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*Urban Stud* 2002; 39; 549

DOI: 10.1080/00420980220112829

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# The Definition of Housing Market Areas and Strategic Planning

Colin Jones

[Paper first received, March 1999; in final form, August 2001]

**Summary.** The purpose of this paper is to develop the concept of a housing market area, thereby provide insights into our understanding of the sub-regional structures of the housing system and hence propose a framework for strategic planning research in the housing market. To tackle this task, it is first necessary to consider the criteria for a local housing market area. The paper begins by reviewing previous definitions by both academics and planners, and their underlying assumptions. Based on the principle of spatial arbitrage, a local housing market area is defined by reference to criteria linked to migration self-containment. Parallels are drawn with the principles that have been applied to define a system of spatial labour markets using travel-to-work areas. This spatial arbitrage definition is tested empirically by developing a system of housing market areas for west central Scotland using data derived from the Land Registry. Finally, the paper draws together the empirical findings to discuss the nature of spatial housing markets and the implications for strategic planning. It argues that the establishment of a geography of functional housing market areas represents the first step in the development of systematic planning research.

## Introduction

The purpose of this paper is to develop the concept of a housing market area, thereby provide insights into our understanding of the sub-regional structures of the housing system and hence propose a framework for strategic planning research in the housing market. To date, the focus of the economic analysis of the housing market has been either at the individual urban housing market or regional level. Maclelland and Tu (1996) note that there is a dearth of understanding of the structure and functioning of housing markets and no systematic research has been undertaken into the definition of local housing market areas (HMAs) within a sub-

regional context. This has important consequences for estimating concepts, such as supply elasticities, or testing practical planning issues. Empirical analysis has also suffered from the use of administratively convenient boundaries that are subject to arbitrary change and may not have any functional meaning within the housing system. Such an approach is likely to use mis-specified local HMAs or aggregated HMAs that could invalidate research conclusions or produce unexpected planning outcomes (Goodman, 1998).

Strategic planning for housing provision in Britain illustrates these issues. It is undertaken within a framework of sub-regional

*Colin Jones is in the Department of Building Engineering and Surveying, Heriot-Watt University, Riccarton, Edinburgh, EH14 4AS, UK. Fax: 0131 451 3161. E-mail: C.A.Jones@hw.ac.uk.*

strategic 'structure' plans within which planning authorities are required to assess future local housing land requirements. Current UK planning forecasts of population and hence housing requirements are normally based on National Health Service data on households moving to a new doctor in a Family Health Service area and lack any reference to tenure (Baker and Wong, 1997). In addition, structure plans in the UK generally analyse and allocate land acreage available for private housing development on the basis of individual authorities. This leads to criticisms of the underlying economics. Cullingworth (1997, p. 946) argues that there is

the total absence of economic analysis in planning which is particularly marked in the crucial area of land allocation.

This paper sets out to define a HMA using economic principles. The paper begins by reviewing previous definitions by both academics and planners. Based on the principle of spatial arbitrage, a local housing market area is defined by reference to criteria linked to migration self-containment. Parallels are drawn with the principles that have been applied to define a system of spatial labour markets using travel-to-work areas (TTWAs). This spatial arbitrage definition is tested empirically by developing a system of housing market areas for west central Scotland using data derived from the Land Registry. Finally, the paper draws together these findings to discuss the nature of spatial housing markets and the implications for strategic planning. It argues that the establishment of a geography of functional housing market areas represents the first step in providing the framework for the analysis of interurban housing market dynamics and the development of systematic planning research.

### **Previous Research on HMAs**

A range of academic studies have taken the local TTWA as the basis for a HMA; for example, the 1989 Joseph Rowntree housing finance studies of six UK cities was based on TTWAs (see Maclennan *et al.*, 1990). The

logic of this approach stems from the seminal work on urban housing markets led by Kain (1961), Wingo (1961) and Alonso (1964), followed by Muth (1968) and Evans (1973), which emphasised travel to the city centre as a key determinant of residential location. In what has become known as the access space model households trade off journey-to-work costs for housing expenditures. The implicit logic of these models is that the housing market is defined by the TTWA.

The access space model, as a long-term comparative static equilibrium model, provides a valuable insight into the structure of cities and housing markets. However, the necessary assumptions used to highlight these points also limit its practical usefulness as a tool to explain housing market dynamics and define a HMA explicitly. The model can be developed to incorporate sub-centres and other less restrictive assumptions, but suffers from the assumption of employment concentrated at a central location. This is potentially a most serious impediment to the application of the model where there is long-term decentralisation of employment from the city centre.

The requirement to define a HMA in the British planning system has been limited. Within the British structure (strategic) plan framework, individual planning authorities are required to assess the local housing land requirements, but only in Scotland are structure plans required to allocate land within a HMA framework. This requirement has evoked considerable debate in Scotland on the technical approaches undertaken to what is arguably a complex task that necessitates assessing local supply and demand with the statutory objective of achieving market balance. A systematic attempt was undertaken by the former Strathclyde Regional Council: in its 1988 Structure Plan Update, it identified 7 HMAs based on migration patterns. Strathclyde RC's approach was based on migration between district council areas (Strathclyde RC, 1994). Following local government reorganisation (and the abolition of Strathclyde RC), this essential method has been refined for the Glasgow and Clyde Valley 2000

Structure Plan. HMAs have been derived based on migration within the structure plan area between settlements and 11 'audit areas' (administrative sub-areas) of Glasgow (Glasgow and Clyde Valley Structure Plan Joint Committee, 1999).

This approach is criticised by MacLennan (1992) for not incorporating spatial market search analysis, as for example developed by Smith and Mertz (1980) and Smith and Clark (1982a, 1982b). He argues that sectoral and geographical search patterns by households indicate both the perceived structure of the local HMA and the localised nature of demand. Therefore, housing market search analysis has two important outcomes. First, it reveals where market pressure-points (i.e. where there is high demand relative to supply) exist. Secondly, it identifies the nature of area-based or housing-type latent demand, which is currently being crowded out or simply not provided for by the market. Unfortunately, his empirical analysis uses local authority administrative boundaries which severely limit the proclaimed benefits of search analysis (see also later).

Formal government advice on defining a HMA in Scotland is issued by the Scottish Office in *Planning Advice Note 38*; the most recent version was published in 1996 (Scottish Office, 1996). This advice has in fact changed the preferred research method three times since the early 1980s (Strathclyde, 1994). However, this note on estimating housing land requirements does not define a HMA. Rather it states that

These are ideally areas in which a self-contained housing market operates. A pragmatic test is that a substantial majority of people moving house and settling in an area will have sought a house only in that area (Scottish Office, 1996, p. 9).

This advice in itself is insufficient as the whole of the UK would meet this test. It also suggests that any empirical analysis requires some reference to housing search patterns but, by implying the use of local authority boundaries, it severely restricts the power of this approach. As advice, the note begs many questions.

This latest note advises local councils to refer to a research manual by a government agency, Scottish Homes (1993). This manual describes a HMA as a self-contained area. It notes that the labour market and its locational structure within a region are critical in shaping HMAs, although it recognises that these are not the only factors. It concludes

Thus, in terms of housing and labour markets a self contained housing market would be an area in which the majority of those moving house (migration), without changing jobs, would stay, and an area in which the majority of the employed population both reside and work (Scottish Homes, 1993, p. 20).

The logic of this analysis is that households will move to meet their individual domestic requirements as income changes or as they pass through the family life cycle without the requirement to shift employment.

The manual's practical advice is not precise; rather, it recommends the analysis of commuting and migration flows, plus an examination of migration in net terms. It adds that the boundaries should reflect household preferences rather than constrained choices of migration and commuting patterns. Ideally, it recommends the use of housing search analysis. The areal unit of analysis is not spelt out. However, it suggests that, in the absence of local knowledge to the contrary, the analysis begins by testing for self-containment using district council boundaries.

From a socio-demographic viewpoint Forster *et al.* (1995) partially review many of the difficulties in defining HMAs. They suggest a number of alternative approaches including defining a HMA from the vendor's viewpoint (i.e. the area in which a house might be marketed), search patterns, TTWAs and commuting costs, and environmental quality. The kernel of their ideas is the household migration decision and the role of life cycle. They emphasise that the extent of a HMA varies with different socioeconomic-demographic household groupings, but this leads to some confusion about the differ-

ences between sub-markets and HMAS. In their conclusions, they cast doubt on the utility of trying to define self-contained HMAs. While not providing a definitive solution to the problem, the authors suggest the use of GIS to develop multifactorial models of housing demand.

### Defining A HMA

The discussion above demonstrates that a number of ways have been applied to define HMAs. In general, they appear pragmatic, only partially coherent and suffer from the use of administrative boundaries as their unit of analysis. While the use of migration is the favoured practical policy approach, there is a lack of an explicit theoretical underpinning and doubts are expressed that such an approach can reflect constraints rather than choices. For these critics, the solution is the application of housing market search analysis. With this lack of consensus, it is important to review and assess the fundamentals of what we understand by a spatial market area. To achieve this task, this section first examines the spatial arbitrage principle, then the distinctions between the use of migration and search and between markets and sub-markets, and finally considers the practicalities of defining a HMA. Where relevant it draws on parallels in the labour market.

#### *Spatial Arbitrage*

Stigler and Sherwin (1985, p. 555) remind us that the fundamental definition of a market area by Cournot was that

A market for a good is the area within which the price of a good tends to uniformity, allowance being made for transportation costs.

This basic economic principle implies that for this to occur buyers can and do consider transactions at any point within the area to be an appropriate substitute and therefore that spatial arbitrage occurs. Stigler and Sherwin test for the extent of the market by reference to the similarity of price movements in dif-

ferent locations. (They examine the price differences between the commodity markets in Chicago and New York.)

While housing (and labour markets) are unusual in that it is the consumer who moves not the product, these essential tenets should apply to defining a HMA. However, Stigler and Sherwin's statistical approach is more applicable to a homogeneous product and difficult to apply to a heterogeneous durable product such as housing and labour (although possible). The definition of local labour markets has therefore not chosen this route (Coombes *et al.*, 1986). Instead, the concept of a TTWA based on commuting patterns has been developed to define a local labour market area. This is consistent with Cournot's underlying principle of the requirement for spatial arbitrage to exist: the TTWA is an area within which buyers and sellers of labour interact to establish wage rates (prices). However, one potential criticism of this approach is that it does not necessarily ensure the internal coherence that Goodman (1970) argued was an essential feature of a local labour market area.

Following this analysis, the guiding principle for the definition of a HMA applied here is an area within which spatial arbitrage applies. This principle implies the use of migration to define contained areas within which house prices are determined. Despite this, definitions of HMAs constructed in this way, as noted above, have been subject to continued criticism about the importance of market search. This debate about the role of market search has bedevilled the progress of research into local housing markets (although the issue has not impinged on parallel local labour market areas research). To clarify this matter, the paper now examines the distinction between migration and search within the operation of a housing market.

#### *Market Search Analysis*

Market search analysis sees search as the first stage in the household migration process within a heterogeneous housing market that

offers incomplete information on prevailing prices. The search process may be influenced by 'gatekeepers' such as estate agents and mortgage finance lenders. It can be seen as a series of (potentially) hierarchical stages—for example, through the narrowing of spatial focus over time or through initially receiving information on a wide range of available property to visiting a sub-sample. This process informs demand and can shape migration patterns. Ultimately, households, in the last step in this process, adjust their consumption of housing by moving house. Migration patterns therefore represent effective or revealed demand.

Search patterns as means of defining HMAs suffer from a number of problems. First, there are problems of practicability. There are a whole series of questions here. Which level of spatial search should be used, and how could such data be collected on a consistent basis? Should all search areas be weighted equally? How could variation in search processes (some households may only undertake one stage) between households be accounted for? To date, data on search processes have primarily been collected from households who have moved but this excludes those who searched but who were unable to move or did not find a home that met their requirements. The practical data requirements of deriving a HMA solely from search data are severe and probably prohibitively expensive, and this explains why a search-based HMA has yet to be developed.

Secondly, and the most overriding point is that, even if these problems could be overcome, would a search area be a housing market area? Let us take the example of a city and a satellite town, and presume that there are significant decentralising moves from the city to the satellite. If all the households who move to the satellite search only in that town, and HMAs are defined by search, then this will increase the potential of the satellite being defined a HMA in its own right. Such a conclusion ignores the underlying influences on search—for example, relative house prices and available house types

in the city and the satellite town. Furthermore moves between the city and its satellite will create spatial arbitrage: shifts in demand to the satellite could lead to a change in relative spatial prices. A search-based criterion could therefore define a set of HMAs that denies the underlying decision criteria, the interaction between city and satellite housing markets, and hence the existence of spatial arbitrage. This contradiction of the guiding principle of spatial arbitrage arises because search is seen as a process in isolation, not as only the first step in the migration process. It is not a transaction in the housing market in its own right.

The use of migration patterns to determine HMAs in the example above would define the HMA as the combined city and satellite consistent with the spatial arbitrage principle. Household migration is effective demand and therefore represents the outcome of the interaction of supply and demand. It is not a pure measure of the level of demand. This is the main argument against, and is illustrated by Evans (1990) who argues that planning constraints on supply in south-east England in the 1980s forced up house prices. Migration patterns in the south-east over this period do not measure the excess demand that forced up prices. Those households who were rationed or crowded out of the housing market are not included in the migration statistics (nor usually in search analysis); others, who searched and reappraised their options, are. The unsuccessful buyers are households who will presumably have searched the housing market before giving up. Whatever their reasons for the lack of success, there is no reason why (or evidence to show) the spatial search patterns of successful and unsuccessful purchasers should be significantly different.

Thus search is only the first stage in the migration process. It can be seen as a series of steps or stages and therefore suffers from severe practical problems in its systematic application to the definition of HMAs. More fundamentally, areas defined in this way do not necessarily meet the spatial arbitrage criterion necessary for a HMA. Household



migration patterns, while only measuring effective demand, provide the better measure of the spatial extent of a local HMA as they also take account of the essential tenet of spatial arbitrage.

### *Markets and Sub-markets*

With the acceptance of the use of migration patterns to define a HMA brings the requirement to develop a set of criteria required to identify such areas. If a settlement has an open migration pattern in the sense that it has high proportions of movers into and out of the area, then it is clearly not a HMA in its own right but part of a larger HMA. A necessary key to the spatial definition of a HMA is a high degree of closure or spatial containment. The logic of our definition also implies conversely that there is a lack of spatial arbitrage between HMAs which in turn implies no or minimal overlaps between HMAs. Following Goodman's comments on local labour markets, internal coherence within a HMA is a further potential criterion to be incorporated in a definition. Taken together, these criteria imply that such an area should at the very least be a settlement or contiguous group of settlements with a high degree of housing market self-containment, or that in-migration from the surrounding area is of only minor significance.

The issue of local housing market size also raises a number of questions. At one extreme, there is the question of whether a small settlement which satisfies the self-containment criterion can have enough transactions to really act as a market in its own right. At the other extreme, there is the query: can a large settlement be really only one HMA or can it be broken down into a series? Both these problems are related to the potential existence of sub-markets. Hence, in the first case it is possible that the small settlement might best be characterised as a sub-market of a larger neighbour.

Unlike HMAs, there is now a wide empirical literature on the existence of housing

sub-markets (see Watkins, 1998, for a review). The theoretical underpinnings for sub-markets have a similar starting-point to that for HMAs, but by definition are constituents of the latter. As a HMA must be at least the size of a settlement, sub-markets could occur in a large city, but the distinction goes beyond this semantic. Sub-markets can occur because the spatial arbitrage process within a HMA is constrained by market imperfections such as search costs, transaction costs, imperfect information and inelastic supply (caused by construction lags or planning constraints, for example). While there is considerable debate about the specific causes, there is agreement that this leads to the price of a standardised house differing in each sub-market. From this discussion, we can draw some conclusions: the concept of a sub-market is linked to substitutability of housing/spatial arbitrage within a HMA and there is the potential for sub-markets to change over time in the long term—for example, through new building and stock transfers from another tenure.

There are now standard accepted statistical tests for the existence of sub-markets first set out by Schnare and Struyk (1976), but these first require the use of criteria to identify potential markets to stratify cities. These tests are based on actual transactions and require detailed data on sales of individual housing units including their housing and neighbourhood characteristics and price. These tests require extensive data collection. However, there is no reason why a self-containment test as an alternative could not be applied to the existence of sub-markets in cities. Indeed Jones *et al.* (1999) have shown a close relationship between spatial sub-markets (satisfying the accepted statistical tests above) and intraurban migration patterns within Glasgow.

To conclude, the distinction between the definition of a HMA and a housing sub-market is not simply one of semantics. Both have their origin in the spatial arbitrage process but, while sub-markets occur because of constraints on the arbitrage process within a local market, HMAs are defined by the

existence of internal spatial arbitrage and the long-term absence of spatial arbitrage/substitutability between each other. This in turn implies that HMAs have a long-term stability whilst sub-markets could be temporary, depending on their cause. There is an established literature on the identification of housing sub-markets that applies statistical tests based on static housing market outcomes rather than processes. These statistical tests for sub-market house price differentials are very data-intensive and impractical except for one-off studies. An alternative outcome approach is the use of intraurban migration patterns that mirror the research method applied here. The identification of a HMA could incorporate two (potentially sequential) tests comprising migration containment and weak interconnection between areas. A third and subsidiary 'test' is the relationship with TTWAs: the discussion above with regard to the access space model suggests a close relationship between HMAs and TTWAs in which the former may be equivalent or embedded in the latter.

### *Practicalities*

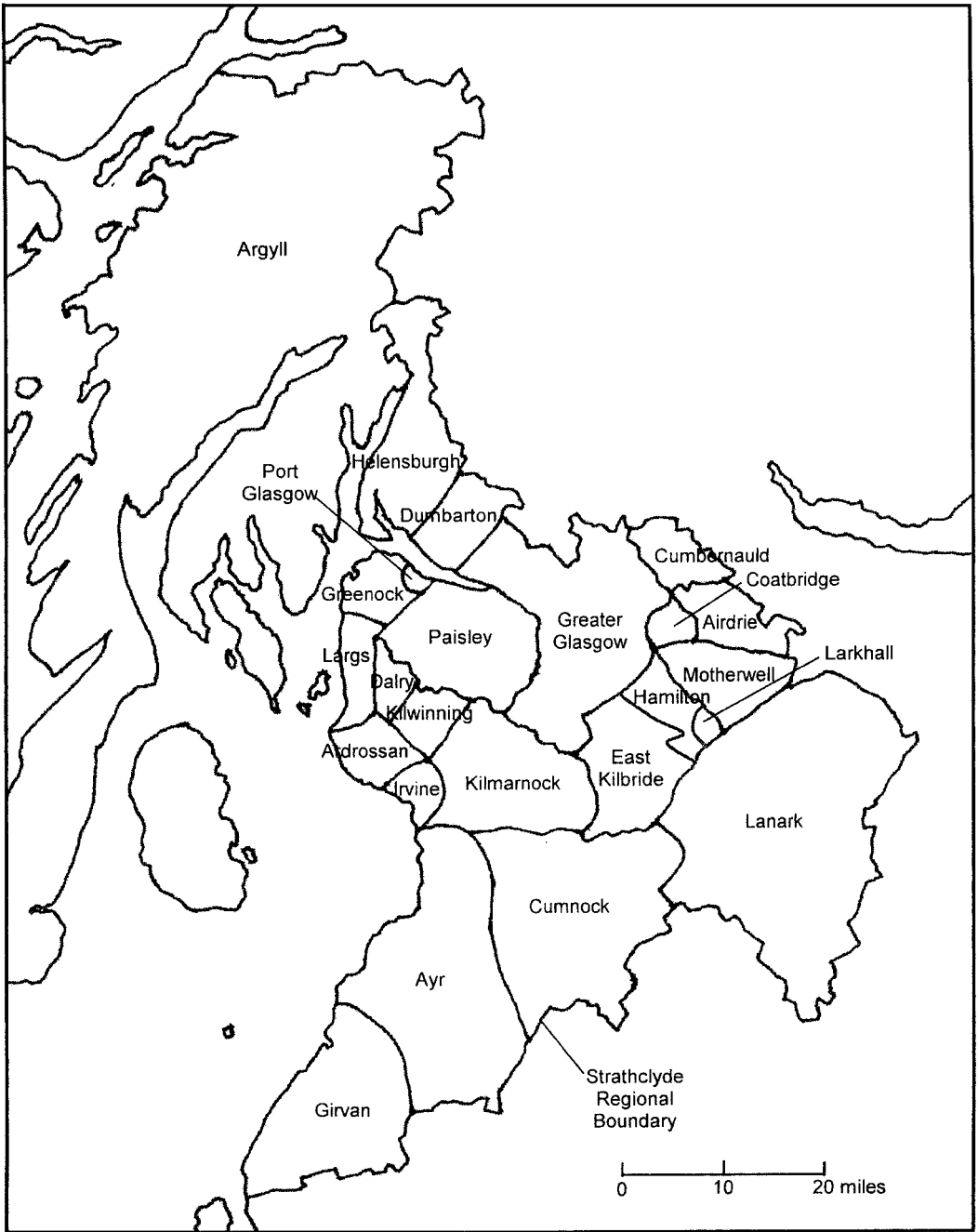
So far in this section, the paper has formulated the concept of a local HMA based on the principle of the existence of spatial arbitrage. This is translated into practical form through the analysis of migration patterns between settlements to identify self-contained areas. In this way, a theoretical concept is defined by reference to household behaviour. As 100 per cent self-containment in reality is impossible, the precise level of self-containment which ensures spatial arbitrage remains an unanswered question. To some extent, this can only be answered empirically. We can, however, receive some guidance on the scale of HMAs from the discussion in the previous section. The access space model for a uni-nodal town presumes perfect spatial arbitrage within a totally self-contained HMA that equates to a TTWA. In a multinodal city or urban system with dispersed employment there is still

likely to be a close relationship between HMAs and TTWAs in which the former may be equivalent or embedded in the latter. In other words, the vast majority of households will move within their existing TTWA. Those who move to another TTWA are likely to do so following a change of job necessitating a move.

Before proceeding to the empirical analysis, it is useful to draw on the parallels with the definition of a TTWA, and associated problems identified by Coombes *et al.* (1979). Housing markets and TTWAs in rural areas will be different from those in urban areas, and it is perhaps necessary to have flexible criteria to deal with this—for example, with regard to size and containment. The dynamics of urban settlement systems could ultimately lead in the very long term to changes in the definition of HMAs and the pattern of migration flows. To accommodate the impact of such change on the labour market, TTWAs have been periodically redefined, after a decennial census. These issues are not considered in the empirical analysis below, but are subjects for further research.

TTWAs represent the closest UK official approximation to local labour market areas (Coombes *et al.*, 1988). The official UK definition of a TTWA draws on the criteria of dominance and containment. The minimum size of a TTWA is a resident workforce of 3500 and to qualify a minimum of 75 per cent of journey-to-work trips to or from any TTWA both start and end in the area. For areas with labour forces of 20 000 or more, the self-containment criterion falls to 70 per cent (Coombes *et al.*, 1985). Based on these criteria, a map of TTWAs was constructed using a computer algorithm which grouped wards in England and Wales and postcode sectors in Scotland. The TTWAs are internally contiguous and the final map contains no overlapping areas and leaves no area unaccounted for. This research based on commuting does not discuss the impact of changing the size of the self-containment criterion as this paper does below (but see Coombes, 1997).





**Figure 1.** Fifty per cent + housing market areas in the former Strathclyde Region.

### Study Area and Data

The analysis is based on housing migration patterns within the occupied sector. The

spatial focus of the analysis is the area covered by the former Strathclyde Regional Council, less Argyll and islands (see below) shown in Figure 1. It covers almost half the

population of Scotland and hundreds of square miles. The area encompasses the Clydeside conurbation and a large number of free-standing towns. Settlements range in size from the city of Glasgow to small villages. As noted in the previous section, rural areas with their large number of small settlements and hence low levels of transactions need to be considered distinctly. To simplify our task, deep rural areas are excluded and so the research here does not consider Argyll or the islands, with the exception of Cumbrae. The area can be broadly defined as mainland west central Scotland.

The migration data are derived from the housing market database developed by the Land Value Information Unit (LVIU) at the University of Paisley. The LVIU records all property market transactions in Scotland based on information provided by the Register of Sasines. Each transaction record provides details of the address, type of property, sale price, date of registration, the origin of the buyer and a code which provides information on the nature of the sale (that is, whether the sale was new build, by a district council, to a property company, a part share and so on). The analysis is based only on 'pure' new and second-hand private house sales, ignoring all sales that appear to be non-market sales, including sales to sitting tenants and houses sold for less than £10 000. Ninety-five per cent of the origins of purchasers are known.

The data on migration cover the 10-year period 1984–93. The Scottish housing market was relatively stable over this period, avoiding the boom and bust of the late 1980s and 1990s experienced in much of the rest of the UK. The use of a 10-year average avoids any problems associated with possible short-term distortions. While absolute migration flows may vary from one year to the next, intersettlement spatial migration patterns—the focus of this research—are likely to be stable. In all, over 325 000 moves are analysed, representing one of the largest studies of housing market dynamics ever undertaken.

A major weakness of previous studies is

the use of local council administrative boundaries that are not only large units of analysis, but also do not necessarily have any functional meaning within the housing market. The estimation of TTWAs by Newcastle University used the finest areal units available—namely, postcode sectors in Scotland. The approach here is based on the grouping of settlements to establish HMAs. These settlements range in size from the city of Glasgow to small villages, equivalent to a postcode sector; their attraction is their internal coherence. Watkins (1999) and Jones *et al.* (2000) have shown how the city of Glasgow housing market can be decomposed into a system of sub-markets, but this is beyond the scope of this paper.

### A System of HMAs

From the discussion above, a HMA can be defined as a contiguous area comprising a settlement or group of settlements with a high degree of housing market self-containment, and where in-migration from outside the immediate HMA is of only minor significance. In the analysis below, it is the former principle that is initially applied, but the use of spatial containment, as noted earlier, to define a HMA requires a set of criteria. The theoretical analysis above reveals that there is no strict *a priori* theory to guide us on these issues. As household migration is not part of a daily urban system like commuting, it seems logical that the appropriate measure of containment should be lower than the 70 per cent applied to TTWAs. The initial benchmark of a HMA is taken to be 50 per cent of house purchasers moving within the area, but this is later relaxed. More formally, this 50 per cent criterion can be applied to the number of moves starting and finishing within an area's boundaries as a percentage of the total number of moves into that area. HMAs are also assumed to be contiguous areas.

The grouping of settlements is undertaken using an iterative algorithm, as set out in the Appendix. The basic principles within the algorithm are the test for a HMA noted

**Table 1.** Housing market areas in west central Scotland defined by a 50 per cent containment benchmark

	Market size <sup>a</sup>	Containment <sup>b</sup> (percentage)	Large migration inflows <sup>c</sup>
Dumbarton	8 309	62.6	Glasgow (5.3)
Helensburgh	5 935	56.3	
Paisley	33 914	60.6	Glasgow (11.5)
Dalry	690	51.7	Paisley (8.0)
Greenock	9 807	73.5	Port Glasgow (7.4)
Port Glasgow	1 321	62.2	Greenock (21.9)
Largs <sup>d</sup>	5 021	44.6	Glasgow (9.3)
Ardrossan	4 920	67.9	Kilwinning (5.3)
Kilwinning	2 208	50.1	Irvine (11.9)
Irvine	4 397	58.4	Kilwinning (5.3)
Ayr	20 562	59.7	
Kilmarnock	12 757	59.3	
Cumnock	1 897	59.4	
Girvan	1 084	54.7	
Glasgow	154 607	75.9	
East Kilbride	13 974	62.1	Glasgow (11.5)
Hamilton	9 210	59.5	Glasgow (5.1)
Larkhall	2 341	52.6	Hamilton (12.1)
Motherwell	14 373	59.5	
Coatbridge	3 675	64.2	Airdrie (12.5)
Airdrie	4 559	56.1	Coatbridge (15.3)
Cumbernauld	8 678	55.2	Glasgow (16.4)
Lanark	2 782	49.2	Motherwell (5.1)

*Note:* Excluding Argyll and islands.

<sup>a</sup>Market size is measured by the number of market transactions over the 10-year period, 1984–93.

<sup>b</sup>Containment is the percentage of purchasers moving within the HMA.

<sup>c</sup>5 per cent or more of purchasers are migrants from another HMA.

<sup>d</sup>Largs does not strictly qualify as a HMA on containment criteria alone.

above—i.e. 50 per cent containment—and that a settlement is paired with the settlement to which it has the closest migration inter-linkages. Settlements are combined into HMAs through a transitive linkage provided there is a minimum threshold of 5 per cent of local sales originating from another settlement. In this way, ‘open’ settlements are married to ‘closed’ settlements which already meet the containment criterion. This process of aggregation implicitly assumes that more ‘closed’ settlements are dominant. The algorithm does not allow for overlaps between HMAs.

Twenty-two HMAs are identified from this algorithm and these are listed in Table 1 and shown in Figure 1. The table reveals a range of types of HMAs which satisfy the 50 per

cent closure criterion. Glasgow is by far the largest with Paisley, the next largest, almost a fifth of its size. Some quite small settlements have closed housing markets. The most extreme are Dalry, Girvan and Port Glasgow, each with less than 1350 sales over the 10 years, although reference only to the scale of sales underestimates the size of these towns by ignoring the role of public-sector housing. Largs is listed as a HMA in Table 1 but does not formally meet the containment criterion. It has only weak migration links with surrounding areas and is essentially a residue of the algorithm. The largest source of its in-migration is people retiring from Glasgow.

If we now add the criterion, the lack of interconnection with surrounding areas, the

simple containment benchmark is augmented and can be rewritten as:

- (A) at least 50 per cent internal migration; or
- (B) in-migration from an adjacent HMA equivalent to less than 5 per cent of the market.

Based on these criteria the Largs area, a residue in the containment algorithm, would qualify as a HMA giving 23 (50 per cent + ) HMAs in all.

The basic algorithm is based entirely on a self-containment criterion and the results for the 50 per cent HMAs in Table 1 reveal still significant flows between HMAs especially from Glasgow to adjoining areas. Therefore, the HMAs do not meet the original second criterion set out above. Further detailed research shows that this out-migration from Glasgow is to adjoining settlements (rather than the HMAs as a whole). This suggests a little fuzziness at the edges of HMAs, and a different algorithm could include these within Glasgow. There are also still large pair-wise migration flows between the contiguous areas of Coatbridge and Airdrie, Greenock and Port Glasgow and, to a lesser extent, Kilwinning and Irvine. These flows are inconsistent with the principle of lack of spatial arbitrage between HMAs (the algorithm does not incorporate this criterion).

We now apply the two test criteria simultaneously—namely, the 50 per cent containment benchmark and in-migration from an adjacent HMA equivalent to less than 5 per cent of the market to derive a system of (50 per cent\*) HMAs. Analysis of Table 1 reveals 11 (50 per cent\*) HMAs (including Largs which does not quite meet these collective criteria), as shown in Figure 2. The Glasgow HMA now incorporates the surrounding areas within the Clydeside conurbation of Dumbarton, Paisley (including Dalry), Cumbernauld, East Kilbride, Hamilton and Larkhall. Girvan and Cumnock continue as small HMAs, but the criteria necessarily lead to the disappearance of the significant pair-wise migration interflows identified above. This system of (50 per cent\*) also broadly satisfies our third test

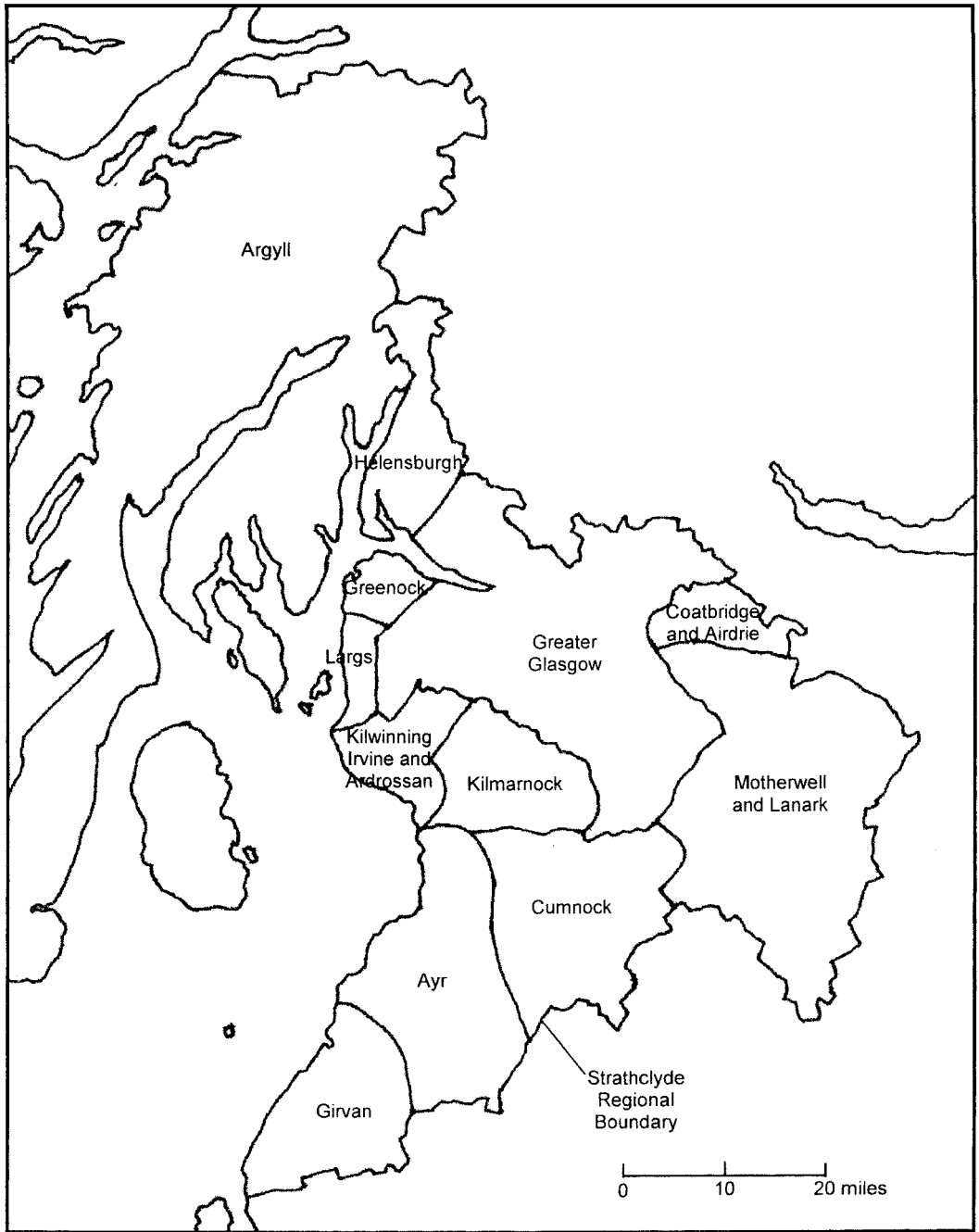
with respect to TTWAs; there are a number of minor discrepancies at the margins of the enlarged Glasgow HMA.

So far, we have defined a HMA by reference to the 50 per cent, 50 per cent + and 50\* per cent benchmarks, but this is not a hard-and-fast rule embedded in theory. It is possible to reapply and extend the algorithm to meet a criterion of 60 per cent, but Table 1 demonstrates that only a few areas would meet such a criterion and yet there would still be 1 strong pair-wise migration interflow. A 60 per cent\* definition would leave only 6 HMAs, less than the 9 TTWAs identified by the government within the study area. A 40 per cent benchmark would create at least 41 HMAs with many of the suburban satellites of Glasgow meeting this criterion but with significant flows between areas. Overall, the 50\* per cent benchmark best achieves our original theoretically driven criteria, while at the time best meeting our third test: a close (embedded) relationship with TTWAs.

These results provide useful insights into the open structure of spatial housing markets: 23 HMAs are identified in west central Scotland based on the simple 50 per cent + criterion, but this still leaves significant migration links between these HMAs defined in this way. This does not satisfy the second test. Extending the 50 per cent containment criterion to include weak interconnectedness reduces the number of HMAs to 11 and achieves our *a priori* theoretical understanding of HMAs. The region is dominated by the city of Glasgow and migration patterns appear to ensure an immediate house price spatial arbitration process which can encompass large areas. Yet there are also relatively small communities in rural areas and some free-standing towns which have relatively closed HMAs.

### Implications for Planning and Housing Market Research

These findings demonstrate that empirical housing market research derived from analysis based on local authority administrative



**Figure 2.** Fifty per cent\* housing market areas in the former Strathclyde Region.

boundaries or TTWAs could be inaccurate. The HMAs identified here do not in all cases conform to these areas. In many cases, local authority areas are either too large or oc-

asionally too small. The significance of this potential inaccuracy depends on the precise goals of the research. Examples include the potential mis-specification of sub-markets

and the inaccurate estimation of supply elasticities which are particularly dependent on the definition of the area/unit of study (see Pryce, 1999). Unfortunately, our analysis does not produce a distinctive pattern to provide definitive guidance for such research beyond the extensive nature of a city-wide housing market incorporating suburbia and contiguous towns, but even here care should be taken to establish the cut-off of the city HMA.

The research further demonstrates the potential for identifying a national system of HMAs that could be used as a framework for the analysis of the owner-occupied market linked to strategic planning. As with TTWAs and unemployment statistics/labour market analysis, they would provide a consistent geography for this task (Green, 1997). The establishment of a geography of functional HMAs would be the first step in the development of a nationally systematic approach to assessing future demand at a local level. Given the localised/neighbourhood nature of housing (MacLennan, 1992), such analysis would then need to be disaggregated to sub-market or settlement level set within the overarching framework of HMAs. This research would be combined with demographic trends and equivalent analysis of demand for other tenures, and would be incorporated in an assessment of local land-use requirements. In this way, a logically transparent research process could address the fundamental economics of the housing market (Jones and Watkins, 1999).

Whereas these HMAs have been derived by using the Land Registry in Scotland, it would be possible to derive them from social surveys or a census. Some local authorities in the UK already collect information for planning purposes using postal surveys. There is potential for using the approach here based on land registry data in the rest of the world. National land registration systems can be generally traced back to either the cadastral approach developed by Napoleon or the land registration method of Anglo-Saxon and English-speaking countries (Larsson, 1991). The cadastral system was originally map-

based and established for tax collection purposes and is ordered by owner's name. However, these traditional approaches are being transformed. Larsson (1991, p. 30) argues that

A general trend is that the original fiscal aspect of the cadastre is becoming less and less pronounced, while its role as the basis of a general land information system is assuming increasing importance.

Practically all European countries are seeking to establish computerised land records within a multipurpose geo-information system that has a recognised potential as an aid for regional planning. Some are further down this path than others and, in this process, the historical differences between systems are disappearing. Former British colonies are also beating the same path, although generally they are less advanced, including for example the lack of universal coverage. The major exception to this trend is the US, where the land registration system varies by state, and the dominant approach to land registration seems to be a private insurance solution (Larsson, 1991). It is not possible here to give a full review of the different systems, but it seems likely, with the exception of the US, that much of the developed world has or will soon have land information systems capable of undertaking equivalent research to that undertaken in this paper.

## Conclusions

To date, academic research has not adequately addressed the issue of interurban housing markets. Similarly, current planning techniques that analyse housing demand lack an economic basis and are applied to arbitrary administrative areas. This paper has sought to redress the balance in both these areas. The review of the theoretical underpinning of the concept of a HMA reveals a number of parallel strands of thought. Residential location theory implicitly defines a HMA as the surrounding TTA. Practical schemes for the identification of HMAs to date have emphasised migration patterns, but



in some instances also recommend the application of market search analysis. The use of search analysis is shown to be theoretically unsound as it is not based on market outcomes. Instead, it is argued that HMAs are created jointly by internal spatial arbitrage and by the lack of spatial arbitrage/substitutability between them. They are hence estimated from a combination of self-containment and lack of interconnectedness measured by migration patterns.

The paper derives a system of HMAs for west central Scotland using a simple algorithm which first groups settlements on the basis of migration patterns. It initially defines the spatial extent of a HMA by the area from within which the majority of buyers move—i.e. solely on the basis of 50 per cent self-containment. The addition of the weak interconnectedness criterion (< 5 per cent migration inflow from an adjacent area) reduces the number of HMAs from 23 to 11. The analysis sheds light on the open nature of spatial housing markets (another algorithm or a different weak interconnectedness criterion would have derived a marginally different set). Increasing the containment criterion to 60 per cent together with weak interconnectedness would reduce the number of HMAs to 6—less than the number of TT-WAS in the study area (our third test). Therefore, the favoured self-containment criterion is 50 per cent.

The results demonstrate that the region is dominated by the city of Glasgow and a HMA encompassing much of the Clydeside conurbation. Migration patterns appear to ensure a house price spatial arbitrage process that can encompass large areas. Yet there are also relatively small communities in rural areas and free-standing towns which have relatively closed HMAs. These findings also expose the weakness of housing research based on administrative boundaries, especially those based only on urban core authorities. In addition, the research establishes a method for identifying a system of HMAs for strategic planning research. The study is based on migration data from the Scottish Land Registry; an approach which could be

replicated elsewhere in the world either using social survey data, censuses or land information systems.

## References

- ALONSO, W. (1964) *Location and Land Use*. Cambridge, MA: Harvard University Press.
- BAKER, M. and WONG, C. (1997) Planning for housing in the English regions: a critique of the household projections and regional mechanisms, *Environmental Planning C*, 15, pp. 73–87.
- COOMBES, M. G. (1997) Travel to work areas: frequently asked questions, in: I. TUROK (Ed.) *Travel-to-Work Areas and the Measurement of Unemployment: Conference Proceedings*, pp. 13–32. Centre for Housing Research and Urban Studies, University of Glasgow.
- COOMBES, M. G., DIXON, J. S., GODDARD, J. B. ET AL. (1979) Urban systems in Britain: from theory to practice, *Environment and Planning A*, 11, pp. 565–574.
- COOMBES, M. G., GREEN, A. E. and OPENSHAW, S. (1985) New areas for old: a comparison of the 1978 and 1984 travel-to-work-areas, *Area*, 17, pp. 213–219.
- COOMBES, M. G., GREEN, A. and OPENSHAW, S. (1986) An efficient algorithm to generate official statistical reporting areas: the case of the 1984 travel to work areas: revision in Britain, *Journal of the Operations Research Society*, 37, pp. 943–953.
- COOMBES, M. G., GREEN, A. E. and OWEN, D. W. (1988) Substantive issues in the definition of 'localities': evidence from sub-group local labour market areas in the West Midlands, *Regional Studies*, 22, 4, pp. 303–318.
- CULLINGWORTH, J. B. (1997) British land use planning: a failure to cope with change?, *Urban Studies*, 14, pp. 945–960.
- EVANS, A. W. (1973) *The Economics of Residential Location*. London: Macmillan.
- EVANS, A. W. (1990) A house price based regional policy, *Regional Studies*, 24, pp. 560–567.
- FORSTER, E., ELLIS, S. P. and MCCLEERY, A. (1995) *Difficulties in defining housing market areas*. Paper presented to the conference *Social Change in the City and the Countryside*, Heriot-Watt University, June.
- GLASGOW AND THE CLYDE VALLEY STRUCTURE PLAN JOINT COMMITTEE (1999) *A Housing Market Area Framework for Glasgow and the Clyde Valley: Summary Technical Note*. Glasgow and the Clyde Valley Structure Plan Joint Committee, Glasgow.
- GOODMAN, J. F. B. (1970) The definition and analysis of local labour markets: some empiri-

- cal problems, *British Journal of Industrial Relations*, 8, pp. 179–196.
- GOODMAN, J. L. (1998) Aggregation of local housing markets, *Journal of Real Estate Finance and Economics*, 16, pp. 43–53.
- GREEN, A. (1997) Alternative approaches to defining local labour markets for urban and regional policy, in: I. TUROK (Ed.) *Travel-to-Work Areas and the Measurement of Unemployment: Conference Proceedings*, pp. 105–122. Centre for Housing Research and Urban Studies, University of Glasgow.
- JONES, C. and WATKINS, C. (1999) Planning and the housing market, in: P. ALMENDINGER and M. CHAPMAN (Eds) *Planning after 2000*, pp. 89–104. Chichester: John Wiley.
- JONES, C., LEISHMAN, C. and WATKINS, C. (1999) *Exploring linkages between housing submarkets: theory and evidence*. Paper presented at the RICS 'Cutting Edge' Conference, University of Cambridge, September.
- JONES, C., LEISHMAN, C. and WATKINS, C. (2000) *Structural change in a local housing market*. Paper presented to the American Real Estate Society Conference, Santa Barbara, California, April.
- KAIN, J. F. (1961) *The Journey to Work as a Determinant of Residential Location*. P-2489, Rand Corporation, Santa Monica, CA.
- LARSSON, G. (1991) *Land Registration and Cadastral Systems*. Harlow: Longman Scientific & Technical.
- MACLENNAN, D. (1992) *Housing search and choice in a regional housing system: new housing in Strathclyde*. A report to the Housing Research Foundation for the Scottish House Builders Federation, University of Glasgow.
- MACLENNAN, D. and TU, Y. (1996) Economic perspectives on the structure of local housing systems, *Housing Studies*, 11, 3, pp. 387–406.
- MACLENNAN, D., GIBB, K. and MORE, A. (1990) *Paying for Britain's Housing*. York: Joseph Rowntree Foundation.
- MUTH, R. F. (1968) *Cities and Housing*. Chicago, IL: University of Chicago Press.
- PRYCE, G. (1999) Construction elasticities and land availability: a two-stage least-squares model of housing supply using the variability elasticity approach, *Urban Studies*, 36, pp. 2283–2304.
- SCHNARE, A. and STRUYK, R. (1976) Segmentation in urban housing markets, *Journal of Urban Economics*, 3, pp. 146–166.
- SCOTTISH HOMES (1993) *Local Market Analysis and Planning in Scottish Homes: A Best Practice Guide*. Edinburgh: Scottish Homes.
- SCOTTISH OFFICE (1993) *Planning Advice Note PAN 38 Structure Plans: Housing Land Requirements*. Scottish Office Environment Department, Edinburgh.
- SCOTTISH OFFICE (1996) *Planning Advice Note PAN (Revised 1996) 38 Structure Plans. Housing Land Requirements*. Scottish Office Development Department, Edinburgh.
- SMITH, T. R. and CLARK, W. A. V. (1982a) Housing market search behaviour and expected utility theory: 1. Measuring preferences for housing, *Environment and Planning A*, 14, pp. 681–698.
- SMITH, T. R. and CLARK, W. A. V. (1982b) Housing market search behaviour and expected utility theory: 2. The process of search, *Environment and Planning A*, 14, pp. 717–737.
- SMITH, T. R. and MERTZ, F. (1980) An analysis of the effects of information revision on the outcome of housing market search with special reference to the influence of reality agents, *Environment and Planning A*, 12, pp. 155–174.
- STIGLER, G. and SHERWIN, R. (1985) The extent of the market, *Journal of Law and Economics*, 28, pp. 555–585.
- STRATHCLYDE REGIONAL COUNCIL (1994) *Structure Plan Review: Consultative Draft*. Department of Physical Planning, Strathclyde RC, Glasgow.
- WATKINS, C. (1998) The definition and identification of housing submarkets. *Aberdeen Papers in Land Economy* 98–10, University of Aberdeen.
- WATKINS, C. (1999) The definition and identification of housing sub-markets in Glasgow. Unpublished PhD thesis, University of Paisley.
- WINGO, L. (1961) *Transportation and Urban Land*. Washington, DC: Resources for the Future.

## Appendix. Housing Market Areas Algorithm

The algorithm is based on migration patterns within and between settlements. It follows a set of simple rules based on the predicate that if 50 per cent or more of purchasers originate from within a settlement area, then that area is a HMA.

If less than 50 per cent of purchasers of houses in a settlement area originate within its boundaries then it is amalgamated with another settlement(s).

For a given settlement, the process follows a stepwise procedure:

*Step 1.* Identify the adjacent settlements which account for at least 5 per cent of the origins of all purchasers within that settlement.

*Step 2.* If there is only one above the (5 per cent) benchmark, then the settlement is paired with that.

If there is more than one settlement above the benchmark, then the migration flows in and out of

the settlement from/to each of these settlements are summed. The settlement will be paired with that which gives the highest total migration flows between settlements.

If there are no settlements above the benchmark, then the above process is undertaken for all settlements.

*Step 3.* If one of the paired settlements is already a HMA, then the other settlement is incorporated in that HMA.

If a settlement is paired with another settlement which in turn is paired with a HMA, then it too is incorporated in the HMA.

Where a pair of settlements or group of pairwise linked settlements are not tied to a HMA, these settlements are combined into one entity and the HMA test is applied again.

*Step 4.* Settlements with an average of less than 10 sales per year are allocated to the adjacent HMA and the migration patterns recalculated.