

Geography of Housing Market Areas in England

Summary Report

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Foreword

This report is the final output of a study commissioned by the National Housing and Planning Advice Unit to construct a consistent geography housing market areas for England. The research has drawn on a strong theoretical base of how local housing markets work. The final geography has also been tested against a range of technocratic criteria. The implications for spatial planning have also been assessed and guidance provided on the final recommended geography. It is hoped that this functional geography will provide the housing planning process with a clear spatial framework on a national basis. By defining housing market areas in a theoretically robust and consistent way the geography will also support equitable comparisons of market conditions across the country.

The research has been undertaken by a team with a range of expertises drawn from four universities. We wish to thank

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1. Introduction

The overall task for the study is to construct a consistent geography – a set of boundaries – of housing market areas (HMAs) for England. A key objective is that such a geography will support those planning for housing with a clear spatial structure to help them do their job. Specifically, it will provide a base to assess the likely outcomes for housing affordability as a result of the strategic choices available for the location of new housing supply. In this way a theoretically robust and practically acceptable definition of HMAs will be of direct relevance and also enable equitable comparisons of market conditions across the country.

The research considers the practicalities of defining HMA geographies and a range of potential candidates are assessed. There are no easy answers to the construction of a geography of HMAs as there are both theoretical and practical challenges. The initial research strategy was to first produce several sets of draft HMAs which have different levels of migration or commuting closure, where “closure” means self-containment as measured by the proportion of such flows which do not cross the boundaries of the HMAs. The next step was to compare standardised house prices between the constituent areas as a form of ‘refinement’ of these geographies. In this way the final test of the appropriate geography is that each adjacent HMA has a statistically different price for the same standardised house. In this way, the research aimed to produce the first rigorously defined geography of HMAs taking account of all the three strands of evidence: commuting, migration and house prices. The key focus of the research, and its likely policy application, is the owner occupied sector.

Each of the research approaches based on commuting and migration face substantial methodological tests and required practical development. The standardised house price differences test too had never been applied in this way before so the research faced many challenges. We have developed a series of approaches to boundary definition, and produced a range of alternative HMA boundary definitions by:

- varying the data used (commuting and/or migration),
- changing the closure criteria applied,
- experimenting with urban areas as ‘seeds’ on which to base the grouping process (instead of using individual wards as ‘building blocks’).

The key task is to generate the most plausible possible HMA geographies that are produced in a transparent way using consistent criteria. These geographies also must be acceptable in terms of technical criteria, such as contiguity (viz. that each HMA is one coherent ‘territory’ and thus not split into separate parts). This methodological analysis is supported by geographic information system (GIS) functionality but ultimately depends on software created by the research team.

This report begins with a review of the theoretical perspective that underpins the research. Next the existing geography of HMAs in use by local authorities is presented. After this, there is a summary of the approaches to construct HMAs, briefly outlining their relative advantages from both technocratic and theoretical viewpoints. Next the standardised house price tests are discussed, together with their implications for the research. The following section considers the implications of using a selection of the different geographies for spatial planning. Finally the conclusions are outlined.

2. Theoretical Perspective

This section argues that the system of local housing markets can be seen as series of tiers. It begins by reviewing the theory of urban housing markets that centres on the role of journey to work as a key influence. It then focuses on the role of spatial arbitrage in moulding the nature of housing markets via household migration. When households, whether they have a member who is working or not, move the process of price bidding is not only the internal housing market dynamic but it is argued also the basis for determining the boundaries of HMAs.

The essentials of the theory of urban housing markets were developed by Alonso (1964), Muth (1969) and Evans (1973). They develop the concept within an urban area that is characterised by the following key assumptions:

- the town or city occupies a featureless plain, so any topographical features that might distort key relationships are ignored,
- employment is concentrated in the city centre, the central business district, and households make a fixed number of work trips a week.

The housing market in this model is assumed to have perfect information and that households then make bids for particular locations and through this process a price surface emerges. In this housing market the law of one price holds but prices vary with distance or accessibility from the city centre. In deciding the price to bid households take into account the transport cost of any location to the CBD.

Households are prepared to bid a higher price for an equivalent house (of the same size etc) in more accessible locations with lower travel costs than one in locations further out. This basic model assumes that all housing quality (including types) is the same and that there are no neighbourhood preferences within an urban area. Within the model, known as the 'access-space' model, the equilibrium price of housing per square metre declines with distance from the city centre. Muth(1969) demonstrates mathematically within the confines of the strict assumptions that for a stable long run equilibrium the house price gradient has to be a negative exponential function with house prices decreasing at a slower rate with distance from the city centre.

The model presumes a dominant city or town centre that represents the key point of accessibility and the major locus of urban employment. The current pattern of settlements and commuting does not conform to these assumptions. First the urban system does not comprise a series of independent towns with associated commuting patterns. In addition within cities commuting trips are no longer necessarily only from suburbs to city centre because subcentres exist within a city-region. Outside city-regions there are sub-regions with several towns where the key accessibility relationship is linked not to the centre of the town with the largest population but the point of greatest 'regional' accessibility within the inter-urban road network.

Notwithstanding these differences between the hypothetical and actual urban system/commuting patterns empirical price studies consistently find a significant distance decay

function from central urban locations (see Jones et al, 2009, for example). This finding implies that the essential dynamic of the access-space model holds under less restrictive conditions, and the journey to work is the key force in shaping local spatial housing markets. Commuting from the local employment centre is in a sense the driver of the local housing market and this employment is the source of incomes that creates the demand. The corollary is that the limits to a local HMA are determined by travel to work patterns. In other words the boundaries of a HMA are determined by the distances travelled by the longest commuters in different directions from a dominant accessibility point. Within this perspective spatial house price arbitrage occurs as households move within these areas which are here called *Framework HMAs*.

There are key qualifications to these conclusions. First, the access-space model represents a long term equilibrium view of the housing market so HMAs defined by commuting patterns is best viewed as a framework within which spatial housing market processes operate. Second, the simplifying assumptions of the access-space model neglect important dimensions of the housing market and its short term dynamics, namely that households have preferences for different house types and neighbourhoods and areas, and that the housing stock is differentiated in terms of housing quality and types and (relatively) fixed at any particular location. Finally the assumption of a unitary housing market within an urban area in which the law of one price holds has also been the subject of considerable academic debate and challenge (Jones and Watkins, 2009). Data and resources mean that this specific issue has not been addressed here. There is a range of factors linked to the localisation of household mobility and the slow response of new house building to price rises that lead to a view that short term price differences in different parts of an urban market may persist into the long term (see Jones et al, 2003, 2004). In other words the extent of spatial arbitrage in the *Framework HMA* that was defined by commuting is constrained by schisms within that wider area.

The heterogeneity of housing, range of neighbourhoods/locations and the short distances often moved by households suggest the potential for subsystems or layers within a *Framework HMA*. In other words differences are not arbitrated away across the *Framework HMA* because there are numerous factors that limit the responsiveness of new supply and/or household mobility at least in the short term. There have been different approaches to the measurement of these subsystems that are defined by constraints on spatial arbitrage. The first approach analyses migration patterns between and within settlements: if an area has a degree of self-containment in the migration flows, then the fluidity of spatial arbitrage within that area will persist alongside a quasi-independence from other parts of the *Framework HMA*. The second approach considers the outcomes of this quasi-independence, so that the lack of spatial arbitrage should result in differences in the prices of a standardised house in each subsystem. This is tested by using hedonic price analysis.

To illustrate this tiered nature of the housing market, one starting point is to consider household movement through the family life cycle and the range of substitutes and locations households consider when moving home. City centre living, usually in a flat, has become popular for childless households in their twenties and thirties. Later in life households with children often will prefer a home with the use of a garden, or place greater emphasis on neighbourhood factors such as school catchment areas (assuming the work search areas remain unchanged). The price a household is prepared to pay for a specific house will reflect

a combination of its structural characteristics and the neighbourhood in which it is located. Although this price will in the long-term be determined by reference to the wider fundamental spatial house price structure of the whole Framework HMA, the spatial arbitrage processes are limited by actual migration patterns, leading to the possibility of defining a separable set of smaller areas that are here termed *Local HMAs*.

This perspective can be further decentralised to neighbourhood or house type *submarkets*. The concept of the submarket implies that the urban housing market may be segmented on the demand and supply side of the market. From a demand perspective households may form distinct 'consumer groups' with associated housing preferences and tastes that are in turn linked to stage in the family life cycle, size and composition, and socio-economic status. These 'consumer groups' may also have similar constraints in their search and information costs. In parallel the housing stock (supply) is also segmented into product groups (Maclennan *et al*, 1987) that represent relatively homogenous dwellings and hence close substitutes to the demanders of housing. The existence of submarkets implies segmented demand is matched to the differentiated housing stock and results in differential prices to be paid for given attributes in different market segments. In this way premiums for a particular neighbourhood/house type are derived.

The constraints on market adjustment or spatial arbitrage between *Local HMAs* (and even *submarkets* where relevant) means that standardised house prices in different parts of the same *Framework HMA* can be very different. Spatial arbitrage occurs, but indirectly and with a time lag. Excess demand for particular dwellings (and their close substitutes) will drive prices in that *Local HMA* upward, but may not affect other *Local HMAs*. The result is that different parts of a *Framework HMA* may have very different house price structures, and hence different house price inflation trends and levels of affordability. This also means building new houses in one part of *Framework HMA* may not necessarily address an affordability problem due to supply shortages in a particular *Local HMA* if it does not lead to a redrawing of migration patterns. To achieve this will require a sensitive approach to the location of such new housing taking into account transport networks for example and demands a focus on *Local HMAs* embedded within their *Framework HMA*.

This discussion has therefore established three potential tiers for the structure of HMAs.

1. *Framework HMA* defined by long distance commuting flows
2. *Local HMAs* defined by migration patterns
3. *Submarkets* defined in terms of neighbourhood and/or house type price premiums

This theoretical analysis creates guidelines for the approach to identifying *Framework HMAs* and *Local HMAs* (nb. this research does not aim to define *Submarkets*). In particular, the *Framework HMAs* definitions should be based on the analysis of commuting, whilst the definitions of *Local HMAs* will focus on migration patterns. It is possible that these two sets of areas may collapse into a single set of boundaries, or may not closely align with each other where the relationship between migration and commuting 'on the ground' is complex. It is most likely that *Framework HMAs* will be considerably larger than *Local HMAs* where long-distance commuting is widespread (eg. around major conurbations). By contrast, *Local HMAs* could actually be larger than *Framework HMAs* in some rural areas where many of the

migrants are retired and so not part of the local labour market (where commuting patterns for most workers are localised).

Implementing the theoretical guidelines as a set of empirical analyses is not simple. A key problem is that there is no theoretical basis for the degree of closure which will be required of the HMAs. Even if the whole country was considered a single HMA it would not have 100% closure in terms of either commuting or migration. The official Travel to Work Areas (TTWAs) are defined with a level of commuting closure of 66.7% (Coombes & Bond 2008). When this level of closure is applied to migration data then the areas produced are fewer – and so larger – than TTWAs; this does not accord with the strategy for the commuting-based *Framework HMAs* to be a similar size to, or larger than, the migration-based *Local HMAs*. This point is made also by Hinks and Wong (2010).

The way forward is for the definition of *Framework HMAs* to be based on a relatively high level of commuting closure, while a lower level of closure will be appropriate for the migration analyses to define *Local HMAs*. In this way, the boundaries of *Framework HMAs* will be defined to be larger than, or the same as, *Local HMAs*. Ultimately the selection of the levels of closure is a purely empirical question, with the most useful HMA boundaries identified by assessing the results in different types of area across the country.

3. HMAs for Strategic Housing Market Assessments

A relevant benchmark for this research is the geography of existing HMAs developed for strategic housing market assessments by local authorities. For ease of description these HMAs are referred to as SHMAs rather than SHMA areas. In Stage 1 the analysis reviewed the approaches currently taken to the definition of these HMAs across England. There is considerable inconsistency in approaches taken to defining HMAs because of the different publication dates of the geographies and changing central government advice note/policy and the openness of the latest guidance. The study constructed a map of SHMAs in England in consultation with regional authorities and this is given in Map 1. These SHMAs do not cross regional boundaries which are in black on the map and individual SHMAs are shown in different colours.

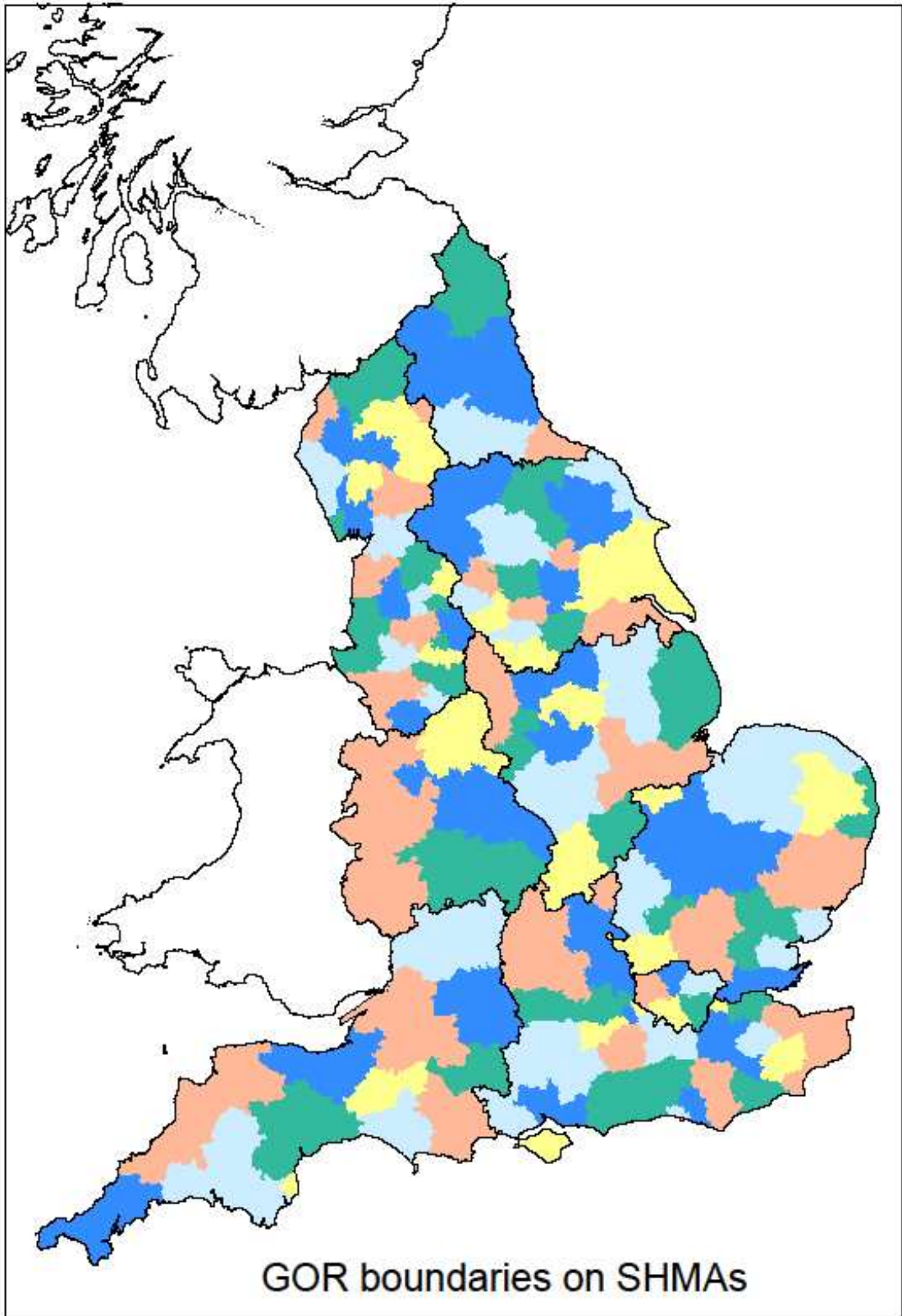
The breakdown per region is given in Table 1. There are dramatic differences between the number of SHMAs per region that are not purely explicable on the basis of the differing urban/rural characteristics of the regions. For example, the inconsistent approaches to the SHMA definitions have produced a larger number of SHMAs in the North West than in the other two northern regions *and* the West Midlands in combination. How these individual regional geographies are derived is explained in Paper A.

Table 1 SHMAs per region

Region	number of SHMAs
East of England	13
East Midlands	11
London	5
North East	4
North West	27
South East	23
South West	14
West Midlands	4
Yorkshire and the Humber	17
England (total)	118

In general, the maps of boundaries from the research analyses in the next section allow the comparison of these proto-HMA boundaries with the current SHMAs by using the latter as background to the boundaries.

Map 1 Strategic Housing Market Assessment Areas



4. Constructing HMA Geographies: A Review of Approaches and Findings

The research has constructed a series of HMA geographies based on a grouping algorithm. This algorithm follows the TTWA methodology (Coombes & Bond 2008) because it has become an internationally-recognised standard for labour market area definition, and its basis in identifying clusters of commuting flows. In this case the algorithm groups commuting or migration flows between wards. The results presented here are a précis of the wide range of results, with the associated maps, detailed in Paper B.

The results can result in the splitting of local authorities (LAs) because the analyses use wards to produce more precise boundaries than would be possible with groupings of whole LAs (especially with the large newer unitary LAs in former Shires). It will be necessary later to meet NHPAU's analysis requirements to produce a best-fit to the HMAs using whole LAs, but it is crucial to the robustness of the results that the initial 'gold standard' definitions are not constrained to be groupings of whole LAs. The boundaries of HMAs also potentially span the borders of England (with either Wales or Scotland). It was found that in practice few areas are affected.

The grouping algorithm applied focuses on the key definition criterion, which is the level set for minimum self-containment or "closure" (ie. the proportion of the flows analysed that both start and end within the same area). The algorithm aims to identify as many as possible separate areas which meet this criterion, grouping the building-block areas in whatever way minimises the number of flows that cross them. This algorithm is applied to commuting and/or migration flows with variable closure criteria. Several different approaches have been developed within this broad strategy, with a key difference between the approaches being the dataset(s) that are analysed, and a selection of the results are summarised in the following subsections of this report.

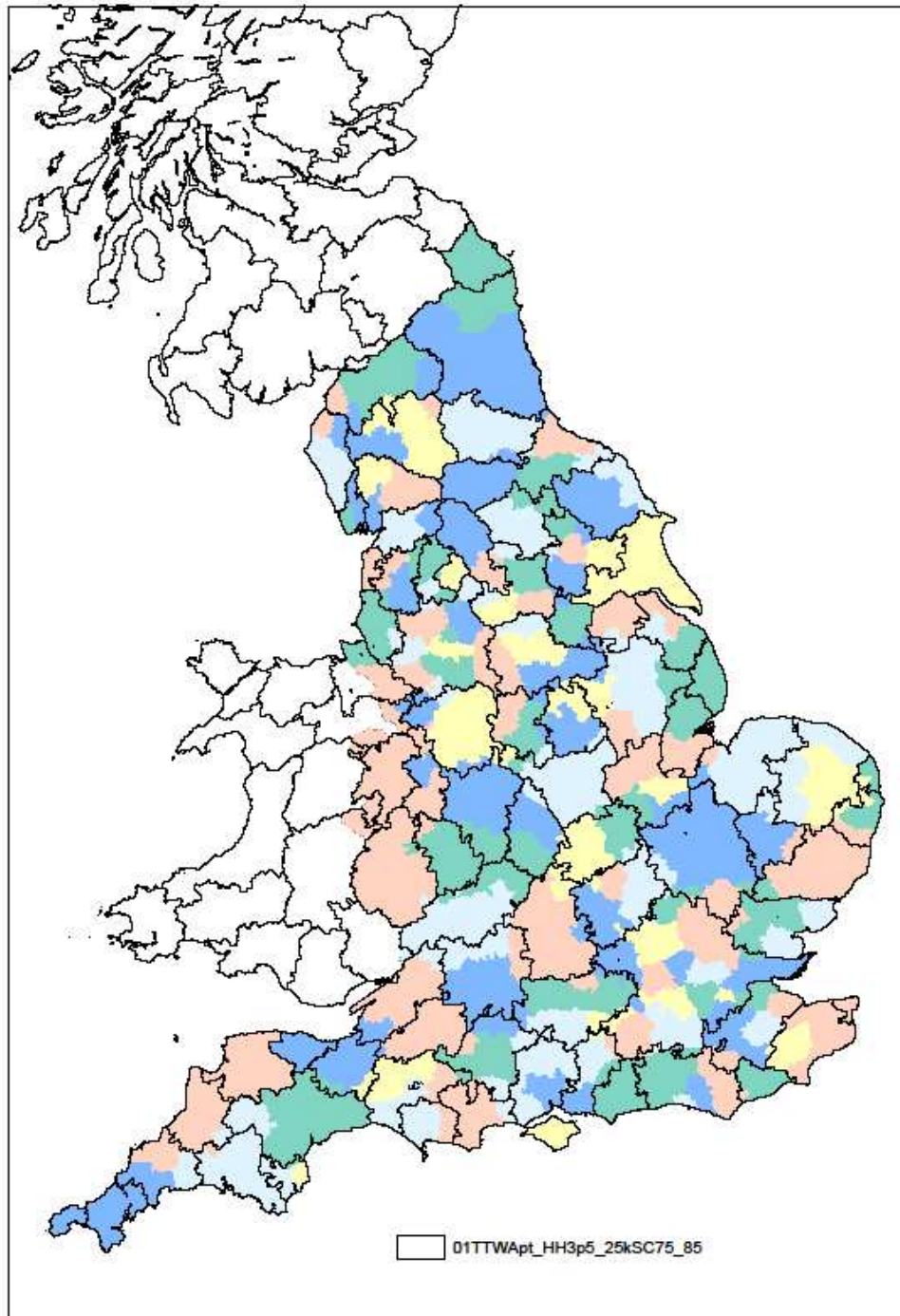
Approach based solely on Commuting

This approach generates the equivalent of the *Framework HMAs* described above and applies the same method and data used to produce the 140 TTWAs in England. The dataset covers commuting flows identified in the 2001 Census. Given the theoretical analysis above higher levels of closure are examined in this analysis, reducing the number of areas. The resulting geography based on 75% closure comprises 85 HMAs in England and is shown in Map 2.

Changing the closure criterion to 77.5% and applying it to all commuters produces 75 HMAs (rather than the 85 in Map 2): this indicates the modest level of sensitivity of the definitions to change in the closure criterion. In general, this approach produces areas that perform well on technocratic criteria relevant to sets of boundaries for policy applications. In particular, the areas are fairly similar in size, and there are few non-contiguities (ie. fragmented areas). Using closure criteria around 75% produces large HMAs around metropolitan areas (Map 2) due to longer-distance commuting, and this is appropriate for *Framework HMAs*. As was indicated earlier, it is not feasible to argue that one specific closure level is more theoretically justified than another, so the choice is based on the appropriateness of the set of boundaries

to the purpose for which they will be used. On this basis, the sets of areas produced by the closure settings of 75% and 77.5% were considered to have corresponding 'pros and cons' while performing equally on the technocratic criteria.

Map 2 Areas based on 75% commuting closure



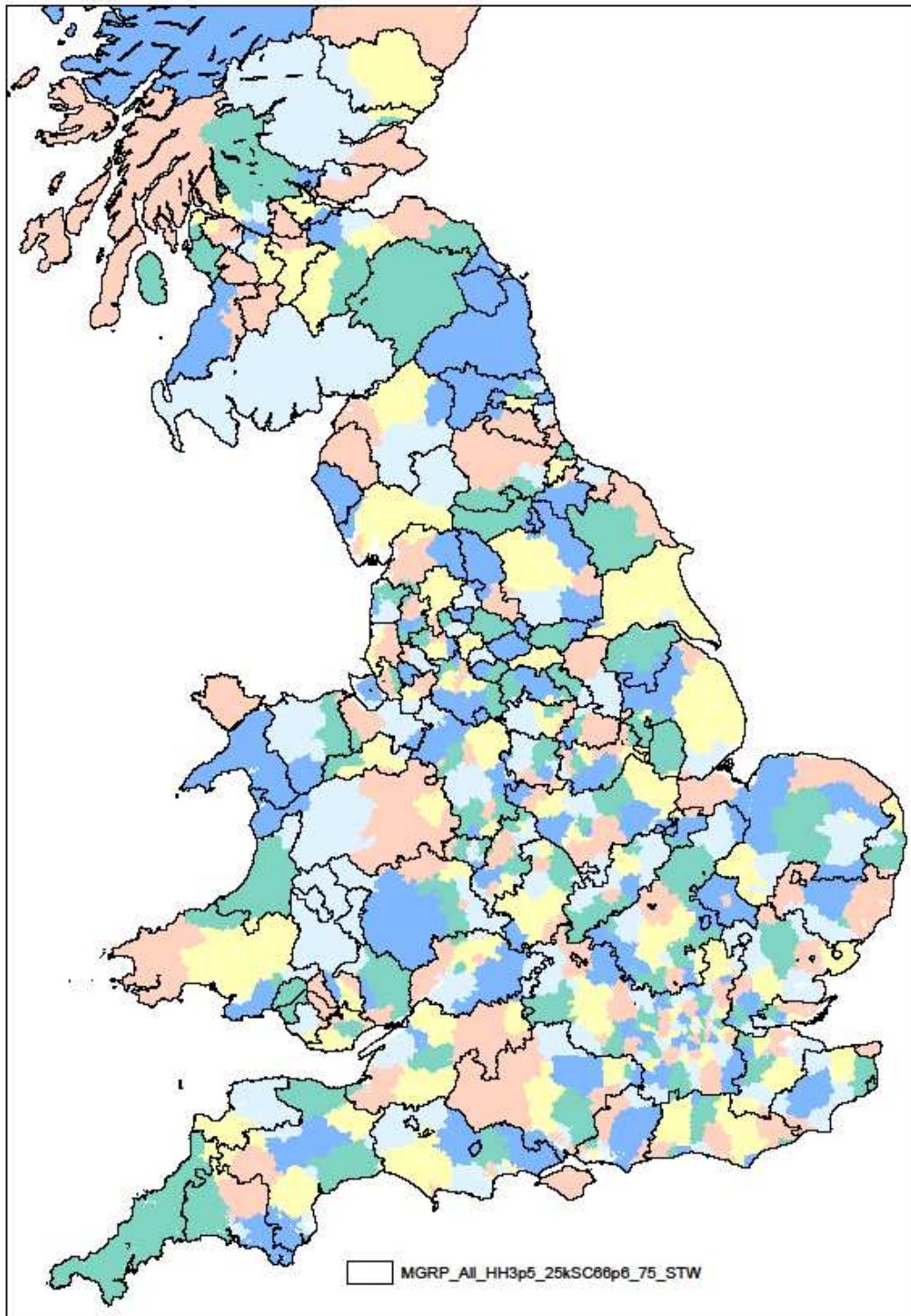
Approaches based solely on Migration

Migration approaches derive directly from the *Local HMA* concept noted earlier. While the focus of the research is the owner occupied sector it is planned that the migration flows could be disaggregated by tenure for subsequent analysis. The published data source for migration data, the Census, does not cross-tabulate households by tenure or age or whether the person was a student. This was resolved by the use of a customised dataset of Moving Group Reference Persons (MGRPs) specifically provided by the Office of National Statistics. This data records the tenure of migrants and allows the exclusion of people aged under 25: this was a great benefit here because the numerous lengthy moves of students are not relevant to the research. It should be noted here that the definition of MGRP includes many people who are not heads of households: for example, a 25 year old returning to the parental home will be a single person moving group, and if the parental home is owner-occupied then this 25 year old will be recorded as an owner-occupying MGRP because the same tenure characteristic applies to all household members.

Map 3 applies a 66.7% closure criterion to the dataset covering all 25(+) MGRPs. This criterion generates 86 HMAs and the results are notably similar to those in Coombes (2009). Reducing the migration closure criterion from 66.7% to 60% or 55% leads to increases in the number of HMAs to 152 and 223 respectively, whilst setting the closure level at 50% yields 327 HMAs. This indicates a steep level of sensitivity of the results to the choice of criterion.

In Map 3 there is a very considerable difference in size between areas in the south and those in the old industrial regions. In some parts of the country there are also rather large numbers of non-contiguities. The use of migration data alone, with wards as the building block areas, thus tends to produce boundaries that do not perform very well on the technocratic criteria. That said, these problems are somewhat less at 55% and 50% closure levels so *local HMAs* based on this criteria have more credibility, although at these levels the northern conurbations tend to be broken down into large numbers of areas.

Map 3 Areas based on 66.7% migration closure



Approach based on combining Commuting and Migration

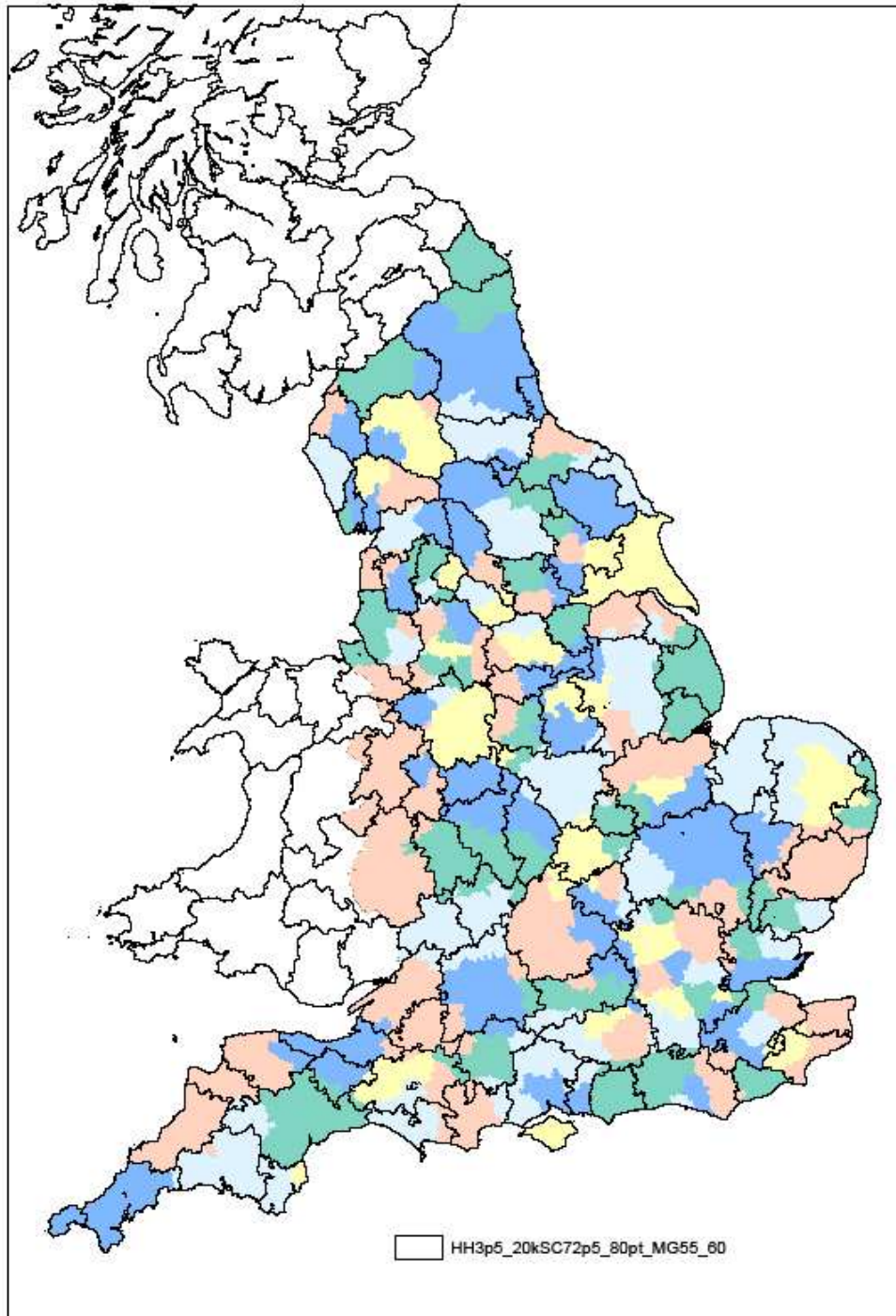
This approach seeks to be more innovative by combining analyses of commuters into a further grouping process that uses migration flows in a two step process. In this way step 1 is identical to the commuting approach only, but is followed by a step 2 which takes account of migration patterns. The resultant geography requires the HMAs to be relatively self-contained in terms of both labour market areas (shown by commuting) and also migration. The basic method is not hierarchical. What this means is that step 1 labour market areas which do not pass the migration flow self-containment test are broken down into their constituent wards and these are then re-grouped on an individual basis so the final set of boundaries are as optimal as possible. Of course, the key decision remains the choice of just how self-contained the areas must be, and here the example presented is based on 72.5% commuting closure and 55% migration closure (Map 4). These boundaries perform particularly well against the technocratic criteria.

It is relevant to compare these results with those from the analysis based purely on commuting data. The specific closure levels applied here to the commuting and migration data have produced 93 HMAs and this is 8 more than the set defined with the slightly higher closure level applied to commuting the data alone (Map 2). Several of the 'additional' HMAs in the geography based on two datasets are in more peripheral areas such as Norfolk and Cornwall but there are also larger urban areas which are separately recognised in Map 4: for example, Sunderland is separated from Newcastle while Birmingham no longer includes all the Black Country towns (Wolverhampton and Walsall emerging as a separate HMA). Even at the strategic level for which the *Framework HMAs* are being defined, it is arguable that these areas are as distinctive in their housing market processes – as separable from the still larger urban areas nearby – as are Reading from London and also Leeds from Bradford. If that is correct, then the areas in Map 2 are less appropriate than those in Map 4 because the latter set of areas keeps these areas as separate potential *Framework HMAs*.

A crucial distinctiveness of this approach is that it defines a single set of areas that meet defined levels of closure in terms of both commuting and migration flows. It first identifies areas with 72.5% commuting closure – of which there are 100 in England – then on finding that some of these areas do not achieve 55% migration closure those 'failed' HMAs are split up and their constituent wards re-allocated in a process that produces 93 areas which then meet the migration closure criterion.

This methodological advance does not readily fit with the theoretical tiered housing system derived from urban economic theory. This is because the theory as elaborated earlier envisaged that migration-based areas would be either smaller than or a similar size to the commuting-based areas: by contrast, this approach has used migration data to define areas which are *larger* than those which were originally defined by reference to commuting flows. A resolution of this problem could flow from the fact that the theory was based on the study of urban economies, with restrictive assumptions then made to generalise the processes. When actual data on a complex mix of urban and rural areas are analysed it is not very surprising if some divergent patterns are found. More specifically, the commuting-based areas which are found here to not have 55% closure in terms of migration patterns are predominantly rural areas where there are more retired migrants (who are not subject to the constraints of commuting), and where there are numerous similarly sized settlements without a single dominant urban settlement around which all the flow patterns focus.

Map 4 Areas based on 72.5% commuting closure *plus* 55% migration closure



A Tiered Approach with Lower Level Areas based on Migration within Upper Level Areas based on Commuting

This approach defines commuting-based upper tier areas directly from individual wards and then subdivides these areas on the basis of migration self containment criteria. In this way *Framework* and *Local HMAs* are established in one system. The algorithm first allows the upper tier boundaries to be more optimally defined based on a commuting criterion (step 1), but it creates a technical challenge because there is no existing method for disaggregating an upper tier set of areas into the largest possible number of lower tier areas that satisfy the migration self containment criteria (step 2). The technical innovation here is to treat each upper tier area as a separate problem, so the second step of the analysis takes its constituent wards individually and then groups them until they meet the migration self-containment criterion *without* allowing any grouping to cross the upper tier boundaries.

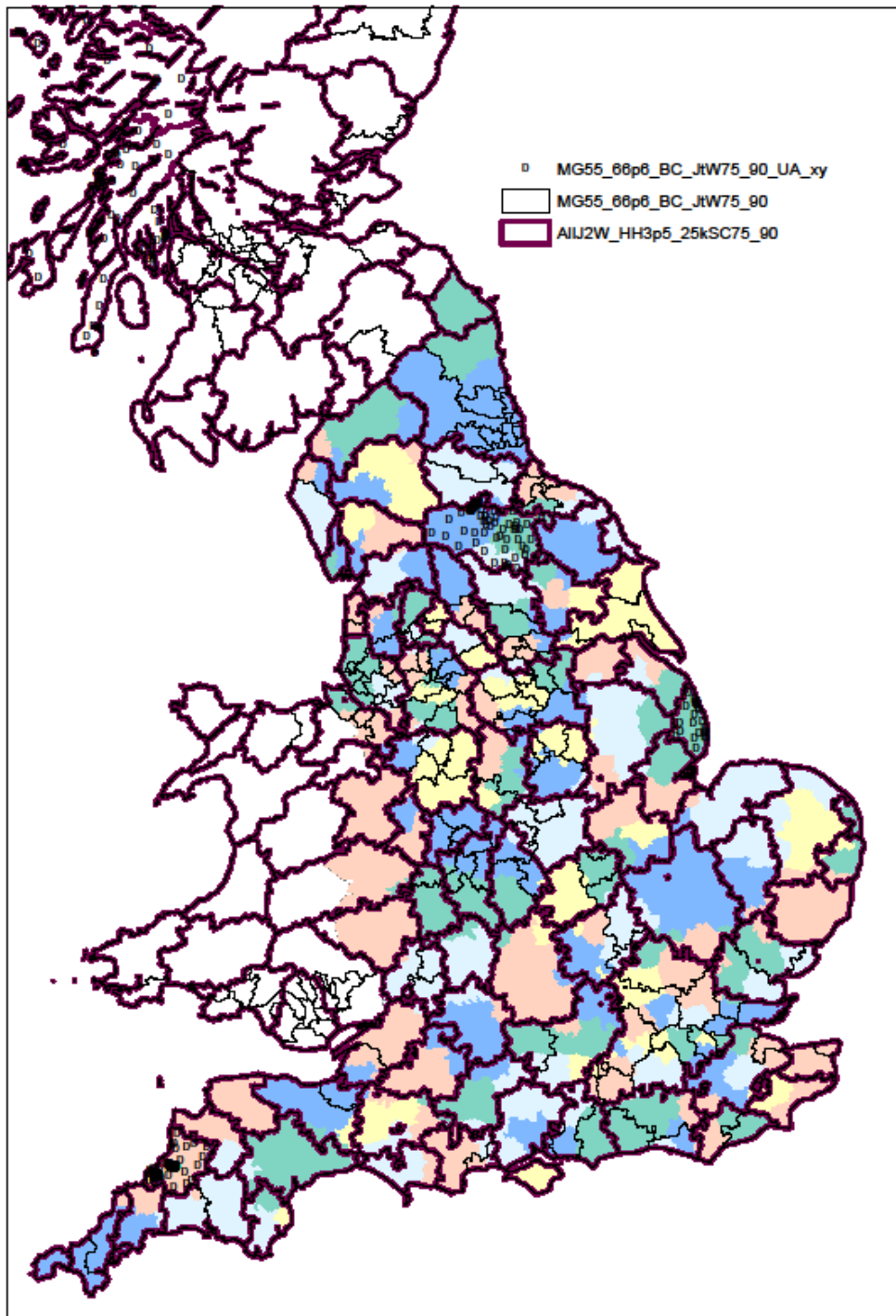
The initial containment settings applied are 75% and 55% commuting and migration closure respectively and Map 5 shows the result with the upper tier boundaries shown by the thick dark maroon boundaries and the lower tier areas by fine black boundaries. There is a possibility that the higher tier area may not meet the criterion for lower tier migration self-containment. Map 5 shows three areas that are 'speckled' with D symbols (one for each ward in that area); in these upper tier areas step 2 was unable to meet the criterion for lower tier migration self-containment even after grouping all the wards back together. It is notable that these are all rural areas, echoing the finding of the previous approach that within some rural areas the limits of commuting-based areas do not constrain migration patterns. In the three areas here, the potential upper tier *Framework HMA*s areas do not satisfy the criterion for migration closure required of lower tier areas (nb. all three do satisfy a 50% migration closure criterion.)

Map 6 shows the boundaries produced by raising the step 1 commuting closure criterion for the upper tier to 77.5%. The difference is not great, but is noticeable in cases such as London (which now extends further into Kent) and the area around Tyneside (which extends as far as Yorkshire). Where the upper tier boundary is different (to that in Map 5), the lower tier areas could also be different because step 2 is working within a different outer boundary, even without changing the level of migration closure required of lower tier areas. In fact, Map 6 shows the resulting boundaries when the migration closure requirement is also lowered to 50% and it can be seen that there are no longer any 'speckled' areas in this case. What this means is that all these upper tier boundaries also have migration closure levels that are sufficient for them to also meet the lower tier criterion (50%).

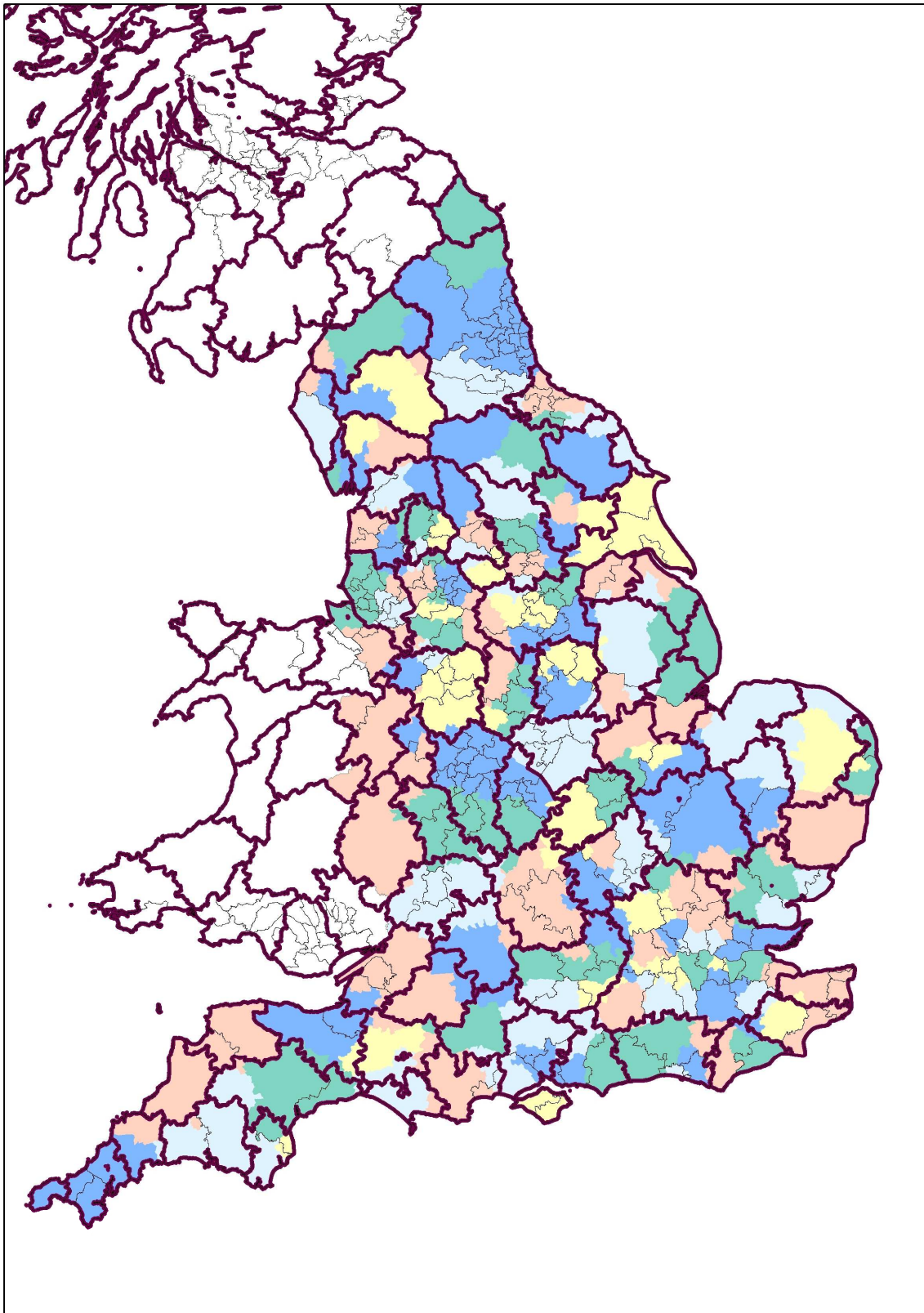
A similarity between these two two-tier sets of areas (Maps 5 and 6), is that in more rural areas there are many upper tier areas that are not divisible at a lower tier, so any advantage of having a second tier mainly applies to more metropolitan parts of the country. This shows once again that migration flows are often as long as commuting flows in more rural areas. There are very few problems with the upper tier areas in terms of the technocratic criteria, but there are non-contiguities among the lower tier areas. Map 6 produces a more convincing lower tier subdivision of its London *Framework HMA* than that found in Map 5 but this is largely achieved by setting the migration closure criterion as low as 50% and this has the disadvantageous consequence of heavily fragmenting some of the northern conurbations at the lower tier of *Local HMAs*.

These geographies are in nested tiers: the lower tier of *Local HMAs* is bounded by the limits of the upper tier *Framework HMAs*. As noted for the London area in Map 5 in fact, a nesting approach can distort the pattern which would be observed if the *Local HMA* geography was defined in an unconstrained way. This experiment has been done, but the judgement made was that the greater policy importance lies with the *Framework HMAs* and so should a lower tier be defined then it should not ignore these upper tier boundaries.

Map 5 Lower tier based on migration (55%) within commuting-based upper tier (75.%)



Map 6 Lower tier based on migration (50%) *within* commuting-based upper tier (77.5%)



5. Standardised House Prices

To test 'prototype' HMAs by comparing standardised house prices between the constituent areas requires the estimation of a hedonic regression model. The basic hedonic model decomposes the price of housing into its constituent parts or characteristics and places a price on each. In other words housing is seen as a composite good and the price equation can be written in algebraic terms as:

$$P = \alpha + \beta_1 S + \beta_2 T + \beta_3 D + \beta_4 R + \beta_5 M + \varepsilon$$

where

P	sale price of house;
S	structural attributes;
T	market conditions;
D	distance to major centre of population
R	residential density of neighbourhood
M	house type mix of neighbourhood

The α and β s are estimated using the statistical technique, regression, and the remaining unexplained error is represented by ε . This equation is estimated using data from market transactions, house type and neighbourhood characteristics. The hedonic analysis is then used to statistically test whether the price of a standardised house is different in an adjoining HMA by comparing the coefficients (β s) of the explanatory variables (ie characteristics). The details of this process, including the data, were given in an earlier report from the research.

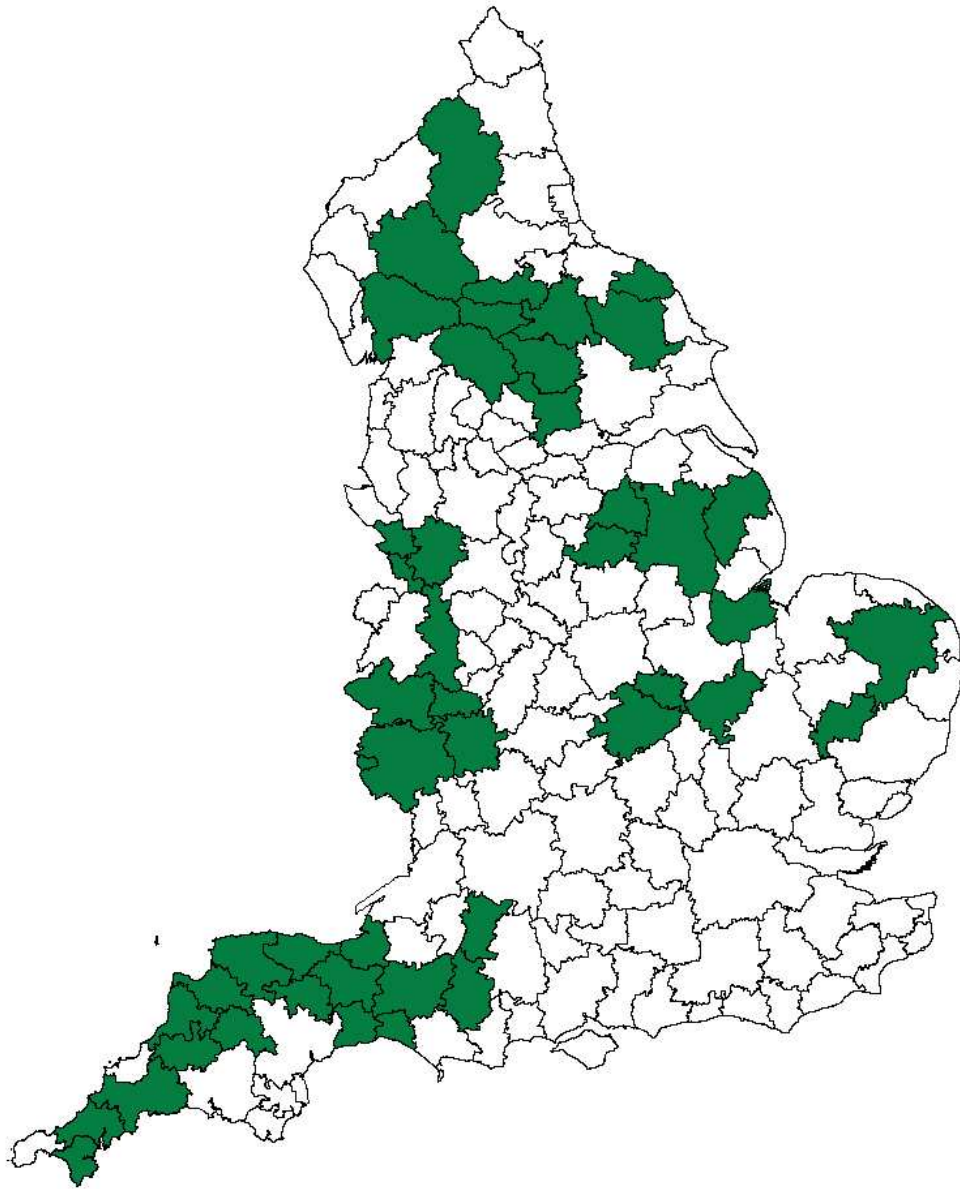
The results of the analysis in general find that most of the pro-type HMA geographies pass the pair-wise test that standardised house prices are statistically different. The largest number of similar contiguous pairs is found in the current TTWA geography as Table 2 shows. The pairs are shown in Map 7 where it can be seen that they are mostly in more peripheral and rural parts of the country. This rurality issue stems partly from the differences in commuting and migration flows in these areas. The TTWAs algorithm defines as many separable areas as possible subject to commuting self-containment and in practice this leads to a high proportion being in areas where there are smaller towns with a traditional market area around them. Migration flows tend to be longer in rural areas, especially where there are more retired people. This is also a partial explanation for 4 of the 7 pairs of the lower tier *Local HMAs* that fail this test, some of which cross *Framework HMA* boundaries. The other 3 contiguous pairs that do not have statistically different standardised house prices are urban *Local HMAs* within the same respective *Framework HMA* suggesting a case for amalgamation.

Table 2 Comparison of Results of Hedonic Tests of HMA Geographies

Geography	No. Spatial Units	No. Contiguous Pairs with same Standardised Price	% Reduction in Standard Error	Error Efficiency Index of Geography*
Commuting 77.5% Closure	74	0	24.4	32.97
Commuting 75% Closure	82	1	25.3	30.85
TTWAs (66.7% Closure)	163	40	23.5	14.42
Nested Lower Tier 50% Migration Closure	277	7	29.5	10.66
Upper LAs	157	6	27.0	17.20
LAs	352	3	31.4	8.92
SHMAs	117	3	4.2	3.59

*% Reduction in Standard Error x 100/ Number of Spatial Units in Geography

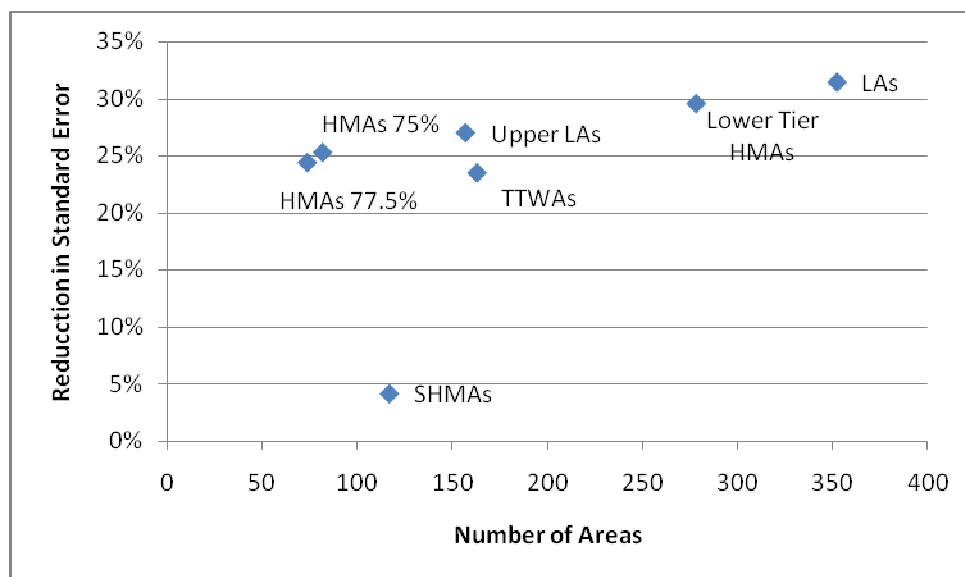
Map 7 Contiguous pairs of TTWAs with standardised house prices that are not different



There are also more fundamental problems about the hedonic analysis and tests that arise partly because of the tiered nature of the housing marketed noted above and partly because of the difficulties in the use of the regression technique. It has been noted that there exist quite localised price differences between neighbourhoods (and wards) so the tests of pairs of proto-type HMAs may be dominated by these influences. The regression technique is also not powerful enough to account of this issue because it is not fully specified model, partly because of missing variables. The model specification was driven by the availability of consistent variables on a national basis and is not sufficiently sensitive for the test to produce meaningful results.

The hedonic analysis has been utilised to compare the efficiency of potential different HMA geographies. The localised nature of the housing market means that spatially disaggregated models should produce better results compared with a national model. The efficiency of the different geographies can be measured by a reduction in the standard error of the local regression models summed together in comparison of the national regression model. The results are given in Table 2. As expected the most localised geography considered, 352 local authorities (LAs) produces the greatest reduction in standard error, 31.4%. The existing geography of SHMAs results in only a 4.2% reduction. The most 'efficient' geography considered, defined by an index that looks at the percentage reduction in standard error per unit is derived from the commuting self containment (see column 5 in Table 3). Figure 2 is a graphical presentation.

Figure 2 Scattergram of efficiency of geographies for predicting house prices



6. Implications for Spatial Planning

The conclusions from the HMA construction stage of the analysis are that a tiered approach to HMAs may be the most appropriate as it is both theoretically sound and offers the most advantages for policy application. Geographies with different upper tier boundaries (derived by varying the commuting closure criterion) and different lower tiers (from varying the migration closure criterion) have been assessed in terms of their potential spatial planning consequences. The results are presented in Paper C. Here only a brief summary is provided.

In parallel to each set of *Framework HMA* boundaries from the analysis based on wards, another set of boundaries are examined: these are a *Best-fit* to those areas created from groups of LAs (ie. whole district and unitary local authorities as at 2001).

The appraisal is based on GIS analysis to calibrate the relationships between different administrative and planning policy geographies (viz: SHMAs, growth areas and growth points, National Parks and green belts). The sets of areas are appraised in terms of:

- how far they cut across administrative boundaries including Regions and LAs
- how suitable they were for strategic planning and local planning; and
- how useful they were for monitoring housing markets and spatial planning issues.

Having seen how far they differ from the original boundaries, the *Best-fit* areas can be set aside from this point onwards because the extent of this difference does not vary much from one set of areas to another. In other words, the choice of the set of areas to recommend at the end of the research will not be driven by how far the *Best-fit* version of a geography differs from the original geography.

Fitting with existing administrative boundaries

There are genuine and important cross-regional *Framework HMAs* that should be taken into account seriously in spatial planning terms. The main cross-regional issues involve:

- Manchester (NW) and High Peak (EM)
- Chester (NW) and Flintshire (Wales)
- Sheffield (YH) and Chesterfield (EM)
- Milton Keynes (SE) and Bedfordshire (EE)
- London HMA and Home Counties (SE and EE).

These issues are not seen as problems with the geographies – they tend to be found in most of not all the sets of areas – but good evidence of genuine cross-regional HMAs which the areas are helpfully drawing to the attention of the relevant policy communities.

Given that LAs are the delivery units of planning policy and practice, it is important to note that all the sets of HMAs subdivide some LAs and group others together. There is no simple conclusion in terms of one HMA geography 'doing less violence' to LA boundaries than the other sets of HMAs. As a result, the assessment is that the degree of fit of the alternative sets of HMAs to LAs does not help with the decision as to which set of HMAs to recommend; this assessment applies both to the upper and the lower tier sets of areas which are tested.

In fact the degree of similarity in the way in which the HMAs cut across LAs suggests that the housing market patterns that these geographies reflect should not be ignored in policy. For example, the lower tier areas do genuinely reflect local housing behaviour of residents. Where the *Local HMAs* cut across LA boundaries they are drawing attention to patterns which local policies need to monitor to inform planning application decisions. A clear example would be a major residential development scheme submitted to one LA when the area concerned is part of a wider HMA that involves areas within other LAs: the decision made will have implications for those neighbouring LAs.

Suitability for strategic planning and local planning

In order to assess the suitability of the recommended HMA geographies to inform strategic planning issues in relation to housing delivery, there is an analysis of the relationship between the HMAs and existing policy areas:

- TTWAs;
- SHMAs;
- National Parks and Green Belt; and
- Growth Areas and Growth Points.

In general, the conclusion is similar to that for regions and LAs: there tends to be a similar degree of fit of the alternative sets of HMAs to these areas. As concluded above, this gives little in the way of guidance for the decision as to which set of HMAs to recommend. At the same time, this degree of similarity in the way that the different sets of HMAs cut across existing policy areas tends to suggest that the HMAs are robustly defined and do provide some evidence on real patterns in the housing market which is missing from the sets of areas currently used in strategic planning.

Monitoring of housing markets

With the complexity of planning policies requiring sectoral and spatial integration vertically and horizontally, a robust monitoring framework is very important. The existing Annual Monitoring Report of the Local Development Framework (LDF) involves the compilation of many indicators at the LA level, although government guidance recognises that no single set of boundaries can fully satisfy the monitoring needs of complex spatial policies.

The analysis undertaken in this research aimed to explore monitoring of key housing information sources: house prices, brownfield residential development sites, along with the Index of Multiple Deprivation (IMD). Here the central question was whether there is a need to have two-tiers of HMAs, rather than a single set of *Framework HMAs*.

The house price maps in Paper C show that with *Framework HMAs* the variation of house prices within some areas HMAs is huge. Not surprisingly, this is most evident for the very large *Framework HMAs* such as those centred on London or Manchester: here monitoring house prices and housing affordability will produce an average value for areas that is large enough to conceal a wide distribution at smaller scales. Without a tiered perspective a focus on large *Framework HMAs* any local areas of very high and very low housing prices will also run the risk of producing an averaged out value which fails to diagnose the dynamics of local changes in the housing market. They also mask more localised rural / urban housing markets - with more rural areas such as north Northumberland simply swallowed-up as extensive hinterlands associated with neighbouring urban areas. The more fine-grained differentiation of multiple housing markets within a major urban area will also be missed - the latter is most obvious in London where much of Greater London is identified as a single *Framework HMA*. It is in such areas that an additional lower-tier geography can reflect more localised housing market conditions, and it is notable that it is in such areas that separate lower-tier HMAs are mostly identified. Paper D provides an illustration of this issue by examining the range of affordability across HMAs in the North west region measured by calculating the ratio of median house price by type to the value of a key worker salary (viz. that of a teacher in their mid-20s).

A tiered HMA geography and the promotion of spatial planning policies

Spatial planning goes beyond traditional land use planning to bring together and integrate policies for the development and use of land with other policies and programmes which influence the nature of places and how they can function.(ODPM, 2005: para 30). This definition captures the complexity of planning policies which requires sectoral and spatial integration. Plan-making of local areas requires consideration of the wider spatial context and outcomes (positive, negative, displacement effects) for the surrounding areas. Since places are connected in different ways to deliver different activities, it is important to recognise that there are different spatial layers of administrative and functional geographies and that no single set of boundaries can fully satisfy the monitoring needs of complex spatial policies. A tiered HMA geography links to both national / cross-regional and more strategic sub-regional analysis whilst, at the same time, providing a sufficiently fine-grained basis for more locally based analysis and policy formulation in respect of, for example, issues relating to affordability and/or core strategy / LDF preparation and monitoring by individual local planning authorities.

While the *Framework HMAs* may provide a useful macro perspective for central government to plan for housing, they would be less appropriate in informing day to day planning decisions at the local authority level because housing behaviour as reflected from migration analysis is very localised and developers and house builders will respond by providing different types of housing according to very sophisticated local and sub-market demands. Having an additional 'lower tier' set of HMAs would potentially offer this more flexible

perspective to allow the shorter-term and day to day planning activities over planning approval and monitoring work.

In considering the soundness of emerging LDF documents, inspectors might also expect LAs to explain how they have utilized information on *Local HMAs* as part of their evidence base to inform and justify their emerging spatial planning policies. A better knowledge of *Local HMAs* would also be valuable in considering and making decisions on local, but strategically important, planning applications for residential use where, for example, multiple applications within the same local authority area might, in fact, lie within different HMAs and thus have different potential implications as regards to local affordability, house prices and local commuting patterns.

7. Conclusions and Implications

The theoretical perspective views the housing markets as a layered system characterised as:

Tier 1: Framework HMAs defined by long distance commuting flows and the long term spatial framework with which housing markets operate,

Tier 2: Local HMAs defined by migration patterns that determine the limits of short term spatial house price arbitrage

Tier 3: Submarkets defined in terms of neighbourhood or house type price premiums.

The analysis here has been concerned with the top two tiers. The construction of the HMAs was based on a grouping algorithm derived from that used to define TTWAs. The hedonic analysis was originally devised to test and fine tune the specific geographies that were generated by the grouping algorithm but it proved to be an insufficiently powerful method.

The analyses first addressed the challenge of defining the upper tier, not least because these *Framework HMAs* are the more critical in terms of their policy application. The first approaches sought to define these areas using just one of the commuting and migration datasets, with fewer disadvantages found when the analyses used the commuting data (as the theoretical perspective would support). A new alternative approach involved using both datasets, and this too led to broadly satisfactory results.

The conclusions of this stage of the analysis are that a tiered approach to HMAs is not only theoretically sound but also offers important policy advantages. A tiered approach to policy sees the *Framework HMA* as providing the long term horizon for strategic planning encompassing projected household changes, transport connectivities, housing land availability, housing market change, urban capacity study and addressing major initiatives like growth areas. The *Local HMA* can be seen as the short term perspective in which planning also has to operate. Building new houses within a *Framework HMA* may not necessarily address supply shortage in a particular *Local HMA* directly in the short term but it is possible that new building in the long term can lead to a redrawing of migration patterns. To achieve this will require a sensitive approach to the location of such new housing taking into account transport networks for example and demands a focus on *Local HMAs* embedded within their *Framework HMA*.

The particular set of areas with an upper tier of *Framework HMAs* derived from 77.5% commuting closure analysis and a lower tier of *Local HMAs* based on 50% migration closure (Map 6) has emerged as the recommended geography after being considered on theoretical, technocratic and spatial planning considerations.

The derivation of a consistently defined national tiered geography of HMAs as set out here could facilitate LAs and key stakeholders to think more robustly in spatial terms beyond their own administrative boundaries and better recognise the reality and circumstance of local and sub-regional housing markets. From a spatial planning perspective, the adoption of a two-tier set of nationally-defined HMAs would provide for both a set of strategic

Framework HMAs, well suited to national analysis, inter-regional comparisons and regional/strategic sub-regional analysis, monitoring and spatial strategy development, as well as offering greater flexibility and robustness for a variety of analyses, monitoring, policy formulation and planning decisions at the sub-regional and local authority scale.

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