluded. (The formula eventually chosen for the house-price forecasts did not include any ward level variables). Having done this the variables with the strongest relationship to house prices were found to be:

- the percentage of the economically active in managerial occupations,
- the percentage of the economically active in professional occupations,
- the percentage of the economically active who are self-employed,
- the percentage of households in owner occupation with a mortgage,
- the average number of cars per household,
- the percentage of households living in undivided detached properties,
- the percentage of the economically active who are small employers,
- the percentage of the economically active in higher professional occupations, and
- the percentage of the economically active in routine occupations.

- 3.13 On the basis of the formulae derived from the regressions it is possible to estimate what is termed here a ‘neighbourhood price’. This represents the modelled price of a terraced house in any output area, taking into account social composition of the neighbourhood but without taking specific account of its location within the Region. The principal neighbourhood variables used in estimation are those listed in para 2.12. This measure of neighbourhood price is simply a measure of neighbourhood status expressed in money terms. The estimates of neighbourhood price for 2000-2004 produced on this basis (and expressed in 2009 prices) are illustrated in Figure 2.1a. (Corresponding estimates for 2005-2009 are shown in Figure 2.1b).
- 3.14 Figure 2.1 highlights the social contrast between the urban and rural domains. Figure 2.2 showing part of the Central HMA in more detail draws attention to distinctions within urban areas (very obviously between Sutton Coldfield and adjoining areas of Birmingham, within Wolverhampton and Coventry, but also within smaller towns such as Tamworth).

Price Decomposition 2005-2009

- 3.15 A similar series of steps was followed to estimate price components for 385,203 individual transactions over the period 2005-2009. Use of regression to estimate transaction price and neighbourhood price highlighted the role of a set of socio-demographic indicators substantially overlapping those identified in the original work and in the refresh work on the period 2000-2004. The social and demographic characteristics of neighbourhood found to have the strongest relation to house prices in the Region during the period 2005-2009 were:
- the percentage of properties in the ward in Council Tax band G,
 - the percentage of the economically active in routine occupations,
 - the percentage of the economically active who are self-employed,
 - the percentage of the economically active in professional occupations,
 - the percentage of persons aged 30-44,
 - the average number of rooms per household,
 - the percentage of households with their lowest level on street level,
 - the percentage of households living in undivided detached properties, and
 - the percentage of the economically active in managerial occupations.
- 3.16 This exercise thus confirmed the general stability of the relations between relative prices at neighbourhood level and particular socio-demographic indicators of neighbourhood character. The statistical relationships identified in the ‘refresh’ between property prices and neighbourhood attributes for the 2005-2009 period were in fact slightly closer to those found in the original work than those holding in the period 2000-2004. The key variables in all cases are aspects of occupational mix, an aspect of age structure/ mortgage debt and the value mix of property in the broader environment of the ward. Moreover, for all three time periods, substantially the same statistical relationships hold between property prices and neighbourhood characteristics when the (ward-level) Council Tax band variables are dropped.

Figure 2.1: Neighbourhood Price

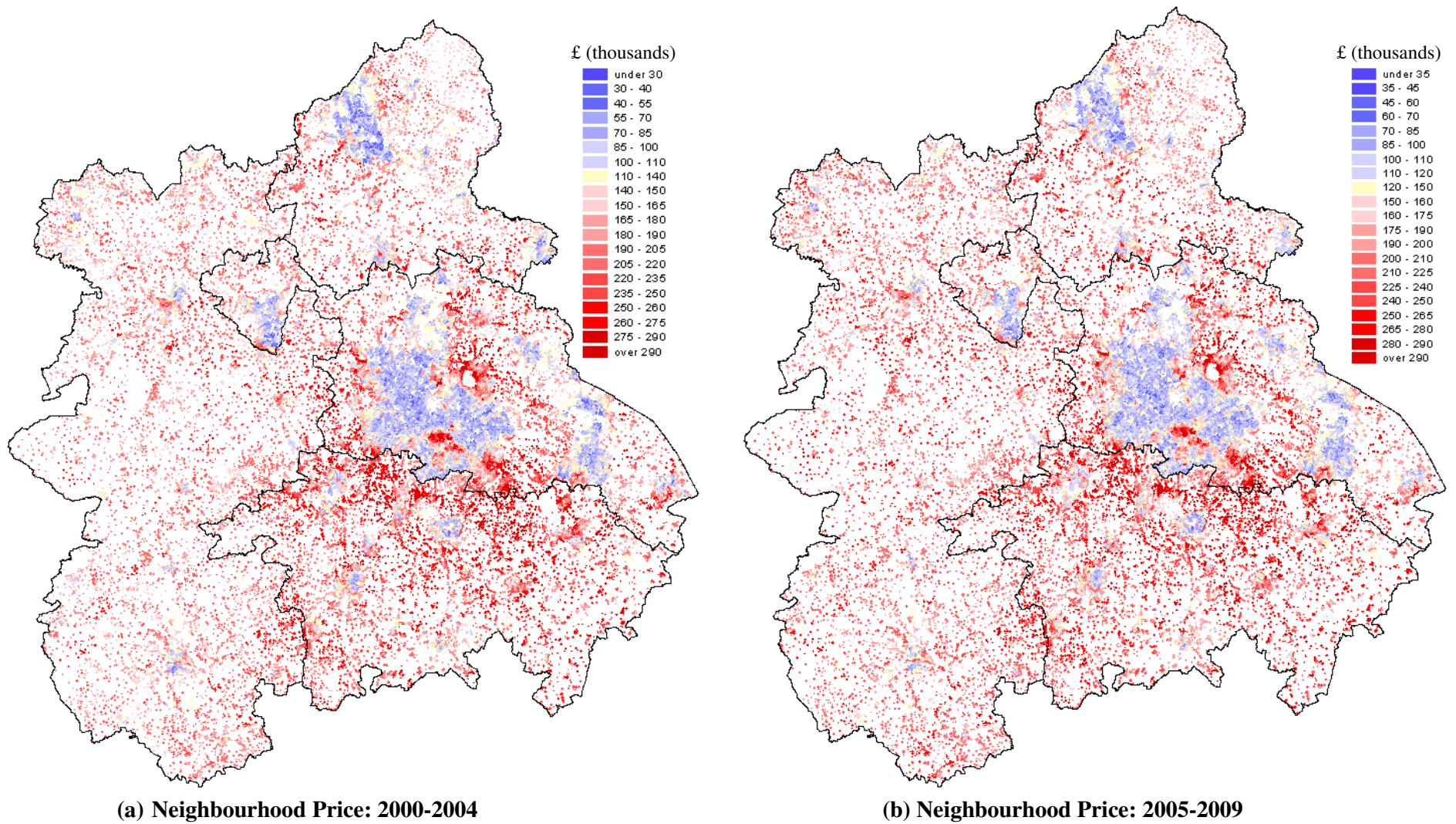
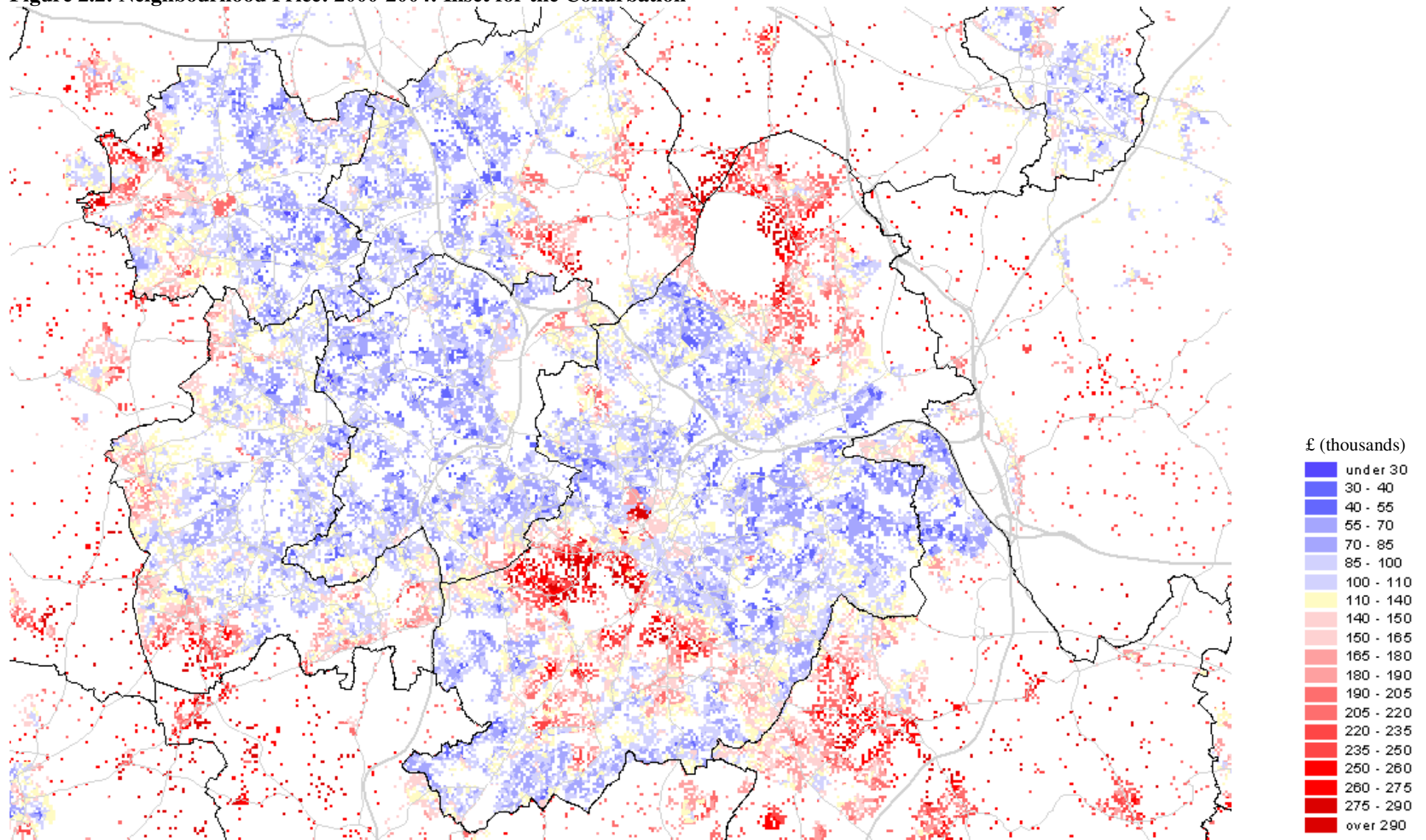


Figure 2.2: Neighbourhood Price: 2000-2004: Inset for the Conurbation



Estimating Aspirational Neighbourhood Price

- 3.17 Obviously the social and demographic character of particular neighbourhoods will have changed since 2001. Change in the social composition of neighbourhoods is usually very gradual. Nevertheless, substantial change will occur in some circumstances and this may be of particular concern especially when it is prompted by local policy initiatives. For this reason, as part of the ‘refresh’ work, an attempt has been made to track changes in dwelling stock at Output Area level and associated changes in tenure mix. On the basis of these changes, new ‘guesstimates’ of social composition were also made. The manner in which these local changes were estimated is discussed in detail in Section 4, while the individual HMA reports comment on areas of major change.
- 3.18 For the period 2005-2009, a further series of regressions were estimated, attempting to identify the statistical relationships between house prices and the *modified* neighbourhood socio-economic measures referred to in para 2.17. Although the use of these modified measures produces slightly different equations for estimating house prices, it does not alter understanding of the overall relationship between house prices and neighbourhood characteristics in any substantive way. Using the modified social measures, the indicators found to have the greatest influence on house price at Output Area level were:
- the percentage of properties in the ward in Council Tax band G,
 - the percentage of the economically active in routine occupations,
 - the percentage of the economically active who are self-employed,
 - the percentage of the economically active in professional occupations,
 - the average number of rooms per household,
 - the percentage of households in owner occupation with a mortgage and
 - the percentage of households living in undivided properties.
- 3.19 A further series of regressions was also run using the adjusted measures, but omitting the variables which capture the value mix of property at ward level. On this basis the indicators found to have the greatest influence on house price at Output Area level were:
- the percentage of the economically active who are self-employed,
 - the percentage of the adults with highest level qualifications at level 4 or 5,
 - the percentage of persons aged 25-29,
 - the percentage of the economically active who are small employers,
 - the percentage of the economically active in managerial occupations,
 - the percentage of households in owner occupation with a mortgage,
 - the average number of rooms per household,
 - the percentage of households living in undivided detached properties,
 - the percentage of households with 3 cars,
 - the percentage of households living in undivided properties and
 - the percentage of households with no cars.
- 3.20 Because of the uncertainty associated with the adjusted socio-demographic measures, the regression equations based upon them played no further part in reviewing the definition of HMAs. Instead they were used to provide an alternative estimate of neighbourhood price termed here the ‘aspirational’ neighbourhood price. The

difference between the measure of neighbourhood price based on actual 2001 Census data and that based on the adjusted measures is intended to gauge in a tentative way the scale of change in house prices that might be expected as a result of neighbourhood change. Marked changes in particular neighbourhoods are discussed in the four subregional reports.

Estimates of Subregional Price 2000-2004 and 2005-2009

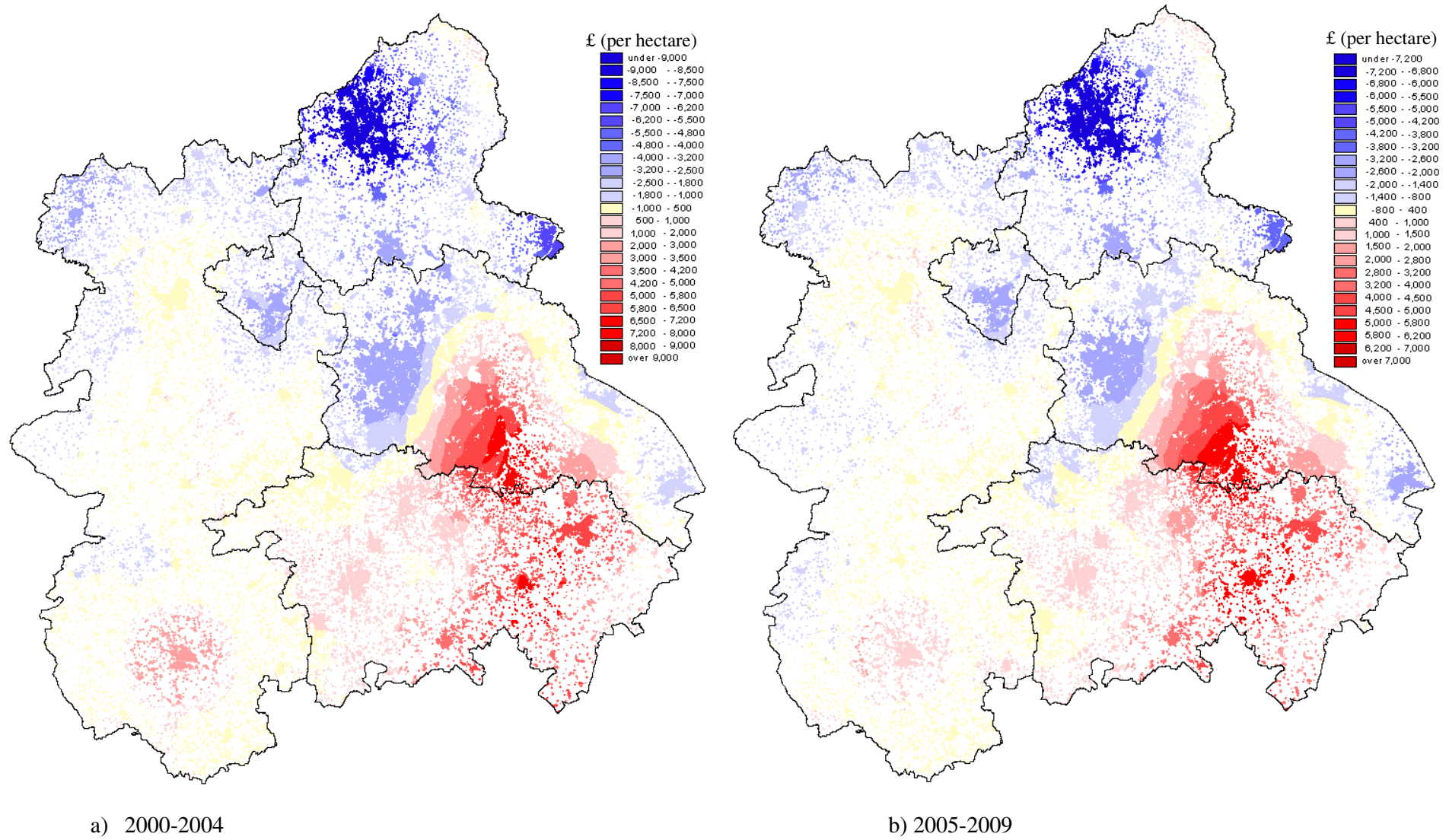
- 3.21 While the preceding paragraphs have been concerned with the nature and stability of the relationship between house prices and social characteristics at the neighbourhood scale, the ultimate aim of these analyses is to expose relationships at the subregional level. To understand the subregional component of price (and hence consider the appropriateness of HMAs) involves examining the gap between the modelled prices estimated using multiple regression and the actual prices at which properties were exchanged. The difference between actual price at which any property changed hands and the modelled price based on property type and neighbourhood characteristics is termed a 'residual.' The residual may be positive if the actual price is higher than the modelled value or negative where the modelled value is lower than the actual price.
- 3.22 The residual for each individual transaction may be thought of as having two components. The first component reflects the difference between the particular property being traded and other properties of the same type in the *same* neighbourhood. The second component represents variation at a much broader scale. It is this latter component, capturing for example the difference in price of identical properties in similar neighbourhoods within, say, Stoke on Trent and Stratford upon Avon which is of concern in evaluating HMAs.
- 3.23 The method used to expose patterns of variation of house-prices at the subregional scale involves averaging the values of residuals within a given distance of any point. This is achieved by first placing a hectare grid over the Region, and assigning the residual associated with each transaction to a cell of the grid (on the basis of the full postcode of the property). A second grid is then created where the value in any cell represents the average residual value within 10kms of that cell. This measure is described as the '10km geographic moving average residual' or '10km geographic running mean residual' around any point. When this averaging is done, patterns of positive and negative residuals associated with property to property differences in particular neighbourhoods are smoothed away, but patterns of variability at broader scales remain. Separate grids of residuals and of moving average residuals were constructed for the periods 2000-2004 and 2005-2009.
- 3.24 One further effect has been accounted for at this stage of the analysis. Neither the property transaction data available from HMLR or Census material allow estimation of the absolute size of properties in a particular neighbourhood or of the plots on which they stand. The calculated pattern of geographic moving average residuals will be influenced by the presence of exceptionally large detached properties in very low-density suburbs or in rural areas. (Unless this is corrected for one might infer that land values in a particular area were very high, and that provision of smaller affordable units would be impossible although in fact it would merely reflect the particular character of existing property).

- 3.25 To offset this effect, the residual values have been adjusted to a value per hectare based on the typical plot size in the Output Area in which the property lies. The estimates of plot size have been based on the Generalised Land Use Database (GLUD) developed by Ordnance Survey for CLG. Estimates of the aggregate residential building footprint and aggregate residential garden size are published at Output Area level. Combining these measures and knowing the number of ground floor properties within an Output Area allows its average residential plot size to be estimated. Dividing the geographic moving average residual by the corresponding moving average plot size allows a residual value per hectare to be estimated. This forms the key to estimating variation in price at the sub-regional scale.

Results: Variation in the Subregional Component of House Price

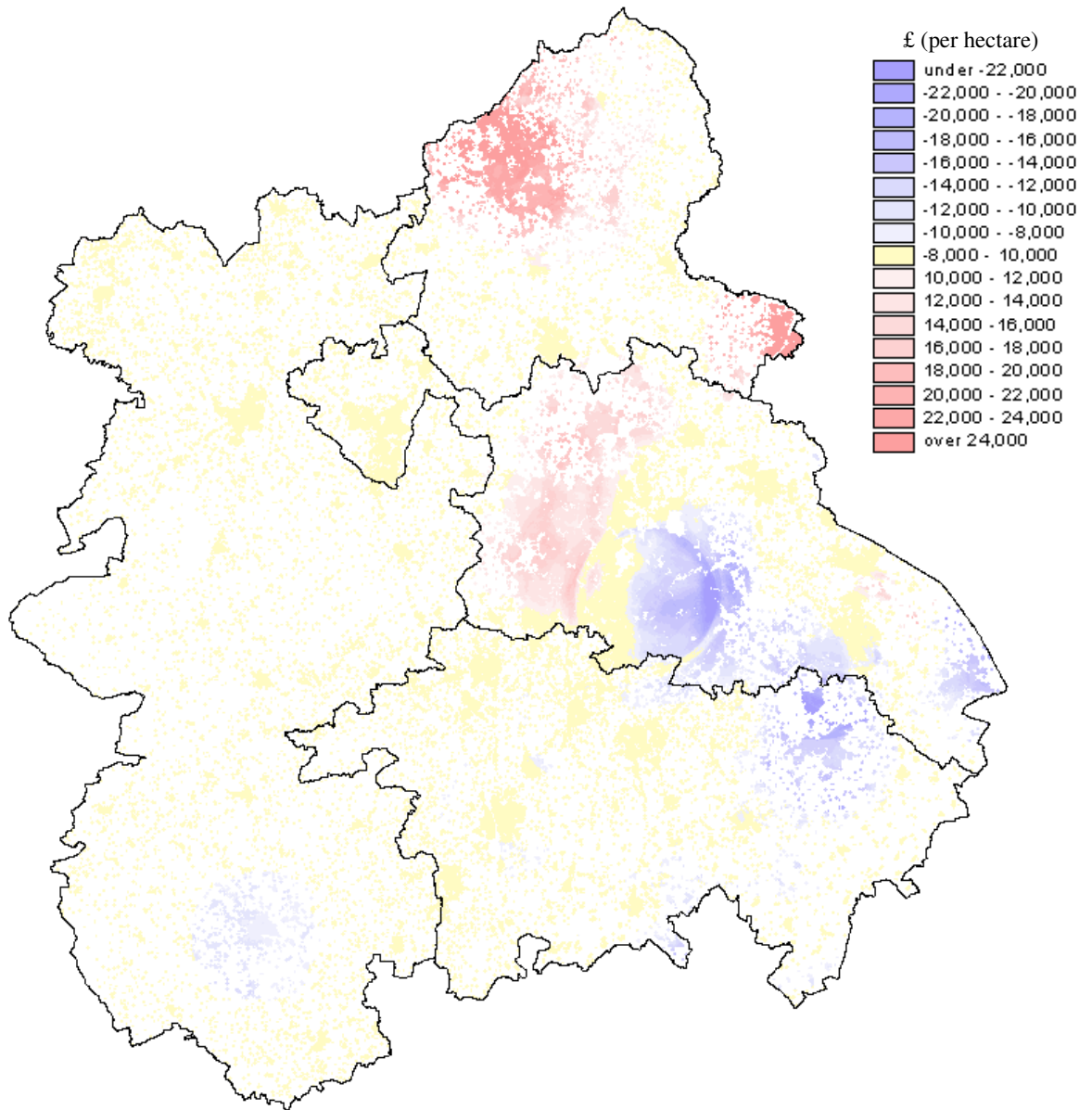
- 3.26 Figures 2.3a and 2.3b illustrate the variation in the subregional component of price for the periods 2000-2004 and 2005-2009 respectively. Each Figure is based on the area-adjusted smoothed residuals (see paras 2.21-2.23) for a particular regression equation. The regression models used make no use of (ward-level) Council Tax band data. They show variation at the 10km scale. That is to say that the value shown at any point on the map captures average conditions in a within a radius of 10km around that point.
- 3.27 The overwhelming tendency to stability in the subregional component of price through the decade is immediately evident. Without the masking effect of local authority boundaries, the underlying pattern of variation is very clear. The tendency for properties in the North Staffordshire conurbation to command lower prices than identical properties in identical neighbourhoods elsewhere in the Region becomes immediately obvious. Burton-on-Trent with nearby Rolleston, together with Tutbury and Hatton also show consistently lower price outcomes throughout the decade.
- 3.28 Equally clear is the continuing tendency for properties in the South East of the Region to secure higher prices than comparable properties in comparable neighbourhoods elsewhere. This holds in South Warwickshire from its boundaries with Oxfordshire and Gloucestershire through Stratford and Warwick and Leamington to Kenilworth. This southern 'current' in house price formation weakens so that it impinges only modestly on Coventry, although extending to Solihull, South East Birmingham and northwards through the Meriden Gap. Similar outcomes are found along Worcestershire's border with Gloucestershire, and extend to Evesham and Pershore, though weakening on the margins of Redditch.
- 3.29 Throughout the decade the pattern of variation across the Western half of the Region has remained stable. House prices have been consistently higher in Hereford and its environs, and consistently lower in the immediate vicinity of Oswestry.

Figure 2.3 Subregional Component of Price



- 3.30 There is little evidence of substantial change in subregional price relatives over the decade. The pattern of change is highlighted in Figure 2.4, but it is important to stress how modest these changes are. Overall in *relative* terms, the price gap between areas has narrowed slightly. In other words if the price of a house in the most expensive locality (Leamington) is expressed as a percentage of the regional mean, that percentage has fallen since 2000. If the price of a house in the cheapest locality (within the North Staffordshire conurbation) is expressed as a percentage of the regional mean, that percentage has increased. There has been a slight tendency towards a reduction in the difference between subregional price in the Black Country on the one hand and Birmingham-Solihull on the other. It is important that this apparent tendency to convergence is not over-stressed, however, as these relative differences are inconsequential when considered alongside the overall movement of house prices relative to income over the decade.
- 3.31 There seems to be very little evidence to suggest that the relative position of particular towns shifting over the decade. A few minor changes perhaps merit comment. The subregional price in Rugby was rather lower than that typical of the Region as a whole in the early part of the decade, and fell a little in the later part of the decade. This runs counter to the general tendency to convergence. There are a few towns characterised by relatively low subregional price at the beginning of the decade, which (while remaining below the regional average) increased more rapidly than elsewhere. Burton-on Trent is the clearest example. Subregional price in North Staffordshire (particularly away from the conurbation core) also increased slightly.

Figure 2.4 Change in Subregional Price 2000-2004 to 2005-2009



4 From Currents in House Price Formation to Reviewing HMA Definitions

- 4.1 The approaches to identifying subregional currents in house price formation discussed above involve generating expected patterns of house prices and examining geographic patterns in differences between these expectations and observed patterns. As mentioned in the introduction, it is of course possible that dwellings that are similar (having regard inter alia to neighbourhood characteristics) may command similar prices purely fortuitously. Thus, similar dwellings in two small towns in distant regions may have similar prices even though these prices are formed quite independently. For this reason it is desirable to bring interaction into the analysis explicitly.
- 4.2 In the work undertaken in support of the 2005 Strategy, considerable attention was devoted to examining the relation between house price outcomes and interaction patterns. In designing the approach to the refresh work, it was considered most appropriate to examine changes in patterns of price outcomes, and then generate hypotheses about the possible changes in work travel implied. The logic of this approach involves then testing these hypotheses against the rather patchy evidence from the WMRO Regional Lifestyle survey and other sources
- 4.3 In the absence of new Census information, the evidence of changed patterns of interaction is sparse. It is clear from Section 2, however, that there is nothing in the evidence of house price outcomes that is consistent with significant shifts. There was concern, for example, that increased commuting between the South East Region and southern parts of the West Midlands Region would alter house price outcomes. In fact, as shown above, it does not appear that relative differences between the Southern HMA and the rest of the Region have increased. Moreover, once overall house price inflation is accounted for, there is no evidence that the area of relatively high prices in the South of the Region has expanded.
- 4.4 Superficially, the evidence of Section 2 suggests very weak convergence of house price relatives. This would be entirely consistent with lengthening commuting in all directions (a phenomenon evident when commuting data from successive decennial censuses are examined). It seems important that this is not over-emphasised. It seems safer to say that there is no evidence that directionally-biased shifts in commuting balances have shifted the Region's housing market geography.
- 4.5 Overall, therefore, the evidence of the 'refresh' exercise points to the continuity of the Region's housing market outcomes. Work undertaken in support of the 2005 Strategy, however, stressed the need for care in moving from the evidence of price outcomes to posit geographic housing markets, or to recommending Housing Market Area definitions.
- 4.6 In the case of North Staffordshire, the earlier work noted a simple parallel between the evidence of the travel patterns and the evidence of house prices in this area. The North Staffordshire conurbation still approximates the archetypal geographic housing market and remains the basis for defining an HMA. The earlier work noted that while price outcomes in the North Staffordshire conurbation and Burton on Trent were similar they were not responding to similar patterns of interaction. There is no reason to believe that this lack of functional interaction has changed. Indeed the fact that

price relatives have increased around Burton more than around Stoke emphasises the distinction between these sub-areas.

- 4.7 The earlier study was more circumspect in suggesting limits on the dominant market relations typical of the conurbation and its hinterland. It noted that patterns of communication implied by the work travel evidence extend deeply into Warwick, Stratford and Wychavon districts. It remains the case that although the extent of work travel flows to the conurbation implies close communication, dwellings of a particular type and in neighbourhoods of a particular character in these latter districts command prices higher than those typical of the Region as a whole. It was noted previously that these outcomes should be understood in part in relation to the openness of these areas not only to the conurbation but also to the South East. There seems to be no evidence in the house price outcomes analysed of any substantive shift in the configuration of these higher priced areas. Any shift in the pattern of inter or intra-regional flows of the decade has not shifted the pattern of house price differentiation. Put somewhat differently, there is nothing in the house price evidence to suggest any substantial shift in interaction patterns.
- 4.8 The difficulties of separating the South East of the Region from the conurbation discussed in the previous work thus remain. There remains a justification for the identification of a geographic housing market (and by extension an HMA) to the south of the conurbation despite the absence of a clear separation of work travel clusters (in contrast to the North Staffordshire case).
- 4.9 The work undertaken in support of the 2005 Strategy drew attention to the difficulty of assessing the appropriateness of treating Telford as a distinct geographic housing market, and the nature of its linkages. The previous work found that dwellings consistently appear to command lower prices than might be expected than if substitutable on the regional market. This conclusion is reinforced by the present work, which shows the same pattern of price relatives persisting throughout the decade. The subregional component of price in Telford is a little lower than in Shrewsbury (which is very close to the regional average) and a little higher than in Wolverhampton. There has been no substantive change over the decade, with less convergence towards Regional levels than in Wolverhampton.
- 4.10 The previous work concluded that there was only a very weak case for identifying Telford as an HMA. It pointed to a misalliance between the (simple) evidence of market outcomes, and of the (complex) patterns of behaviour that underlie them. Travel to work patterns in the 2001 Census were such that the place of Telford OAs in classifications is unstable. Some clustering solutions identified a Telford-Shrewsbury cluster. Other work travel clustering solutions placed Telford with the conurbation. This arose from the high level of flows in to Telford (largely from Shrewsbury) and the high level of flows out (largely to the conurbation). Until the next Census there will not be any data adequate to comment on shifts in these complex patterns. If Telford were to be identified as a geographic housing market this would be based on *consistent* valuation of the housing bundle in the locality *despite open-ness and complex linkage*.
- 4.11 The move from geographic housing markets at the analytic level to HMAs at the level of policy action entails shifting from consideration of market processes to policy and

administrative processes. In practice the most appropriate alignment of Telford for the purposes of policy action would appear to be best considered in the context of working relationships than upon an idealisation (geographic housing markets) which in this instance does not fit 'reality' well.

5 Variation within Housing Market Areas: Assessing Neighbourhood Change

- 5.1 While social status of particular areas tends to change only slowly, there must inevitably be concern that estimates of neighbourhood price based on 2001 Census characteristics will be inappropriate in particular local circumstances. For this reason, an attempt was made to update social characteristics on a partial basis.
- 5.2 In outline, the approach adopted involved firstly considering physical changes: the net change in properties at neighbourhood level in the period since the Census and numbers of new units constructed. Having assembled information about physical change, (taking account of the tenure of new property where possible), an attempt was made to consider associated shifts in social composition.
- 5.3 Variant estimates of neighbourhood price were employed in Section 2 of this report – the first based on Census characteristics at 2001 and the second allowing for estimated shifts in social composition. It was pointed out in para 2.20 that the effect of incorporating these changes does not disturb the *overall* relationship between price and social composition to any substantive degree. This does not mean that the effects in question are not important at a small area level. This section therefore sets out the method used for assessing these changes and provides a brief overview of neighbourhood change, while the HMA reports discuss small area change in more detail.
- 5.4 Changes in numbers of units were assessed by reference to the Postcode Address File (PAF) and the Land Use Change Statistics (LUCS). PAF provides a 100m grid reference for each unit (full) postcode and indicates the number of residential properties. It is thus possible to estimate the number of dwellings on a hectare of land at a particular time. Comparison of PAF for the second quarter of 2001 (the time of the Census) and the last quarter of 2008 indicates the *net* change in dwellings over the period. This will reflect new building, property subdivision, and conversion to residential use, but also ‘losses’ through demolition, property amalgamation and so on. The pattern of net change across the Region is illustrated in Figure 4.1.
- 5.5 LUCS is produced by Ordnance Survey for CLG. It is produced as a by-product of basic scale map revision (at 1:1250 scale across most of the Region) and provides estimates of the number of new dwellings built at the land parcel level. The detailed geography of new building between 2000 and 2006 is shown in Figure 4.2. (Because of the lag incurred before physical change is recorded, no attempt has been made to assess change after 2006).
- 5.6 On the basis of PAF and LUCS together it is possible to disentangle various types of change at neighbourhood level. The types of changes inferred include neighbourhoods (eg at the urban fringe) where the stock of dwellings is growing; neighbourhoods where the net change in dwellings is far less than the number of units built - indicating redevelopment; and areas where there is a net loss of dwellings without new construction – pointing (depending upon scale) either to amalgamation of properties or demolition (but without new building by the cut off date).
- 5.7 Most new properties (identified by LUCS) are built for owner-occupation, though some, particularly in urban cores, have been built as buy-to-let (taking advantage of new financial facilities) and others by registered social landlords (RSLs). There is no

direct way of gauging the extent of buy-to-let units. It is, however, possible to use the CORE database to identify lets arising from new RSL construction, and hence produce a detailed geography of RSL construction. (The geographic distribution of RSL new-build over the period 2001-2009 is illustrated in Figure 4.3).

- 5.8 To move from this awareness of physical change and of the distribution of new RSL property to an assessment of shifting social mix is difficult, and has been estimated using the protocols discussed below.
- 5.9 Where new dwellings have been built and they are not known to be RSL properties, they are assumed to have been built for owner occupation. The social and demographic profile of the occupiers has been assumed to reflect the Census characteristics of the occupiers of Output Areas where (on the basis of LUCS) property appears to have been predominantly newly built in 2000 or 2001.
- 5.10 Where properties have been lost, the social composition of the households remaining has been assumed to reflect the overall composition of the Output Area at the time of the 2001 Census. (This approach was adopted as more complex methods proved unsatisfactory).
- 5.11 Where RSL's have built new property, many social characteristics of the tenants to whom those properties have been let are explicitly recorded within CORE. It is thus possible to estimate average household size, for example, or age profiles directly on the basis of CORE data. Nevertheless, the range of social characteristics of individual tenants recorded by the Census is much broader than of those which may be directly assessed using CORE. For this reason, multiple regression has been used to estimate further social characteristics at neighbourhood (OA) level on the basis of the relationship at OA level between characteristics which can be imputed directly from CORE and other key indicators available from the Census.
- 5.12 Having assessed the 'typical' social profile of these groups, the final step was to generate an updated social and demographic profile for every Output Area. This was estimated as a weighted combination of the profile of the OA in 2001; the assumed characteristics of the new owner-occupiers; and the assumed characteristics of new RSL tenants.
- 5.13 There are clearly some critical assumptions involved in these estimates. The first is that the characteristics of tenants of surviving social housing in any OA reflect the overall composition of households living in social housing within that OA in 2001. The second critical assumption is that the mix of characteristics new owner-occupiers is homogenous across the Region. The first critical assumption is problematic in that the occupiers of particular types of social housing (eg tower blocks) may well not reflect the characteristics of other social housing tenants in the same OA. The second critical assumption will cause difficulties if owner-occupiers within redeveloped areas (such as former social housing estates) have quite a different social mix to new owner-occupiers elsewhere. Taken together it seems likely that the effect of these two assumptions may be to *overestimate* changes in social composition in particular areas.

Figure 4.1: Net Change in Dwellings 2001-2008

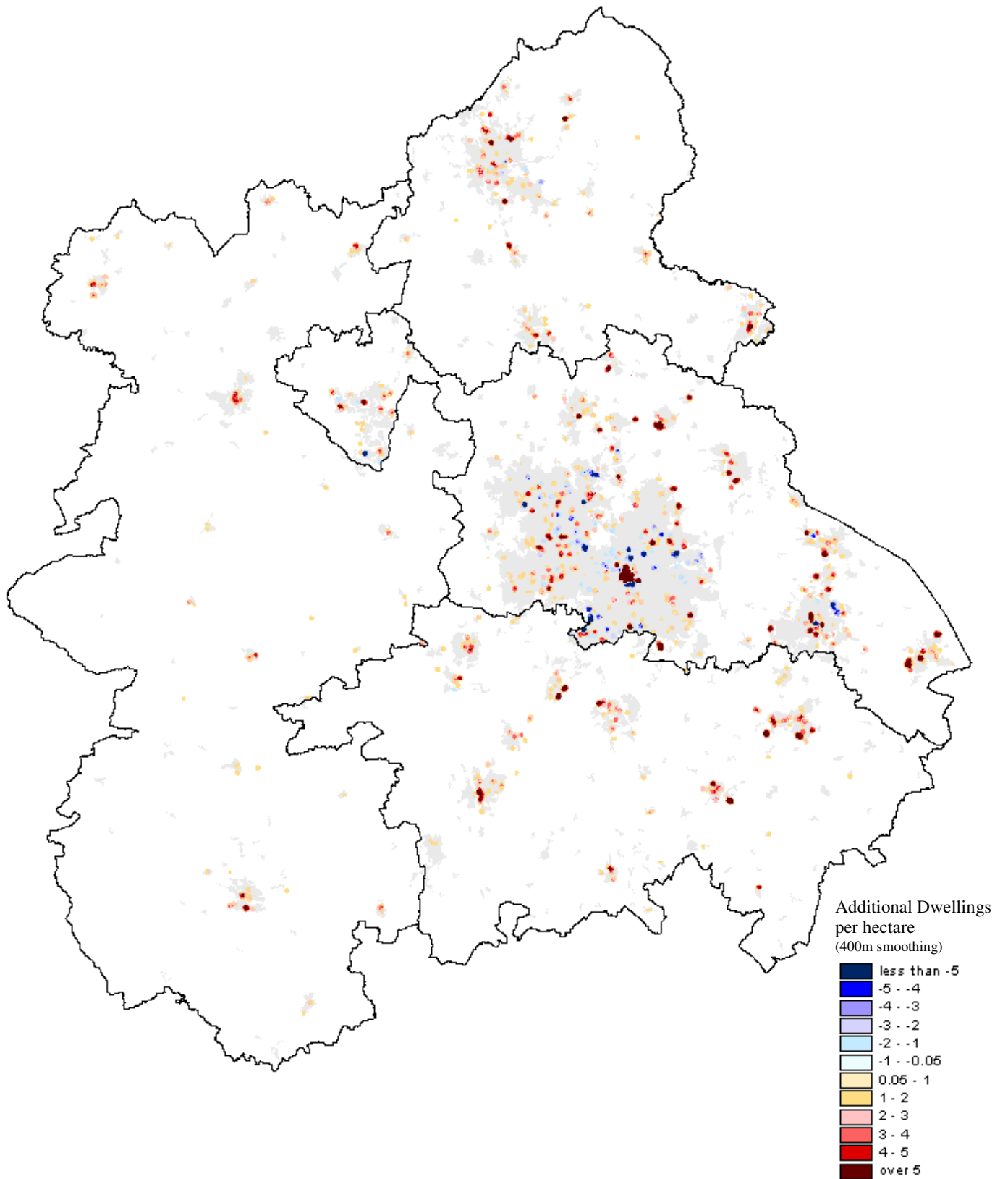


Figure 4.2: New Dwellings Constructed 2001-2006

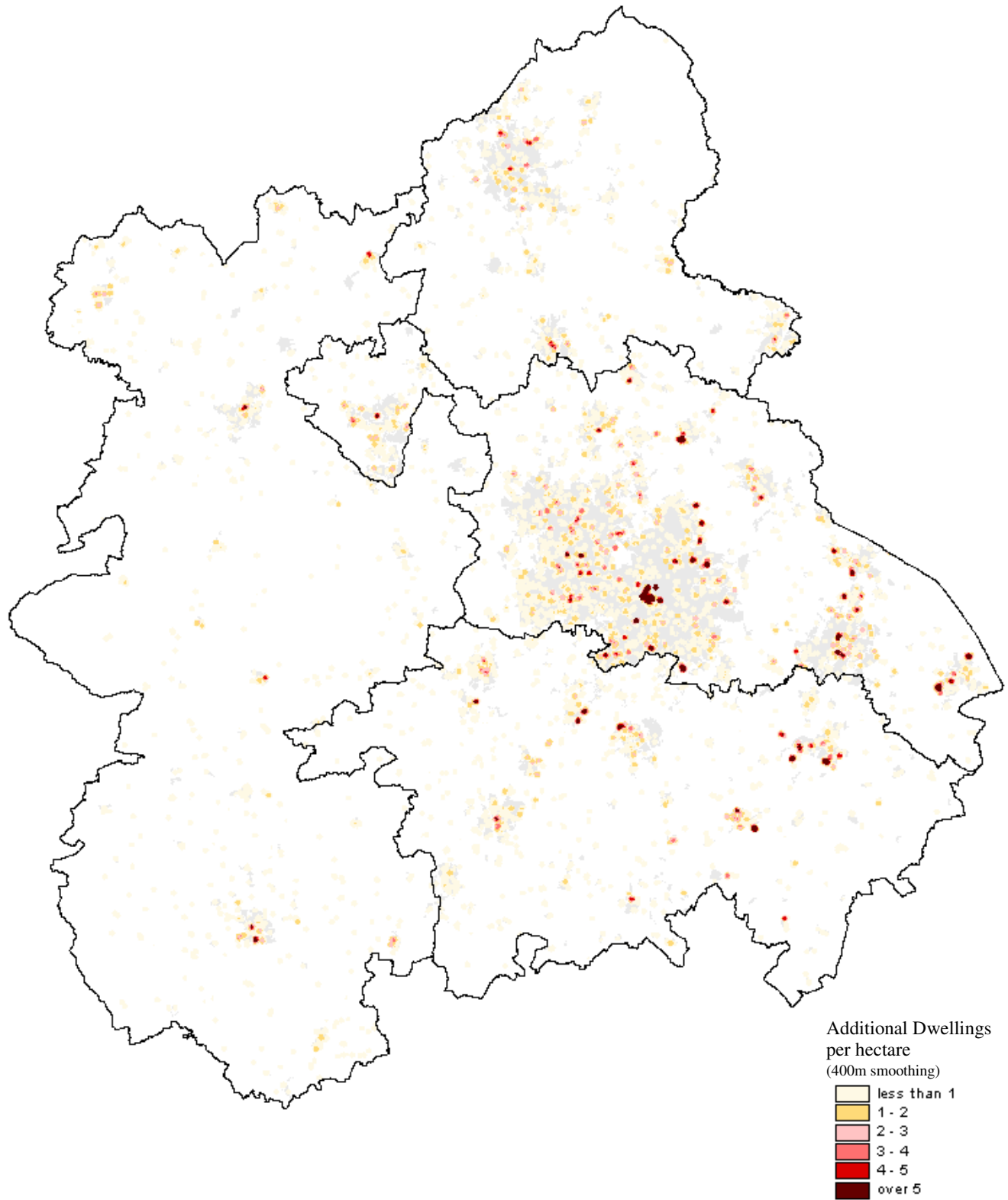
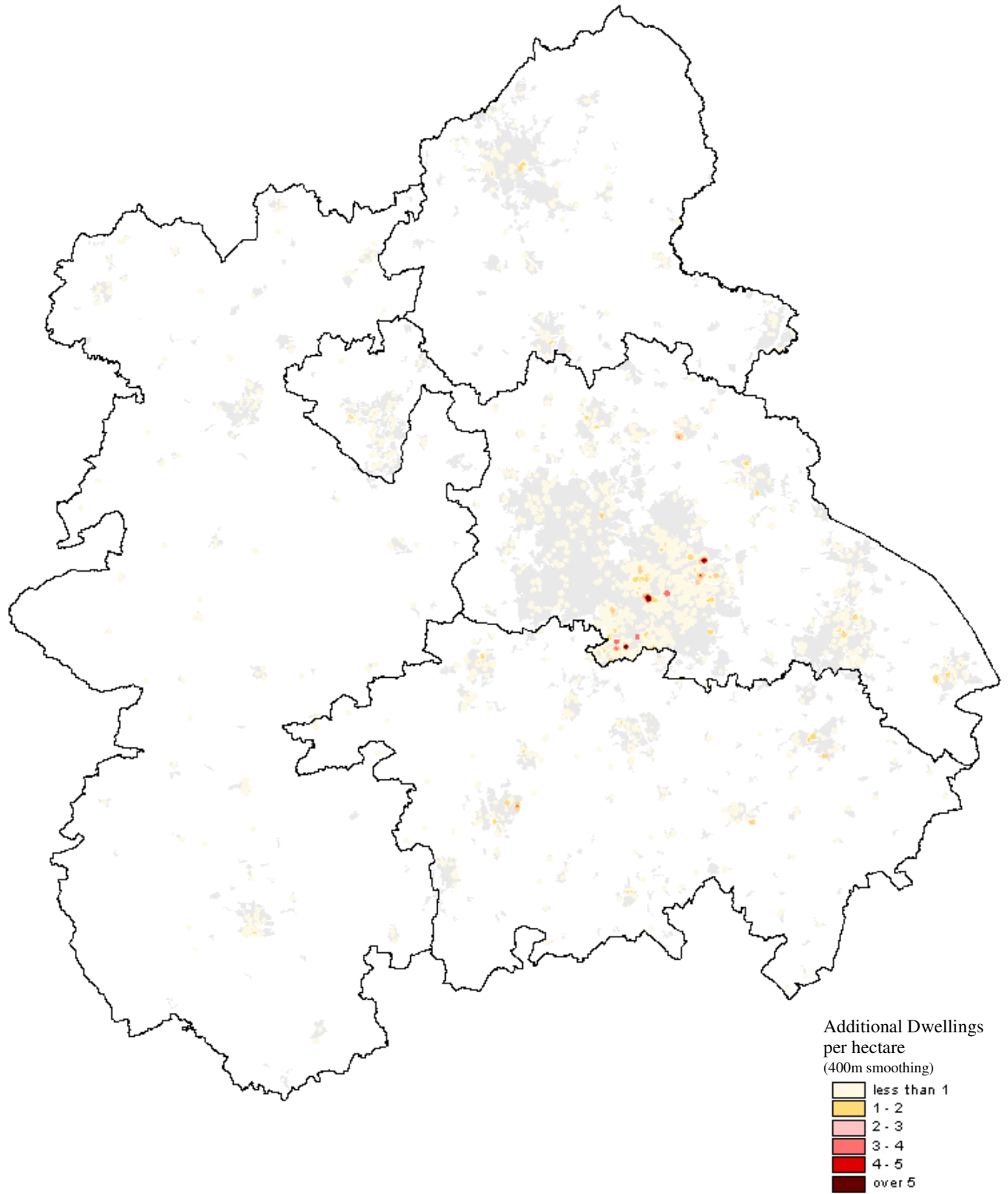


Figure 4.3: New RSL Dwellings Constructed 2001-2008



References:

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Appendix 1: Grid Estimation of Ratios: The Assign Smooth Estimate Procedure ASEr

- A1.1 This appendix is concerned with the procedure used at various points in this report to calculate ratios using hectare grids. The grid framework has the advantage that it avoids various well-known problems in the interpretation of statistical data associated with the size and configuration of the geographic reporting units. It involves first assigning data values to individual properties or unit postcodes, and then using geographic averaging to create derived measures at different scales.
- A1.2 Any data with a full postcode can be assigned to a tile in the hectare grid by reference to the OS grid reference appearing on PAF, and an associated value (eg price achieved at sale) assigned to the grid. Data referenced to broader areal units (eg postcode sectors) can of course be similarly assigned by reference to the postcode hierarchy. This results in a grid where values are not defined for tiles without households. Typically, for analytical purposes, further grids can be defined as a function of such a grid, such as (weighted) moving averages. In this case, the value of a particular tile might be the average of all tiles within a radius r of that tile. In the case of generalized measure, construction of the grid depends on the definition of a grid of summed measures (eg the sum of house prices –indicating the aggregate value of all transactions within a tile) and a grid of counts of measures (eg numbers of transactions). In the case of a proportion, the appropriate procedure is to define first two moving average grids, one based on the counts for the numerator; the other on the counts for the denominator.
- A1.3 Hence for example, if there is a requirement to estimate a measure of the proportion of households in social rented accommodation at the 200m scale on the basis of the 2001 Census the first step is to create a raw grid of Census households. This is constructed by assigning Census households to hectare tiles on the basis of the number of households in each unit postcode from the ONS postcode-headcount file and the grid references held on the postcode address file. The denominator grid is then defined as the 200m moving average of the raw Census households grid. The first step in creating the numerator grid is to apply the proportion of households in social rented accommodation in each Output Area to its associated unit postcodes (by reference to the ONS postcode-headcount file) to the associated number of households from the raw Census households grid to produce an estimate of the absolute number of households renting from social landlords in each populated tile. The 200m moving average of this absolute grid defines the numerator grid. Dividing the numerator grid by the denominator grid produces a continuous measure of the proportion of households in social rented accommodation at the 200m scale.
- A1.4 This process of moving from original reporting units (eg OAs) to unit postcodes, and from unit postcodes to a hectare grid before smoothing (where appropriate both numerator and denominator) values forms the basis for the estimation of all the ratios tabulated Sections 2 and 4 of this report. By way of shorthand, these procedures will be referred to as assign, smooth and estimate or ASE.
- A1.5 Applying spatial averaging at varying scales allows for different degrees of generalization (eg creating average patterns at say 800m or 2km) and plays a role in

examination of possible sub-regional effects in house price formation. The radius over which the smoothing or averaging takes place is critical to the interpretation of any measure; a 200metre smoothing allowing consideration of neighbouring properties and a 10km scale smoothing capturing subregional variation). Using a rather more precise shorthand the former example would be described as ASE200 and the latter as ASE10000.

Appendix 2: Definition of Neighbourhood Characteristics Used in Regressions

Mnemonic	Numerator	Denominator	Numerator Reference	Numerator definition
	pers		KS0060001	All people
pwhitebr	whitebr	pers	KS0060002	White British
pwhitei	whiteir	pers	KS0060003	White Irish
pwhiteo	whiteo	pers	KS0060004	White Other White
pmxcar	mxcar	pers	KS0060005	Mixed White and Black Caribbean
pmxaf	mxaf	pers	KS0060006	Mixed White and Black African
pmxas	mxas	pers	KS0060007	Mixed White and Asian
pmxmx	mxmx	pers	KS0060008	Mixed Other Mixed
pindian	indian	pers	KS0060009	Asian or Asian British Indian
ppakis	pakis	pers	KS0060010	Asian or Asian British Pakistani
pbangla	bangla	pers	KS0060011	Asian or Asian British Bangladeshi
pasoth	asoth	pers	KS0060012	Asian or Asian British Other Asian
pblackca	blackcar	pers	KS0060013	Black or Black British Black Caribbean
pblackaf	blackaf	pers	KS0060014	Black or Black British Black African
pblackot	blackoth	pers	KS0060015	Black or Black British Other Black
pchine	chinese	pers	KS0060016	Chinese or other ethnic group Chinese
poteth	other	pers	KS0060017	Chinese or other ethnic group Other Ethnic Group
	pers1674		KS09A0001	All people aged 16 - 74
peapt	eapt	pers1674	KS09A0002	People aged 16-74: Economically active: Employees Part-time*
peaft	eaft	pers1674	KS09A0003	People aged 16-74: Economically active: Employees Full-time*
pease	ease	pers1674	KS09A0004	People aged 16-74: Economically active: Self - employed
peaue	eaue	pers1674	KS09A0005	People aged 16-74: Economically active: Unemployed
peastu	eastu	pers1674	KS09A0006	People aged 16-74: Economically active: Full-time student
peiret	eiret	pers1674	KS09A0007	People aged 16-74: Economically inactive: Retired
peistu	eistu	pers1674	KS09A0008	People aged 16-74: Economically inactive: Student
peicare	eicare	pers1674	KS09A0009	People aged 16-74: Economically inactive: Looking after home/family
peisick	eisick	pers1674	KS09A0010	People aged 16-74: Economically inactive: Permanently sick/disabled
peioth	eioth	pers1674	KS09A0011	People aged 16-74: Economically inactive: Other

pue1624	ue1624	pers1674	KS09A0012	Unemployed people aged 16 - 74 : Aged 16 - 24
pue50p	ue50p	pers1674	KS09A0013	Unemployed people aged 16 - 74: Aged 50 and over
puenev	uenev	pers1674	KS09A0014	Unemployed people aged 16-74 : Who have never worked
pltu	ltu	pers1674	KS09A0015	Unemployed people aged 16-74: Who are long-term unemployed**
	inemp167		KS12A0001	All people aged 16 - 74 in employment
pmanag	manag	inemp167	KS12A0002	People aged 16-74 in employment working as: Managers and senior officials
pprof	prof	inemp167	KS12A0003	People aged 16-74 in employment working as: Professional occupations
pasprof	asprof	inemp167	KS12A0004	People aged 16-74 in employment working as: Associate professional and technical occupations
padminse	adminsec	inemp167	KS12A0005	People aged 16-74 in employment working as: Adminstrative and secretarial occupations
pskill	skill	inemp167	KS12A0006	People aged 16-74 in employment working as: Skilled trades occupations
ppersser	persserv	inemp167	KS12A0007	People aged 16-74 in employment working as: Personal service occupations
psales	sales	inemp167	KS12A0008	People aged 16-74 in employment working as: Sales and customer service occupations
poperati	operativ	inemp167	KS12A0009	People aged 16-74 in employment working as: Process; plant and machine operatives
pelement	elementa	inemp167	KS12A0010	People aged 16-74 in employment working as: Elementary occupations
pnoqual	noqual	pers1674	KS0130002	People aged 16 - 74 with: No qualifications
pqual1	qual1	pers1674	KS0130003	People aged 16 - 74 with: Highest qualification attained level 1*
pqual2	qual2	pers1674	KS0130004	People aged 16 - 74 with: Highest qualification attained level 2**
pqual3	qual3	pers1674	KS0130005	People aged 16 - 74 with: Highest qualification attained level 3***
pqual45	qual45	pers1674	KS0130006	People aged 16 - 74 with: Highest qualification attained level 4/5#
pqualoth	qualoth	pers1674	KS0130007	People aged 16 - 74 with: Other qualifications/level unknown
	stsc1617	pers1674	KS0130008	Total number of full-time students and schoolchildren: Aged 16 - 17
	stsc1874	pers1674	KS0130009	Total number of full-time students and schoolchildren: Aged 18 - 74
pstecace	stecace	pers1674	KS0130010	Full-time students aged 18 - 74: Economically active: in employment
pstecacu	stecacu	pers1674	KS0130011	Full-time students aged 18 - 74: Economically active: Unemployed
pstuei	stuei	pers1674	KS0130012	Full-time students aged 18 - 74: Economically inactive
	p1674		KS14A0001	All people aged 16 - 74
pphimana	phimanag	pers1674	KS14A0002	People aged 16 - 74: Large employers and higher managerial occupations
pphiprof	phigprof	pers1674	KS14A0003	People aged 16 - 74: Higher professional occupations
pplowman	plowmana	pers1674	KS14A0004	People aged 16 - 74: Lower managerial and professional occupations
ppinter	pinter	pers1674	KS14A0005	People aged 16 - 74: Intermediate occupations
ppsmalem	psmallem	pers1674	KS14A0006	People aged 16 - 74: Small employers and own account workers
ppsuperv	psuperv	pers1674	KS14A0007	People aged 16 - 74: Lower supervisory and technical occupations

ppsemrou	psemirou	pers1674	KS14A0008	People aged 16 - 74: Semi-routine occupations
pproutin	proutine	pers1674	KS14A0009	People aged 16 - 74: Routine occupations
pneverwo	neverwor	pers1674	KS14A0010	People aged 16 - 74: Never worked
ppltu	pltu	pers1674	KS14A0011	People aged 16 - 74: Long-term unemployed*
ppftstu	pftstu	pers1674	KS14A0012	People aged 16 - 74: Full-time students**
ppuncoth	puncoth	pers1674	KS14A0013	People aged 16 - 74: Not classifiable for other reasons***
phhsresi	hhsresi	hhsp	KS0160001	All household spaces: With residents
phhsvac	hhsvac	hhsp	KS0160002	All household spaces: With no residents: Vacant
phhsseco	hhsseco	hhsp	KS0160003	All household spaces: With no residents: Second residence / holiday accommodation
phhsdet	hhsdet	hhsp	KS0160004	All household spaces which are of accommodation type: Whole house or bungalow: Detached
phhssemi	hhssemi	hhsp	KS0160005	All household spaces which are of accommodation type: Whole house or bungalow: Semi-detached
phhster	hhster	hhsp	KS0160006	All household spaces which are of accommodation type: Whole house or bungalow: Terraced (including end terrace)
phhsprbf	hhspbf	hhsp	KS0160007	All household spaces which are of accommodation type: Flat; maisonette or apartment: Purpose Built block of flats or tenement
phhscof	hhscof	hhsp	KS0160008	All household spaces which are of accommodation type: Flat; maisonette or apartment: Part of a converted or shared house (including bed-sits)
phhscomf	hhscmf	hhsp	KS0160009	All household spaces which are of accommodation type: Flat; maisonette or apartment: In commercial building*
phhscvan	hhscvan	hhsp	KS0160010	All household spaces which are of accommodation type: Caravan or other mobile or temporary structure
pnhh	nhh		KS0170001	All households
pnocar	nocar	nhh	KS0170002	Households (number of cars or vans): None
pcar1	car1	nhh	KS0170003	Households (number of cars or vans): One
pcar2	car2	nhh	KS0170004	Households (number of cars or vans): Two
pcar3	car3	nhh	KS0170005	Households (number of cars or vans): Three
pcar4p	car4p	nhh	KS0170006	Households (number of cars or vans): Four or more
pnars	ncars	nhh	KS0170007	All cars or vans in the area**
poocout	oocout	nhh	KS0180002	Households: Owner occupied: Owns outright
poocmort	oocmort	nhh	KS0180003	Households: Owner occupied: Owns with a mortgage or loan
psharedo	sharedo	nhh	KS0180004	Households: Owner occupied: Shared ownership*
plarent	larent	nhh	KS0180005	Households: Rented from: Council (local authority)
pharent	harent	nhh	KS0180006	Households: Rented from: Housing Association/Registered Social Landlord**

pprent	prrent	nhh	KS0180007	Households: Rented from: Private landlord or letting agency
pohten	othten	nhh	KS0180008	Households: Rented from: Other***
pnhh20	nhh20		KS0200001	All households
pnhh1pen	nhh1pen	nhh	KS0200002	Households comprising: One Person: Pensioner
pnhhsing	nhhsing	nhh	KS0200003	Households comprising: One person: Other
pnhhalpe	nhhallpe	nhh	KS0200004	Households comprising: One family and no others: All pensioners
pmhhnoki	mhhnoki	nhh	KS0200005	Households comprising: One family and no others: Married couple households: No children
pmhhkid	mhhkid	nhh	KS0200006	Households comprising: One family and no others: Married couple households: With dependent children*
pmhhnod	mhhnod	nhh	KS0200007	Households comprising: One family and no others: Married couple households :All children non-dependent
pchhnoki	chhnoki	nhh	KS0200008	Households comprising: One family and no others: Cohabiting couple households: No children
pchhkid	chhkid	nhh	KS0200009	Households comprising: One family and no others: Cohabiting couple households: With dependent children
pchhnod	chhnod	nhh	KS0200010	Households comprising: One family and no others: Cohabiting couple households: All children non-dependent
plopakid	lopakid	nhh	KS0200011	Households comprising: One family and no others: Lone parent households: With dependent children
plopanod	lopanod	nhh	KS0200012	Households comprising: One family and no others: Lone parent households: All children non-dependent
pnhhotde	nhhotde	nhh	KS0200013	Households comprising: Other households: With dependent children
pnhhostu	nhhostu	nhh	KS0200014	Households comprising: Other households: All student
pnhhope	nhhope	nhh	KS0200015	Households comprising: Other households: All pensioner
pnhhoth	nhhoth	nhh	KS0200016	Households comprising: Other households: Other
phhsp2	hhspsdwel	hhspsdwel	UV560001	ALL HOUSEHOLD SPACES
phhsud	hhsud	hhspsdwel	UV560002	In an unshared dwelling
phhsudh	hhsudh	hhspsdwel	UV560003	In an unshared dwelling, House or bungalow
phhsuddeth	hhsuddeth	hhspsdwel	UV560004	In an unshared dwelling, House or bungalow, Detached
phhsudsemih	hhsudsemih	hhspsdwel	UV560005	In an unshared dwelling, House or bungalow, Semi-detached
phhsudterh	hhsudterh	hhspsdwel	UV560006	In an unshared dwelling, House or bungalow, Terraced (including end-terrace)
phhsudf	hhsudf	hhspsdwel	UV560007	In an unshared dwelling, Flat; maisonette or apartment
phhsudpbf	hhsudpbf	hhspsdwel	UV560008	In an unshared dwelling, Flat; maisonette or apartment, In a purpose-built block of flats
phhsudconf	hhsudconf	hhspsdwel	UV560009	In an unshared dwelling, Flat; maisonette or apartment, Part of a converted or shared house
phhsudcomf	hhsudcomf	hhspsdwel	UV560010	In an unshared dwelling, Flat; maisonette or apartment, In a commercial building

phhsudcvan	hhsudcvan	hhspsdwel	UV560011	In an unshared dwelling, Caravan or other mobile or temporary structure
phhssd	hhssd	hhspsdwel	UV560012	In a shared dwelling
pperssdwel	perssdwel	perssdwel	UV420001	ALL PEOPLE
pperud	perud	perssdwel	UV420002	In an unshared dwelling
pperudh	perudh	perssdwel	UV420003	In an unshared dwelling, House or Bungalow
pperuddeth	peruddeth	perssdwel	UV420004	In an unshared dwelling, House or Bungalow, Detached
pperudsemih	perudsemih	perssdwel	UV420005	In an unshared dwelling, House or Bungalow, Semi-detached
pperudterh	perudterh	perssdwel	UV420006	In an unshared dwelling, House or Bungalow, Terraced (including end-terrace)
pperudf	perudf	perssdwel	UV420007	In an unshared dwelling, Flat; maisonette or apartment
pperudpbf	perudpbf	perssdwel	UV420008	In an unshared dwelling, Flat; maisonette or apartment, In a purpose-built block of flats
pperudconf	perudconf	perssdwel	UV420009	In an unshared dwelling, Flat; maisonette or apartment, Part of a converted or shared house
pperudcomf	perudcomf	perssdwel	UV420010	In an unshared dwelling, Flat; maisonette or apartment, In a commercial building
pperudcvan	perudcvan	perssdwel	UV420011	In an unshared dwelling, Caravan or other mobile or temporary structure
ppersd	persd	perssdwel	UV420012	In a shared dwelling
ppersage	persage	persage	KS02N0001	All people
pper04	per04	persage	KS02N0002	People aged 0 - 4
pper57	per57	persage	KS02N0003	People aged 5 - 7
pper89	per89	persage	KS02N0004	People aged 8 - 9
pper1014	per1014	persage	KS02N0005	People aged 10 - 14
pper15	per15	persage	KS02N0006	People aged 15
pper1617	per1617	persage	KS02N0007	People aged 16 - 17
pper1819	per1819	persage	KS02N0008	People aged 18 - 19
pper2024	per2024	persage	KS02N0009	People aged 20 - 24
pper2529	per2529	persage	KS02N0010	People aged 25 - 29
pper3044	per3044	persage	KS02N0011	People aged 30 - 44
pper4559	per4559	persage	KS02N0012	People aged 45 - 59
pper6064	per6064	persage	KS02N0013	People aged 60 - 64
pper6574	per6574	persage	KS02N0014	People aged 65 - 74
pper7584	per7584	persage	KS02N0015	People aged 75 - 84
pper8589	per8589	persage	KS02N0016	People aged 85 - 89
pper90p	per90p	persage	KS02N0017	People aged 90 & over
ppers16phh	pers16phh	pers16phh	KS03N0001	All people aged 16 and over living in households

pperemar	peremar	pers16phh	KS03N0002	People aged 16 and over living in households :Living in a couple: Married or re-married
pperccoh	perccoh	pers16phh	KS03N0003	People aged 16 and over living in households :Living in a couple :Cohabiting
pperncsin	perncsin	pers16phh	KS03N0004	People aged 16 and over living in households :Not living in a couple: Single (never married)
pperncmar	perncmar	pers16phh	KS03N0005	People aged 16 and over living in households :Not living in a couple: Married or remarried**
pperncsep	perncsep	pers16phh	KS03N0006	People aged 16 and over living in households :Not living in a couple: Separated (but still legally married)
pperncdiv	perncdiv	pers16phh	KS03N0007	People aged 16 and over living in households :Not living in a couple: Divorced
pperncwid	perncwid	pers16phh	KS03N0008	People aged 16 and over living in households :Not living in a couple: Widowed
pnhhrooms	nhhrooms	nhhrooms	KS19N0001	All households
pahhsize	ahhsize		100 KS19N0002	Average household size
pahhrooms	ahhrooms		100 KS19N0003	Average number of rooms per household
phhoccneg	hhoccneg	nhhrooms	KS19N0004	Households with an occupancy rating of -1 or less*
phhwchwb	hhwchwb	nhhrooms	KS19N0005	Households with central heating and sole use of bath/shower and toilet
phhnchnb	hhnchnb	nhhrooms	KS19N0006	Households without central heating or sole use of bath/shower and toilet
phhnchwb	hhnchwb	nhhrooms	KS19N0007	Households without central heating; with sole use of bath/shower and toilet
phhwchnb	hhwchnb	nhhrooms	KS19N0008	Households with central heating; without sole use of bath/shower and toilet
phhbase	hhbase	nhhrooms	KS19N0009	Households; Lowest floor level; Basement or semi-basement
phhground	hhground	nhhrooms	KS19N0010	Households; Lowest floor level; Ground level (street level)
phh1234	hh1234	nhhrooms	KS19N0011	Households; Lowest floor level; 1st/2nd/3rd or 4th floor
phh5p	hh5p	nhhrooms	KS19N0012	Households; Lowest floor level; 5th floor or higher

Appendix 3: Regression Models

The following tables in this appendix outline the statistical relationships between house prices and a battery of socio-economic indicators (as shown in Appendix 2) referring to the neighbourhood (as outlined in the second bullet point of para 2.2). Multiple stepwise regression was undertaken for both time periods (2000-2004 and 2005-2009) and with/without (ward level) Council Tax data¹. Models for the period 2005-2009 were run on two bases: firstly with unadjusted 2001 Census data; and secondly, taking account of change at neighbourhood level in the dwelling stock and tenure mix since 2001 – to form what is termed in this report the ‘aspirational’ neighbourhood price (see para 2.17).

These statistical relationships are central for the estimation of neighbourhood price (see para 2.13) and the resulting pattern of errors (when reduced to a large scale smoothing such as a 10km scale and adjusted for dwelling plot) form the basis of the sub-regional price (see para 2.21).

¹ In undertaking the ‘refresh’ work there was a particular concern to ensure that ward-level measures, such as Council Tax did not obscure effects at the neighbourhood (ie Output Area) scale. For this reason, the ‘refresh’ work included running further regressions with the ward-level Council Tax variables excluded. The formula eventually chosen for the house-price forecasts did not include any ward-level variables.

Table A3.1: 2000-2004, with Council Tax variables

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	56,306.0	1,385.6		40.6	0.000
Detached property flag	110,738.8	362.5	0.4	305.5	0.000
% properties in the ward in Council Tax band G	4,110.3	35.8	0.2	114.7	0.000
% of the economically active in routine occupations	-1,243.7	36.1	-0.1	-34.4	0.000
% of the economically active who are self-employed	6,100.8	90.6	0.2	67.4	0.000
% of the economically active who are small employers	-5,283.9	97.9	-0.2	-54.0	0.000
Semi-Detached property flag	20,207.9	286.3	0.1	70.6	0.000
% of the economically active in professional occupations	1,113.1	26.3	0.1	42.3	0.000
% properties in the ward in Council Tax band A	-446.3	6.3	-0.1	-70.5	0.000
% of households in owner occupation with a mortgage	-519.3	8.8	-0.1	-59.0	0.000
% of the economically active in managerial occupations	1,820.7	28.7	0.1	63.5	0.000
Flat property flag	-27,410.9	461.0	-0.1	-59.5	0.000
% of households living in undivided detached properties	-549.6	7.4	-0.1	-74.7	0.000
average number of rooms per household	24,884.7	280.2	0.2	88.8	0.000
% of households living in undivided properties	-659.3	11.4	-0.1	-57.8	0.000

$R^2: 50.2\%$

Table A3.2: 2000-2004, without Council Tax variables

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	62,016.1	893.9		69.4	0.000
Detached property flag	110,126.2	369.2	0.4	298.3	0.000
% of the economically active in managerial occupations	2,638.4	28.1	0.2	94.1	0.000
% of the economically active in professional occupations	338.7	40.8	0.0	8.3	0.000
% of the economically active who are self-employed	7,517.3	92.1	0.3	81.6	0.000
Semi-Detached property flag	17,787.4	293.0	0.1	60.7	0.000
% of households in owner occupation with a mortgage	-1,536.2	10.6	-0.2	-145.1	0.000
All cars or vans in the area	841.7	7.2	0.3	116.5	0.000
% of households living in undivided detached properties	-652.8	7.4	-0.2	-88.4	0.000
% of the economically active who are small employers	-7,013.5	99.6	-0.2	-70.4	0.000
Flat property flag	-25,793.9	439.1	-0.1	-58.7	0.000
% of the economically active who are higher professionals	3,480.9	74.8	0.1	46.5	0.000
% of the economically active in routine occupations	-1,604.3	36.3	-0.1	-44.2	0.000

$R^2: 48.5\%$

Table A3.3: 2005-2009, Base 1, using Census data and with Council Tax variables

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	76,754.6	1,319.0		58.2	0.000
Detached property flag	99,444.2	351.6	0.4	282.8	0.000
% properties in the ward in Council Tax band G	4,305.5	32.2	0.2	133.5	0.000
% of the economically active in routine occupations	-1,098.7	31.9	-0.1	-34.5	0.000
% of the economically active who are self-employed	2,293.5	34.1	0.1	67.2	0.000
Semi-Detached property flag	17,732.7	262.5	0.1	67.5	0.000
% of the economically active in professional occupations	1,347.7	22.9	0.1	58.8	0.000
% of persons aged 30-44	-1,309.3	19.7	-0.1	-66.6	0.000
average number of rooms per household	22,136.3	244.1	0.2	90.7	0.000
% of households with their lowest level on street level	-772.7	11.5	-0.1	-67.3	0.000
Flat property flag	-23,406.7	377.6	-0.1	-62.0	0.000
% of households living in undivided detached properties	-436.7	6.9	-0.1	-63.4	0.000
% of the economically active in managerial occupations	1,419.3	26.6	0.1	53.3	0.000

*R*²: 55.1%

Table A3.4: 2005-2009, Base 1, using Census data and without Council Tax variables

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	57,448.0	1,243.2		46.2	0.000
Detached property flag	98,566.6	357.8	0.4	275.5	0.000
% of the economically active who are self-employed	6,917.1	83.5	0.3	82.9	0.000
% of adults with highest level qualifications at level 4 or 5	1,408.5	16.4	0.2	85.7	0.000
% of persons aged 25-29	-942.0	37.7	0.0	-25.0	0.000
Semi-Detached property flag	16,291.5	267.5	0.1	60.9	0.000
% of persons aged 30-44	-1,466.1	22.2	-0.1	-65.9	0.000
% of the economically active in managerial occupations	1,809.9	26.4	0.1	68.6	0.000
% of the economically active who are small employers	-4,731.1	89.5	-0.2	-52.9	0.000
Flat property flag	-26,076.2	388.1	-0.1	-67.2	0.000
% of households living in undivided detached properties	-599.0	7.1	-0.2	-84.4	0.000
average number of rooms per household	22,115.2	287.4	0.2	76.9	0.000
% of households living in undivided properties	-729.1	9.8	-0.1	-74.3	0.000
% of households with 3 cars	1,984.7	44.8	0.1	44.3	0.000

*R*²: 53.9%

Table A3.5: 2005-2009, Base 2, using modified Census data and with Council Tax variables

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	56,145.5	1,147.2		48.9	0.000
Detached property flag	90,684.0	334.3	0.4	271.3	0.000
% properties in the ward in Council Tax band G	4,366.1	31.4	0.2	139.1	0.000
% of the economically active in routine occupations	-1,464.1	31.3	-0.1	-46.7	0.000
% of the economically active who are self-employed	2,448.7	34.0	0.1	72.0	0.000
Semi-Detached property flag	17,026.4	262.1	0.1	65.0	0.000
% of the economically active in professional occupations	1,565.7	23.3	0.1	67.3	0.000
average number of rooms per household	24,288.3	240.6	0.2	100.9	0.000
% of households in owner occupation with a mortgage	-482.0	8.0	-0.1	-60.1	0.000
Flat property flag	-26,067.1	379.8	-0.1	-68.6	0.000
% of households living in undivided properties	-662.4	10.5	-0.1	-62.9	0.000

*R*²: 55.0%**Table A3.6: 2005-2009, Base 2, using modified Census data and without Council Tax variables**

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	62,935.7	1,781.2		35.3	0.000
Detached property flag	94,952.5	357.4	0.4	265.7	0.000
% of the economically active who are self-employed	6,922.9	86.0	0.3	80.5	0.000
% of adults with highest level qualifications at level 4 or 5	1,319.0	17.1	0.1	77.3	0.000
% of persons aged 25-29	-865.5	36.9	0.0	-23.4	0.000
Semi-Detached property flag	15,445.9	270.1	0.1	57.2	0.000
% of the economically active who are small employers	-5,535.0	92.5	-0.2	-59.8	0.000
% of the economically active in managerial occupations	1,926.9	27.3	0.1	70.7	0.000
% of households in owner occupation with a mortgage	-970.4	11.5	-0.2	-84.6	0.000
average number of rooms per household	24,884.8	294.2	0.2	84.6	0.000
% of households living in undivided detached properties	-597.2	7.3	-0.2	-81.6	0.000
% of households with 3 cars	2,127.5	47.4	0.1	44.9	0.000
Flat property flag	-27,748.8	384.2	-0.1	-72.2	0.000
% of households living in undivided properties	-663.1	11.3	-0.1	-58.9	0.000
% of households with no cars	-617.4	15.3	-0.1	-40.3	0.000

*R*²: 54.8%