THE ROLE OF MIX, DENSITY AND LOCATION OF NEW HOUSING IN ACHIEVING SUSTAINABILITY AND AFFORDABILITY

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Abstract

In the last decade housing and planning policies in UK have tended to result in a concentration of much new housing development in central and urban locations, with a marked shift towards more use of apartment development at higher densities. This paper examines the issues of housing type mix and density from the viewpoint of the key housing policy goal of 'affordability' and the key planning goal of 'sustainability', while also considering the essential practical requirement of economic viability. Building on hedonic house price models and models of development costs, the different patterns of price/value and cost and the resulting viability calculation are mapped across a selection of city-regions in England using a range of model housing schemes involving different mix and density. The affordability outcomes are assessed using estimates of local income distributions. Wider social sustainability outcomes are informed by relationships established on national and local survey datasets. In the light of these findings the scope and case for planning to shape the form of new housing development in different parts of the city regions, under different market conditions will be assessed.

1. Introduction

Densities of new residential development in England have risen sharply in the 2000s. Evidence for this, including regional and housing type mix dimensions of change, is given below.

This raises questions about what is driving this change, how far due to planning policy and how far to market forces; and how desirable it is in terms of not simply consumer preferences but also a broader set of sustainability criteria, both environmental and social. This research aims to shed some light on both the drivers and the evaluation.

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The relative profitability of different types of housing development, defined by the difference between housing sales values and construction costs, provides a strong indicator of the likely choices of developers, were they not constrained by planning. In addition, the relative value of homes in the market itself provides evidence of consumer evaluation of density, house type and related attributes in different contexts. We draw out the implications of our findings from hedonic house price models in respect of these variables.

Hedonic modelling is not the only source of evidence about people's evaluations of their residential experience and environment. Household survey questions about satisfaction with home and neighbourhood and concerns about neighbourhood problems provide another body of evidence (see for example Bramley & Power 2009, Bramley et al forthcoming). Arguably evidence of this kind is key to assessing 'social sustainability' of housing, because it goes beyond the immediate consumer satisfaction aspect to pick up the public and collective good aspects of community (Dempsey et al forthcoming).

The environmental sustainability of housing is most often assessed through the lens of the 'compact city' perspective (Jencks 1996), although this also draws on social and economic criteria. The dominant argument here is that compact cities, with a high density core and a lack of peripheral 'sprawl', are more sustainable because they entail less car-dependence, vehicle-km and associated carbon emissions. For this argument the locational aspect is critical, with higher density a means to reach the end of greater accessibility. However, social and economic benefits are also argued to arise from this structure, because access to services (social equity) is promoted whilst the economic viability of these services is at the same time underpinned.

However, house price levels and patterns are also relevant to another social policy concern, namely the concern about affordability, which may be seen as part of the equity aspect of social sustainability. Affordability is a concern because it affects people's ability to access the mainstream tenure of homeownership, and may affect their ability to obtain or retain any adequate housing. The affordability criterion cuts across the 'evaluation of residential quality' and the 'commercial viability' criteria, because higher house prices are inherently less affordable. From this point of view house prices appear as a double-edged sword. Balancing these different criteria, one is perhaps seeking a 'happy medium' position where prices are high enough to promote viability and indicate satisfaction, without being excessively high to the detriment of affordability.

But in some local and regional circumstances relatively high prices and residual land values may be unavoidable. It is in these circumstances that a further link between these values and affordability may become relevant. Local authorities in England increasingly use planning policies and associated 'Section 106' agreements to require developers to include a proportion of 'affordable housing' within their schemes, implicitly subsidized from residual land value. We do not pursue this particular issue much further in this paper, but the underlying modelling of prices, costs and residual values is relevant to this as well.

British planning policy and practice has always had a significant impact on typical housing development densities, although this influence has often been indirect and implicit, as much as through direct formal regulation or zoning. Just restricting the total amount of land available for residential development is likely to lead to market pressures to increase density, other things being equal. The 2000 edition of PPG3, following the Rogers report, placed greater emphasis on increasing housing density, alongside re-use of brownfield land, and this is carried forward (albeit in a more measured fashion) in the latest PPS3 (see below). More broadly, the planning emphasis of the last 15 years on 'compact' cities and towns inevitably points towards higher densities, as does much city centre/waterfront development and much regeneration/intensification of suburban residential areas.

Planning-influenced density/mix changes and their effects on market prices can be thought of as having two components, the direct and the indirect. The direct effect arises when planning regulation and other policies change the particular types of housing schemes which are proposed, permitted and built. Indirect effects arise via the macro-economic and wider market effects of the aggregate combination of local regulations and overall land and housing supply affect the overall level and trend of the housing market. To assess this second indirect effect you would need to operate with some form of macro economic and multi-sector model (e.g. such as the CLG/Reading Affordability model, Meen at al 2005, 2007), if not a fully fledged 'general equilibrium model', to allow for price changes in all the associated markets. It should be clear that this research does not attempt to assess this second category of wider macro and market effects (but see Bramley 2008).

The overarching questions addressed in this paper are

1. What is the optimal pattern of new development in terms of mix, density and location, from the viewpoints of sustainability and affordability?

2. How best to achieve this using planning instruments in a market-driven housing supply system?

As we see below, planners in England have considerable encouragement and several means to influence housing mix, density and location. However, we argue that they still face a number of inherent dilemmas in the way they act.

- Whether to promote compaction and eschew peripheral development, even where this reduces affordable opportunities

- Whether to promote high density apartment development to support affordability, arguably at the expense of longer term welfare and social sustainability

- Whether to promote medium density mixed schemes, which appear to optimise affordability and social sustainability, even where this is not the likely choice of developers (market optimum)

- Whether to allow significant development of low density, larger detached single-family houses, which are often favoured by market forces, and rely on filtering processes to help access and affordability for lower income groups

- How far to use 'planning gain' mechanisms (such as 'Section 106' in England) to deliver specifically 'affordable' housing, even though this may risk reducing the overall volume and pace of development

The remainder of this paper explores these issues and dilemmas in the English context. It starts with a brief review of the planning policy context and its evolution over the last two decades, before reviewing descriptive evidence on recent patterns of residential development. It then presents summarised findings from the application of hedonic house price models specifically designed to explore these issues in a range of city-region case studies. The patterns of market values revealed are discussed, before we move on to consider evidence on the costs of development. Cost estimates are brought together with the market values for a representative range of hypothetical housing schemes to reveal the relative viability/profitability (residual development value) of different options in different locations. The market value estimates are also used, in conjunction with local income estimates, to provide quantified indicators of affordability. Discussion of the findings brings out the point that the dilemmas sketched above are genuine, but play out in different ways in different city-regions and time periods.

2. Planning Policy

Planning policy through the 1990s took a progressively stronger stance in favour of 'sustainability', generally equated with more compact urban forms and also (in some versions) with mixed communities and mixed use. These themes were foreshadowed in the 1990 White Paper *This Common Inheritance,* whilst PPG3 (1992) introduced stronger policies on affordable housing and the re-use of brownfield land for housing, while still warning against 'town cramming'. PPG13 (1994) set out the role of planning in reducing CO2 emissions by managing travel demand, integrating land-use and planning and encouraging cycling, walking and public transport.

Meanwhile the JRF *Inquiry into Planning for Housing* (1994) recommended the re-use of urban land and increased urban densities, leading on to the Llewellyn Davies work on urban capacity. The Government's 'Sustainable Development Strategy' recommended more compact urban development. The 1995 Housing white paper *Our Future Homes: Opportunity, Choice, Responsibility* set out a target of 50% of new residential development on brownfield land, subsequently raised to 60% in the 1998 document *Planning for the Communities of the Future*.

The 1998 SEU Report '*Bringing Britain together'* foreshadowed a greater policy emphasis on regenerating poor and rundown urban areas, and taken together with the Rodgers Report (1999) *Towards an Urban Rennaissance* this signalled a further emphasis on urban (re-)development.

This was then reflected in PPG3 (2000), which introduced a 'new' approach to land allocation/availability, based on urban capacity studies which (for a while) replaced traditional land availability studies. The emphasis was on the re-use of land in urban areas, using a sequential approach to identify potential sites assessed against a number of criteria. In addition to the 60% brownfield target (which included conversions, and could be varied regionally), this PPG set out an overall density target of 30-50 dwellings per hectare and a parking maximum of 1.5 spaces per dwelling. This PPG was accompanied by design guidance '*Better places to live by design*'

However, from about 2003 the policy emphasis shifted again, paying more attention to housing supply and affordability issues, as encapsulated in the Barker (2003, 2004) Review. The ODPM (2003) *Sustainable Communities Plan* identified major growth areas and various funding mechanisms for land assembly and infrastructure. PPS3 (2006) replaces PPG3, and promotes housing development which provides: high quality housing; a mix of both market and affordable housing (tenure, price and type); housing in suitable locations; effective and efficient use of land, while maintaining the 60% target for brownfield land and the 30 dph national indicative minimum density (see esp. para 47).

3. Density Trends in New Development

Figure 1 and Table 1 describe recent trends in residential density, based on the Land Use Change Statistics (LUCS). This source enables previously used ('brownfield') land to be distinguished from land newly converted to urban use ('greenfield'), as in Figure 1. Figure 1 shows a sharp increase from about 2001, tending to level off after 2004. It also shows that the density level tends to be higher on brownfield land and that this difference became more accentuated by 2004. Since, during this period, the share of brownfield land in overall housing supply also increased from 53% in 1997 to 59% in 2000 and 72% in 2006, then it is clear that part of the increase in densities reflects this shift in the location and type of land used for development. Nevertheless, Figure 1 also underlines that density increased markedly within both categories of land.

Figure 1: Trends in new housing density by whether land previously developed

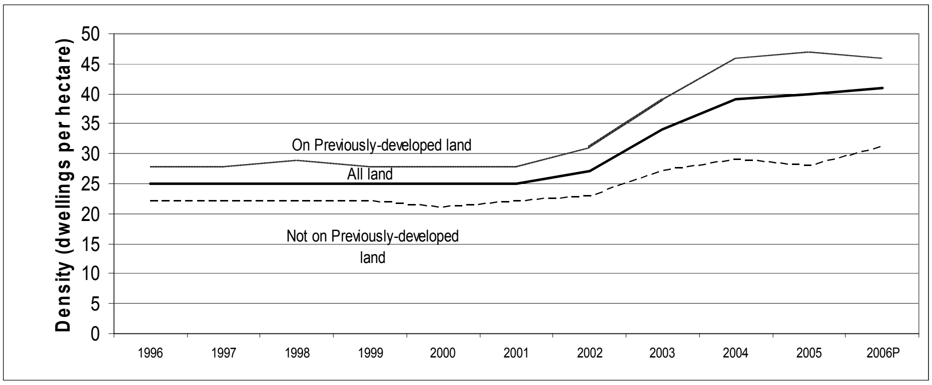

Table 1: Net Density of New Housing by Region 1996-2006
(dwellings per hectare)

Region	*1996*	*2000*	*2004*	*2006*
North East	27	24	32	43

North West	26	26	42	50
Yorks & Humber	24	22	32	41
East Midlands	22	21	35	34
West Midlands	27	24	36	43
South West	24	25	34	40
East of England	22	22	34	33
South East	23	24	37	38
London	56	56	97	84
England	25	25	39	41

Source: CLG Land Use Change Statistics

Table 1 shows the densities by region, before and after this recent upward shift. Up to the end of the 1990s densities had been remarkably stable at around 25 dwellings/ha and this level was found in most regions except London. Bramley & Watkins (1996) and Shepherd & Bibby (1994) discuss patterns in the preceding period, but broadly there was a stable picture going back into the 1980s. However, cross-sectionally, more urban areas, especially in London, built at higher densities, and higher densities were associated with a higher share of flats.

Table 2 presents a descriptive analysis of the patterns of density and the share of flats in new private housing developments, based on combining ward-level data from the Census, Land Registry and Emap-Glenigan housing sites database [*currently based on Glenigan 2004 data, not latest]. Wards with no new private building and no sites data are omitted. The first column shows the rate of new private building, the second shows the net dwelling density of new private housing sites, which may be compared with existing gross density in the next column. The proportion of new flats is shown for two recent time periods and compared with the existing share of flats. Provision of more flats is clearly a key corollary of building at relatively high densities, as is confirmed by the data in this Table.

Table 2: Density and Share of Flats in New Private Development by Wards Types
(wards in England with significant new private building)

	New Priv Build Rate % hhds	*Net New Priv Bldg Density*	*Existing Gross Density*	*Propn Flats % 2000-04*	*Propn Flats % 2005-06*	*Existing propn Flats %*
Gross Density Band						
<15 DPH	0.65	41.5	9.5	21.3	23.8	6.9
15-30 DPH	0.41	63.8	21.2	38.2	46.8	14.3
30-60 DPH	0.34	103.5	40.5	68.4	76.0	36.0
>60 DPH	0.35	141.0	79.2	87.4	89.6	72.3
Deprivation Band						
Worst 10%	0.40	98.5	34.3	60.3	58.3	27.9
10-20%	0.41	94.9	36.5	53.9	64.0	31.9
30-40%	0.40	79.6	30.0	45.7	54.0	23.2
40-60%	0.45	66.5	23.0	39.6	47.0	16.9
60-80%	0.50	57.9	17.2	35.4	41.4	13.7

Least Depr	0.55	49.0	14.5	32.1	37.6	10.5
Urban-Rural Type						
Central London	0.47	152.0	79.2	92.1	95.0	82.9
Inner London	0.32	125.6	53.5	81.5	86.0	59.9
Outer London	0.25	93.6	32.4	66.6	72.6	33.6
South city centre	0.50	79.6	34.0	59.4	70.2	32.2
South other urban	0.50	64.8	21.0	41.1	50.0	17.0
South town fringe	0.56	39.9	11.4	21.1	24.1	9.7
South village isol	0.47	29.1	3.8	23.8	13.6	4.7
Mid-North City Centre	0.52	94.2	29.9	58.4	65.5	20.5
Mid-North other urban	0.44	57.5	20.2	29.6	38.3	9.4
Mid-north town fringe	0.64	38.7	10.7	15.7	15.7	5.2
Mid-north village isol	0.63	31.9	3.0	18.3	8.4	3.3
England	0.46	69.0	23.8	41.1	48.1	18.5

Note on Sources: Col. 1, 4, 5 Land Registry; Col 2 Emap-Glenigan housing sites database 2004; Col 6 2001 Census.

New private build densities average 69 dwellings per ha net, which is 2.9 times existing gross density (but allowing for the typical share of land in residential use, these figures are not very different). It is also much higher than the figures recorded in LUCS, as given in Figure 1; the difference probably reflects a combination of: (a) Glenigan data being biassed towards larger volume builder sites; (b) measurement differences, in terms of treatment of ancillary land uses; (c) the pipeline of new sites under development in 2004 was even more biased toward higher density than the sites actually generating output during this period.

The relationship between new build net density and existing gross density applies in all categories, but to varying degrees; relative intensification appears to be greater in the least dense areas, but these are likely to be wards containing open land and other land uses. Densities obviously peak in central London and other city centres, but it is interesting to note that in urban fringe locations the new densities are just under 40 dwellings/ha, which is what current policy recommends. Only in village/isolated category is there an average as low as 30.

Nearly half (in percentage of units) of recent new private build has been of flats, and this has been on an increasing trend. Flats obviously take a higher share in denser and more urban locations, and the proportion of new flats exceeds the existing proportion of flats in all areas. Whether such a high proportion of flats is desirable or sustainable is one of the questions raised by recent trends.

Overall, linking trend data to the policy evolution, one can say that the policies of the late 1990s – brownfield and urban emphasis, and higher densities – have been successfully achieved. Indeed, it might be argued that they have been over-achieved.

4. Hedonic house price models

In this section we present key findings from a hedonic model of house prices focusing upon location, mix and density effects. The data source is the Regulated Mortgage Survey (RMS) covering most mortgaged transactions in UK for the years 2005-2007 at individual transaction level (approx 1.7 million observations). This data, which includes individual dwelling attributes and sale prices, has been matched to Census data for the smallest possible unit (Census Output Area, COA) to obtain a series of physical and socio-demographic, including among other features house type mix, household types and gross dwelling density. Using GIS software additional location and neighbourhood variables have been added, including data from OS Mastermap as contained in the National Land Use Database (NLUD), also now available at COA level. This enables the calculation of shares of land used for residential buildings, gardens and other land uses.

A preliminary model simply testing the basic relationships was established on the full national dataset. Further models were then developed, disaggregated geographically to focus on a selected number of city regions.

The basic hedonic model to be estimated can be generalised as:

$$P = \propto + \beta_1 S + \beta_2 E + \beta_3 N + \beta_4 D + \beta_5 M + \varepsilon$$

where:

P	sales price of house;
S	structural attributes and market conditions;
E	socio-economic characteristics;
N	ethnic mix
D	residential density of census area;
M	house type mix of census area;
A	accessibility measured e.g. by distance from CBD

Many factors influence price other than location (A), density (D) and mix (M), so the variable groups S, E and N are included to control for this

We use a standard hedonic price model. a semi-log is a common form of such a model, so we specify the dependent variable as the log of sale price; in fact this also fitted the data better than obvious alternatives. . STATA 9.2 was used for the model estimation (see StataCorp, 2007).

The initial national model produces an adjusted r-square of 0.68 (interpreted as 68% of house price variation explained). The control variables generally fall within a priori expectations. For example, the results indicate that prices have risen between 2005 and 2007, detached properties sell for a premium and larger properties (as proxied by number of bedrooms) achieve a higher sale price, all things equal.

The following sub-regional areas (local authorities in brackets) are examined further with respect to density and mix effects. These are intended to represent in each case a city region with a sector or wedge of component areas running from the central to an outer suburban/peripheral area, although in practice this is easier to achieve with smaller cities like Southampton than with London or the larger cities.

i. London North East (Redbridge, Waltham Forest and Hackney)
ii. London South West (Hammersmith and Fulham, Hounslow and Richmond upon Thames)
iii. Manchester (Manchester and Salford)
iv. Leeds
v. Nottingham (Nottingham and Rushcliffe)
vi. Southampton (Southampton, Eastleigh, Test Valley)

The location of these areas is shown in Map 1.

The housing data sample for the six case study areas is in total 90, 666 transactions. This sample size resulted after a data clearing exercises, in which 6666 transaction were dropped, 6.8% of the data. These transactions either have an unreasonably low selling price, below £20000, or refer to council tenants exercising their right to buy or there are missing data about the house type (e.g. detached, flat).

The Breusch-Pagan (Breusch and Pagan, 1979) and White tests (White, 1980) for heteroscedasticity reject the null hypothesis of homoscedasticity at the 99% for all models. White's correction of standard errors (robust HC3) was initially employed to address this issue. However, most of the variables come from census data and refer to a certain census output area (COA), hence not all variables are independent across all the observations. Therefore, the COA was specified as the cluster, running regressions with robust clustered standard error correction, treating only observations in different COAs as truly independent (see StataCorp, 2005; pp: 46-47, 53-54). This estimation procedure affects the standard errors (t-stats and confidence intervals), just as White's correction, but it does not affect the magnitude or sign of the coefficients. The clustered estimation was selected, because the few coefficients that had the wrong sign did not show as statistically significant in the "cluster model".

Variance Inflation Factor (VIF) is used to detect collinearity (Chatterjee et al. 2000, Gujarati 2003). Initially there were collinearity problems with the various socioeconomic data that were derived through census data and expressed as percentages (VIFs higher than 5 I some cases). Therefore the socioeconomic and other area variables expressed in percentages were converted into dummy variables (except unemployment rate and student population). These dummies identified areas which were 'dominated by' or had a relatively large proportion of particular population group (e.g. high social class) or dwelling type. This addressed the multicollinearity concerns and the mean VIF did not reach 2 (and no variable VIF was higher than 4) in any of the models. The dummy variable treatment was also applied to house type mix, distinguishing COAs that were dominated (>50%) by detached houses, terraced houses, flats, or no single type group.

For density, the physical measure of gross dwellings per hectare was used, this fitted the data better than other density measures. However, additional variables were created as the percentage of the total land used for domestic purposes, and the share of this land used as garden space.

The overall fit (r-squared) of the final subarea models range from 0.54 (London NE) to 0.70 (Nottingham). Table 3 below focuses on the relationship between house price, density and mix. The results are interesting and mainly consistent with what is suggested by the literature review and practical experience.

The effect of density is negative in all areas, controlling for individual house type and predominant area mix and for area socio-demographics. The marginal effects for density in £ are larger in the smaller cities than in the larger cities (London and Manchester). So although in simple descriptive terms prices may be higher in denser areas, the market valuation of density per se is generally negative. The effect for share of land in residential use is positive in all cases, with larger values in London. This indicates that people value 'residential' areas more than mixed use areas. The effect for share of gardens is, however, negative, particularly in London, which may seem counterintuitive. We interpret this as proxying areas which are more 'suburban' in character, where underlying land values are lower

The effects for house type mix are also largely as expected. Areas dominated by detached dwellings have generally higher values than areas dominated by semi-detached dwellings, except in Leeds and Manchester. Areas with predominantly terraced property have lower values (the same direction as the individual terraced house effect). Areas with no overall type dominance (i.e. more mixed areas) have generally higher prices, although this is not significant in some cases. However, areas with a predominance of flats have higher values in all cases (even though the coefficient on individual flats is negative). Again, we interpret this as indicating areas of generally high land value.

Apart from the implicit effects associated with predominant house types, location is also represented in the model by distance from the nearest major retail/service centre (CBD). Interestingly, the coefficient on this variable is negative in some case study areas (Nottingham, Manchester, London NE and London SW) and positive in others (Southampton, Leeds). Although the classic urban economic model predicts negative coefficients on distance, this is not always borne out under modern conditions, in this dataset and in some other studies. One interpretation may be that the wider area social and environmental status of different locations within our case study 'wedges' may differ significantly, so that in Southampton and Leeds it is the more peripheral areas which are generally favoured in this respect.

The models may be used to generate predicted values for a 'standard house type' (3 bed semi being the default case). Two variant predictions may be compared, one assuming no dominance of particular socio-demographic characteristics, and the other allowing for the actual patterns of dominance in these cases. These standardized dwelling prices may be compared with the actual observed and predicted prices for the whole sample of transactions. Where actual prices are above standard prices, this indicates that the predominant mix of dwellings traded in that area is of higher quality and size (offering more 'housing services') than average, and vice versa.

Table 4 shows the resulting standard and actual prices and their relationship, dividing each case study area into distance from CBD bands. This shows some differences between the city regions. In Leeds, Nottingham and Southampton, actual prices tend to be above standard prices, indicating that the average size and quality of housing is higher in these cases, whereas it tends to be lower in Manchester and London, especially the NE sector of London. In the latter cases, there is not much variation in this ratio across the distance bands. However, in the former cases there is a definite tendency for the ratio (indicating relative quality/size) to be markedly higher in the more peripheral locations. The table shows the much higher absolute price levels in London, and the rather lower general level of prices in Nottingham and Leeds. These general price levels are significant when we come on to consider costs and viability below.

Table 4: Predicted Standard Dwelling Prices Compared with Actual Prices by Location

Location	Std 3BS No Dom	Std 3BS Act Dom	Pred Price	Act Price	Ratio Act: Std
Leeds					
<2km	146,521	152,005	136,180	150,217	1.03
2-5km	144,919	153,417	137,233	144,480	1.00
5-10km	170,370	172,523	169,834	174,262	1.02
>10km	229,148	211,361	262,282	286,342	1.25
Total	165,652	168,481	164,918	172,084	1.04
Nottingham					
<2km	132,937	156,115	123,626	131,238	0.99
2-5km	140,444	151,387	150,491	160,170	1.14
5-10km	125,238	137,598	141,946	139,080	1.11
>10km	121,475	119,559	219,322	240,983	1.98
Total	133,043	144,753	151,386	158,357	1.19
Manchester					
<2km	200,013	192,464	169,603	182,407	0.91
2-5km	156,370	166,253	132,432	137,000	0.88
5-10km	143,029	146,018	125,950	131,724	0.92
Total	164,067	168,736	139,841	146,514	0.89
Southampton					
<2km	186,400	188,594	168,012	179,500	0.96
2-5km	189,237	191,069	181,814	181,600	0.96
5-10km	211,870	207,268	229,239	239,236	1.13
>10km	226,222	217,756	290,271	338,434	1.50
Total	199,837	198,593	204,807	213,850	1.07
London NE					
<2km	335,724	366,999	247,342	262,820	0.78
2-5km	328,738	340,900	255,202	261,570	0.80
5-10km	307,693	310,187	253,050	262,427	0.85
Total	324,482	338,713	252,597	262,132	0.81
London SW					
<2km	472,974	439,293	407,100	441,899	0.93
2-5km	372,113	355,156	322,949	349,753	0.94
5-10km	252,595	257,799	225,380	234,507	0.93
Total	418,088	393,571	361,366	391,592	0.94

Model Schemes

We go on to use these hedonic price models to predict the prices which would be expected to be realised on the production of a number of distinct model new housing schemes in these different locations. These schemes are intended to capture the typical variations found within existing and new housing developments in English urban areas, drawing on the actual data. Predicting values for these schemes is facilitated by assuming that a typical new scheme would be similar in size to an existing COA (about xx dwellings/households). In this way we can make use of the calibrated effects of density and type mix dominance measured at this spatial scale. The four schemes considered are as follows

1. A development of detached 4-bedroom houses at a net density of 25 dwellings/hectare (gross density 10 DPH, share of residential land 40%, gardens share 80%; 'detached dominant')

2. A mixed development comprising 30% detached 4-bed, 40% semi 3-bed, 30% terraced 3-bed, with net density of 40 DPH (gross density of 15 DPH, residential share 37%, gardens share 75%, 'no overall dominance')

3. A mixed development comprising 60% terraced 3-bed, 40% flats 2-bed, net density 70 DPH (gross density 28 DPH, residential share 40%, gardens 60%, 'terraced dominant')

4. A development of 2-bed flats at a net density of 110 DPH (gross density 33 DPH, residential share 30%, gardens 50%, 'flats dominant')

We estimate the sales values expected to be achieved for each house type in each of these developments at every location in our database, assuming no dominance of particular socio-demographic characteristics, and look at the resulting averages by distance band in each case study area. It should be remembered that the hedonic models used are separately calibrated for each city region.

5. Cost Model

We have also developed a cost model to estimate the cost of building the different model schemes in the different case study locations. This model draws on a different database, assembled by the organisation Emap-Glenigan, which collects data on most of the larger housing development sites in the country from planning files maintained by the local authorities. This database contains a range of details of the schemes including number of housing units, site size (from which net density may be calculated), the proportion of flats, the maximum storey height, location (grid references), and key dates (of planning application, start and completion). The key variable for this exercise is an estimate of the contract value of the construction cost; dividing by number of units we have a figure for unit construction cost. To this database we have attached contextual information at local authority and neighbourhood level, from census and other sources as used in the hedonic price modelling, including local authority level average earnings and unemployment rates, and ward level gross densities and shares of dwelling types as well as some socio-economic indicators.

The model developed here follows similar lines to one previously tested and reported, using earlier Emap-Glenigan data, in Bramley & Leishman (2006). In order to include most of the observations in the analysis it was necessary to impute values for certain variables which were missing in quite a lot of cases, particularly site density and maximum storey height. In the latter case this was simply inferred from the proportion of flats. In the former case an auxiliary regression model was used to predict site net density from ward characteristics including gross density. High outliers on the unit cost variable were also excluded.

The regression model to predict costs is shown in Table 5. The functional form of this model is linear with the dependent variable expressed in £ per unit, and the regression is weighted by relative size of site. 18,674 sites are included in the analysis.

Table 5: Regression model for unit construction costs at site level fitted for major housing sites in England 2005-2008

Variable	*Coefficient B*	*Standard Error*	*Std Coeff Beta*	*t stat*	*Signif.*
(Constant)	77371.7	2858.249		27.070	0.000
compdens	-26.9	8.246	-0.046	-3.264	0.001
sizewgt	-553.3	21.844	-0.220	-25.332	0.000
pflat	-143.9	6.386	-0.218	-22.536	0.000
storeys2	681.7	42.716	0.141	15.960	0.000
workmths	797.0	21.299	0.336	37.419	0.000
mne05	-19.3	3.458	-0.056	-5.578	0.000
asunem06m	-701.8	148.123	-0.043	-4.738	0.000
centlond	14014.3	2269.179	0.059	6.176	0.000
othlond	7382.1	927.122	0.079	7.962	0.000
wpflat	218.1	19.065	0.145	11.442	0.000
wpter	138.0	17.456	0.069	7.907	0.000
wddens	-119.6	29.309	-0.056	-4.080	0.000
pgreenw	-6.4	13.197	-0.005	-0.483	0.629
pprfmg01	-408.5	88.590	-0.060	-4.611	0.000
psusk01	-463.9	57.549	-0.098	-8.060	0.000
ay2005	2196.5	736.033	0.025	2.984	0.003
ay2006	4893.0	706.285	0.060	6.928	0.000
ay2007	3840.8	693.557	0.048	5.538	0.000
ay2008	-309.9	694.165	-0.004	-0.447	0.655

a. Dependent Variable: unitval

b. Weighted Least Squares Regression - Weighted by sizewgt

Model Summary

Model	R	R Square	Adj R-Sq	S E Est
1	0.413	0.170	0.169	29575

	Sum of Squares	df	Mean Square	F	Sig.
Regression	3348000000000	19	176200000000	201.4	.000
Residual	16320000000000	18655	874700000		
Total	19670000000000	18674			

Variables compdens to wrkmths are site level measures, including imputed values for compdens and storeys2 where necessary. Variables mne5 and asunem06m are local authority level measures of average earnings and unemployment rate. ‘centlond’ and ‘othlond’ are dummies for central London and the rest of London. Variables wddens to pgreenw are ward level measures of urban form, while pprfmg01 and psusk01 are socio-economic class shares at ward level. Ay2005 to ay2008 are dummies for year of application, assumed to be the most relevant date for the contract value variable.

The model is not particularly good in terms of overall fit, suggesting considerable variation in unmeasured quality of schemes as well as estimation error in the contract value. Nevertheless, most of the coefficients have effects in the expected direction. So the model suggests the following effects on unit costs:

- Site density - mainly negative in parsimonious models, log or linear Quite small beta
- Site size (sizewgt, centred on 1.0) - mainly negative, larger sites have lower unit cost; quite large effect
- Percent flats (in scheme) - large negative effect
- High max storeys – substantial positive effect
- Duration of works (workmths) - substantial positive when included (proxy for more complicated schemes, or more up-market schemes maybe?)
- Earnings (mne05) - unstable, varying sign, depending on what else in model – not very large effect
- Unemployment (asunem06m - core age group, wider HMA level) negative in some models, not very large effect.
- Central and other London – positive when included
- Ward level % existing flats - positive, quite big effect
- Ward level % existing terraced - smaller positive effect
- Ward level % greenspace - small negative or not stats signif
- Ward % professional managerial - signif negative, don't know why, may proxy 'suburban'
- Ward % semi/unskilled - signif negative, more as expected.
- Application year dummies - mainly positive relative to 2004, but peaking in 2006
- House price (secondhand semi, ward) - either positive or nss (excluded in final model here)

This model is then used to generate predicted unit costs for each of our four model schemes in each of our case study areas, broken down by location in terms of distance from CBD. The results are shown for three selected case study areas in Table 6. The differences between the case study areas are relatively small, although as expected the London costs are significantly higher. The differences between the schemes seem to be mainly driven by the proportion of flats. Costs are higher in the most centrally located distance band, falling in the intermediate bands, but tending to rise again in the more peripheral bands (this is more pronounced in London).

This cost model is admittedly crude and would be improved if it could take greater account of house type mix and house size in the different schemes[2]. However, it seems reasonable as a first approximation.

Table 6: Basic unit construction cost by scheme modelled for selected case study areas by distance from CBD 2007

Location	*Act Ave*	*Scheme 1*	*Scheme 2*	*Scheme 3*	*Scheme 4*
Leeds	unitval	prcost1	prcost2	prcost3	prcost4
<2km	52,381	89,061	88,658	83,455	75,103
2-5km	50,000	77,853	77,450	72,247	63,895
5-10km	55,000	77,584	77,181	71,978	63,626
>10km	71,429	78,845	78,441	73,238	64,886
Total	53,846	78,222	77,818	72,615	64,263
Southampton	unitval	prcost1	prcost2	prcost3	prcost4
<2km	53,333	95,232	94,829	89,626	81,274
2-5km	54,545	80,854	80,451	75,248	66,896
5-10km	55,000	79,768	79,365	74,162	65,810
>10km	55,000	79,670	79,266	74,063	65,711
Total	54,545	80,854	80,451	75,248	66,896
London NE	unitval	prcost1	prcost2	prcost3	prcost4
<2km	55,172	90,983	90,579	85,376	77,024
2-5km	59,091	88,857	88,453	83,250	74,898
5-10km	62,404	90,723	90,319	85,116	76,764
Total	60,000	90,022	89,618	84,415	76,063

In order to get from this cost model to a viability (residual development value) figure for each scheme and location, it is necessary to apply certain markups, for example to allow for professional fees, marketing, financing, normal profit and typical development obligations. The markups used here are those used in Bramley & Leishman (2006), and were based on work by our consultant partners (Three Dragons) in site viability modelling in a series of local studies, where the assumptions were validated in discussion with private and social developers. Bramley & Leishman showed that these assumptions generated residual values consistent with official estimates of housing development land values by region in England in the early 2000s. The markups used were 8% of construction cost for fees, 30% of market value for marketing, finance and profit, and 33% of residual value for development obligations (including contributions of land and money for affordable housing, community infrastructure and open space).

[2] In a further iteration of the research it is intended to work with consultants using a more detailed scheme costing model to take fuller account of this mix effect.

6. Viability

Given the costs and markups, it is then possible to generate a residual value for each scheme in each location. This is expressed as a value in £ per hectare in 2007. The values are shown in Table 7 for all the schemes and case studies/distance bands.

Shading is used to indicate the relative viability, based on residual value: green cells are the most viable/profitable schemes for each location, blue are the second most viable/profitable, and pink shading indicates schemes which, on this test, are non-viable in an absolute sense (negative residual value)

Table 7: Modelled Residual Development Value by Scheme, Case Study Area and Location 2007 (£ per hectare)

Leeds	Scheme1	Scheme2	Scheme3	Scheme4
<2km	1,079,720	604,182	-191,761	-689,873
2-5km	1,445,461	1,120,616	620,375	522,539
5-10km	1,743,225	1,473,486	1,073,245	1,119,535
>10km	2,397,474	2,234,692	2,024,763	2,349,750

Nottingham	Scheme1	Scheme2	Scheme3	Scheme4
<2km	1,687,973	1,127,259	205,229	2,173,514
2-5km	1,710,808	1,217,470	431,867	2,489,495
5-10km	1,480,967	989,783	212,867	2,040,542
>10km	1,087,663	555,705	-296,660	1,093,779

Manchester	Scheme1	Scheme2	Scheme3	Scheme4
<2km	1,979,788	1,446,456	1,021,293	2,800,911
2-5km	1,587,508	1,092,726	682,611	2,184,723
5-10km	1,258,882	755,482	285,417	1,502,756

Southampton	Scheme1	Scheme2	Scheme3	Scheme4
<2km	1,828,769	1,343,407	751,251	1,693,266
2-5km	2,171,818	1,855,050	1,603,109	3,028,350
5-10km	2,421,740	2,151,552	2,001,177	3,644,026
>10km	2,617,283	2,377,438	2,294,821	4,097,171

London NE	Scheme1	Scheme2	Scheme3	Scheme4
<2km	5,079,653	4,726,460	5,797,139	8,750,993
2-5km	4,607,727	4,230,360	5,136,724	7,790,876
5-10km	4,085,387	3,642,532	4,306,907	6,561,237

London SW	Scheme1	Scheme2	Scheme3	Scheme4
<2km	6,983,870	5,794,511	7,548,349	11,755,498
2-5km	5,787,221	4,642,577	5,936,440	9,331,566
5-10km	4,042,495	2,940,815	3,535,577	5,714,626

Comparing case study areas, it is obvious that there are wide regional variation in development profitability and residual land values. In London all values are in the range £3-12m per hectare. In Southampton they range between £0.75m and £4m, while in Manchester they lie between £0.29m and £2.8m. Interestingly, in Leeds and Nottingham there are cells with negative residual values, two in the former case and one in the latter case. This is at a time period which represented the absolute peak of an overheated housing market throughout England, just before the Credit Crunch. This suggests that absolute non-viability may be an issue in some city regions, for certain development mixes, however, buoyant the market, but that this is less of an issue in London and the south.

If mix and density were determined by developer initiative in a market driven system, we would expect developers to choose schemes like those shaded in green in Table 7, for any particular location (i.e. reading across the table for each line). If they had operational/business preferences for certain types of development, or somewhat different cost structures than we have assumed, or differing price expectations, they might deviate from this a bit, perhaps choosing the 'second best' options we have shaded in blue. However, they would be reluctant to choose the unshaded option, and very unlikely to choose the pink shaded options.

This interpretation of the data leads to a prediction that developers subject to little constraint on density/mix from planning regulation would tend to choose schemes like 1 (low density detached) in cities like Leeds, where their other possible option might be 2 (medium density mixed houses); whereas in most other types of city regions they would tend to choose schemes like 4 (high density flats). However, there is a noticeable difference in the second best options, with the other provincial cities (Nottingham, Manchester, Southampton) showing scheme 1 (low density detached) moderately favoured, whereas the London cases mainly show Scheme 3 (terraced and flats, medium-high density) as moderately preferred (except the outer part of London SW, where low density detached is better). Southampton central distance band is a little odd in showing low density detached preferred over high density flats.

This of course assumes market conditions similar to those in England in 2007. These results are interesting, and broadly conform with expectations based on general knowledge and observation of the English housing scene in this period. In other words, whereas traditionally private developers have tended to favour low density detached in most areas, in the high demand/supply constrained conditions of the mid-2000s, there was a strong shift towards the building of flats. While this was most marked in central areas, it happened in other urban locations as well, particularly in the more pressured south (see Table 2 above for the actual shares of flats and densities).

In an earlier exercise, using data for the period around 2004 (Bramley & Brown 2008) but with a similar approach, we found a tendency for viability/profitability measures to predict a polarisation of choices, the majority favouring low density detached, but with a smaller cluster favouring high density flats, and some support for medium density houses. But, as in the results reported here, there was little support from the residual value data for commercial choices to build intermediate density/mix options, for example those involving a mixture of terraced and semi-detached houses with a small proportion of flats.

In section 2 above we reviewed the policy context, and highlighted the shift from the late 1990s towards favouring higher density development in urban locations. The evidence just presented suggests that the observed shift toward building more higher density flats could have resulted primarily from market forces, rather than from the specific interventions of planners, although the overall planning limits on land availability will have been an underlying factor in underpinning the structure of market values.

7. Affordability

In the opening discussion we identified affordability as one of the key public or social policy concerns about housing market outcomes, and an increasingly important component in debates about planning for housing. It therefore seems appropriate to highlight the affordability properties of the different housing development options exemplified for these case studies. In a sense, this can be read off in a simple way from the predicted house price levels – lower prices are more affordable. Affordability is generally assessed from the relationship between house prices and incomes, and we are in a position to introduce some evidence on local incomes provide a more explicit affordability measure for each scheme, albeit still crude in some respects.

In a parallel study for the same organisation (NHPAU), one of the present authors has developed estimates of the level and distribution of household income at local authority level for the whole of England, building on earlier work (e.g. Bramley & Karley 2005, Bramley 20xx). These estimates are modelled using a combination of micro data from the government's main official income survey (the Family Resources Survey, FRS) and local data on proxy and predictor variables from sources such as the Census, the Annual Population Survey (APS) and the Annual Survey of Hours and Earnings (ASHE). We omit the details of these income estimates here, but simply state that these provide a relevant measure of household income (for core household units with head aged under 40 and discounting income-based welfare benefits) expressed as proportions below a sequence of thresholds (£200 per week, £300 per week, etc.) at local authority level. These incomes are currently for 2005, so we adjust prices back from 2007 to 2005 using local coefficients on the time dummies in the hedonic model. Values are averaged for the groupings of local authorities constituting our case studies, and we assume that these constitute 'housing market areas', such that households within such an area will seek affordable solutions wherever in that area these are available (for example, moving further in or out across our distance bands). We gloss over the issue of household size and minimum bedroom requirements, and simply look at the cheapest house type within each model scheme.

The results of this exercise are shown in Table 8. The numbers are the estimated percentage of under-40 households in the whole case study area able to afford the cheapest house type within each scheme at each location. These numbers are estimated using linear interpolation between the income bands. Higher numbers denote greater affordability. The absolute levels of this indicator are mainly of interest in comparisons between the case study areas (i.e. between city regions). Attention particularly focuses on comparisons vertically within each city region between the different locations/distance bands – will new housing be more affordable if it is located centrally, peripherally, or in-between? There is also interest in which scheme types generate more affordability, although it can be readily seen that schemes 3 and 4 tend to dominate in this respect.

Table 8: Affordability by Scheme and Location: percent of under 40 households able to afford cheapest type within each scheme, 2005

Leeds	Scheme1	Scheme2	Scheme3	Scheme4
<2km	23	36	53	54
2-5km	21	35	51	52
5-10km	18	33	43	44
>10km	10	28	35	35
Nottingham	Scheme1	Scheme2	Scheme3	Scheme4
<2km	19	34	40	34
2-5km	21	35	41	35
5-10km	23	37	44	36
>10km	28	43	53	42
Manchester	Scheme1	Scheme2	Scheme3	Scheme4
<2km	14	29	30	29
2-5km	19	32	36	32
5-10km	23	38	40	38
>10km	19	31	36	32
Southampton	Scheme1	Scheme2	Scheme3	Scheme4
<2km	23	41	47	45
2-5km	22	40	46	44
5-10km	19	39	45	43
>10km	16	37	43	41
London NE	Scheme1	Scheme2	Scheme3	Scheme4
<2km	negl	21	33	29
2-5km	negl	24	35	31
5-10km	6	27	37	34
London SW	Scheme1	Scheme2	Scheme3	Scheme4
<2km	negl	32	45	38
2-5km	9	38	49	43
5-10km	24	46	55	50

We are also interested in the interaction, or potential conflict, between affordability and viability. The shadings used attempt to bring this out. Cells shaded yellow are the most affordable option, but appear to be unlikely to be chosen or favoured by developers on viability grounds. In the first two case study areas, these options are non-viable in absolute terms; in the other cases they are substantially less profitable/viable than the other options. Cells shaded green are those which are relatively favoured for affordability and also relatively favourable on viability grounds (green or blue in terms of Table 7).

So if planners are motivated by promoting affordability while still respecting the need for reasonable viability, which schemes and locations should they choose? In Leeds, for example, they should go for Schemes 3 or 4 (higher density, with flats) in suburban locations 5-10km from the centre – the central locations look more affordable but they are unviable; the peripheral areas are less affordable. In

Nottingham they should go for highest density flats in suburban and peripheral locations; mixed higher density in peripheral locations is very affordable but does not look viable. High density flats also look favoured in the other provincial cities, but the optimal locations vary; closer in to the centre in Southampton, in the middle distance bands in Manchester. In London, medium high density mixed schemes in middle distance bands look best.

In general terms, this analysis suggests that planners concerned about affordability could be justified in using their powers to steer development towards certain locations, and in some instances towards different mixes/densities than might have been freely chosen by developers. However, this point should not be overstated. The more general picture is one of reinforcement of the emphasis on higher density flats, which derives from the general planning policy on the one hand and the viability/profitability map in most city regions, on the other.

However, even these tentative conclusions must be hedged around with several important qualifications. Firstly, they reflect market conditions in a particular time period. In a different period and market conditions, the viability pattern might look different, with more market emphasis on low density detached for example – this would of course bring a stronger conflict with the affordability-oriented planners. Secondly, the crude affordability model used here tends to simply favour flats as the cheapest house type. However, larger family households will need larger units and will prefer terraced houses to flats. Broader social sustainability considerations, which we return to below, will also favour medium density mixes including houses as well as flats.

Planning Requirements for Specifically 'Affordable Housing'

Since 1991 in England, policy and practice for the inclusion of proportions of affordable housing within general (i.e. private) housing developments has developed and become a new normality. It is not the intention to describe or review such policies here, merely to note some key features and draw out significant interactions with the topic of mix and density considered here[3]. Planning requirements for affordable housing are locally determined, should be based on evidence of need, and are generally enforced through 'Section 106' planning agreements. 'Affordable housing' should be either social rented or 'low cost home ownership' or 'intermediate rent' housing with a cost significantly below what is available in the market (secondhand as well as new).

It is generally understood that the rationale for s.106 Planning Agreements, beyond the existence of the need for such lower cost accommodation, is that they should drive down the residual land value by the amount of the cost of the obligation, or the value of the profitable market units foregone. This assumes that the policies are consistently applied and that their costs are fully factored into the expectations of developers, landowners and their agents. These presumptions are now probably much better understood and truer than they were in the early days of such policies in the early 1990s.

[3] See Crook et al 2002, Monk et al 2005

Given that intimate relationship with residual value, it is clear that planning authorities face tradeoffs when considering their affordability aims in the broader sense. It is also clear from the data presented in Table 7 that they cannot make any requirement they choose in any area and expect it necessarily to be delivered. The residual values in Table 7 made a blanket allowance for planning obligations, which might include some element of affordable housing, or might simply be for community infrastructure, open land and suchlike. The point is, the scope for requiring additional affordable housing beyond that is clearly very variable within these cities.

Bramley et al (1995) suggested that the theoretical maximum 'quota' of affordable housing would be given by v/s, where v is the open market land value as a proportion of house price, and s is the typical subsidy required for affordable housing; this formula might be modified by multiplying by t', the maximum 'tax rate' which might be prudently applied to development gains without risking serious supply effects. This simplistic formula has its limitations, including the assumption that the mix/density of affordable housing is the same as that of the private housing, and ignoring any issues about alternative use values. But it does give a reasonable picture of the feasible upper limit on affordable housing requirements, assuming no added public subsidy is available. Given the cost and value estimates already generated for our case studies, and assuming for arguments' sake a tax rate of 50%, it is easy to run this ruler over all of the options as well.

Higher affordable housing quotas are possible in higher priced city regions, such as London where figures of 20-30% are possible (more if you put in extra public subsidy). In Southampton figures range mainly from just below 10% to 25%; in Manchester from around 5% to 20%. In Leeds and Nottingham there are some non viable (<0%) cases, and otherwise figures range up to 20%. The cities vary in terms of the inner-outer profile, with Leeds and Southampton showing higher potential quotas in the peripheral areas, while Manchester and London show greater potential in the inner bands. In general, within each city region and distance band, quotas could be higher in percentage terms for Schemes like 1, low density detached, because these tend to display the highest residual value relative to sales value, but this would deliver less units than a somewhat smaller quota on a much denser site, as with Schemes 3 or 4.

It is interesting that these notional quota figures are in the relatively modest size range just quoted, despite 2007 being the year at the top of the housing market boom cycle – that is 'as good as it gets'. This evidence provides a warning that planners cannot just casually set high affordable housing quotas wherever they choose, not provide public subsidy to back it up, and then expect the housing to be delivered. The evidence suggests that quotas will have a bigger role to play in generally (and permanently) higher priced regions like London (esp SW sector) and to a lesser extent subregions like Southampton, and will have a lower role in northern cities like Leeds, Nottingham and Manchester. It also suggests interestingly that such quotas may make more sense in cases where the private developers are proposing to build low density detached houses (the classic suburban development on greenfield sites), and possibly less sense on higher density urban sites, particularly those where medium density and type mix including houses is sought.

This brings us back to the issue of tradeoffs, and what it is that planning wants to achieve, having regard to all of its objectives. In general, it appears to be the case that, the more you try to promote affordability through density/mix requirements, for example through promoting Schemes like 3, the less you will be able to expect to impose large affordable housing quotas at the same time.

8. Concluding Discussion

We have rather skirted round the broader 'sustainability' agenda in our mainly economic analysis of housing supply options. Much has been asserted about the sustainability benefits of compact cities, but until recently the actual evidence to support these assertions was patchy to say the least. However, more recent work has filled many of the evidence gaps and it is now more possible to make empirically-verified generalisations about the sustainability performance of different residential environments typically found in British cities(see in particular Bramley & Power 2009, Bramley et al forthcoming, Bramley & Brown 2008). Table 9 attempts to summarise the findings of this work in the form of a simple matrix. While this does some injustice to the subtleties of some of the evidence, we can broadly distinguish two dimensions of sustainability: a) a cluster of issues relating to travel behaviour and access to services/opportunities; and b) a cluster of issues relating to residential satisfaction and the quality of community. Very broadly, sustainability issues of type a) favour higher density housing solutions located more closely to city centres, while issues of type b) favour lower density (or in some cases medium density) and less immediate proximity to city centres. Some important sustainability issues (e.g. domestic energy consumption) are no longer strongly related to density, house type or location. Others (ecological and environmental issues) have a more complex, nuanced relationship; broadly, these values may be promoted better by green suburbs than by either intense urban centres or industrialised farmland.

Table 9: Simple 'Sustainability Matrix' for Density/Type Mix options by location

Location distance	Low Dens Detached	Mod Dense House Mix	Higher Dens Terr+Flats	High Dense Flats
<2km	. .'	+ +	+ .	+ -
2-5km	. +	+ +	+ .	+ -
5-10km	- +	. +	. .	-
>10km	- +	- +	. .	-

Comparing Table 9 with Table 7 suggests that sustainability-oriented planning may face many conflicts with market-led housing development. The cells in Table 9 with more plusses tend to be the options which do not look so profitable for developers, for example Schemes 2 and 3 in inner and middle bands. Developers will want to build either high density flats everywhere, which are generally negative on sustainability criteria b), or low density detached houses which, insofar as these are mainly associated with peripheral locations, are generally negative on criteria a). Affordability reinforces some of these tendencies. A simple approach to affordability, as in our Table 8, seems to reinforce the developer enthusiasm for high density flats everywhere, not just in city centres. From a social and community viewpoint such solutions cannot be seen as sustainable, particularly in the more peripheral locations.

A more nuanced approach to affordability, taking account of family type and size, would tend to point towards schemes like 3. or 2. but again these are often not so viable. That in turn means that they could not easily be delivered in the market, and certainly not with the additional overlay of s.106 planning gain quotas, without the addition of public subsidy. However, this kind of evidence might be used to better target the limited amount of available cash subsidy.

Returning to the key questions posed in the introduction, the first was whether it made sense to continue to promote compaction and resist peripheral development, particularly when account is taken of affordability. Bramley (2008) argued that providing the same amount of new housing in a more dispersed pattern would not promote affordability overall and would have a slightly regressive overall impact. The evidence from this paper is complementary with that. It suggests that there is no general presumption that peripheral locations are more affordable – that depends on the city region in question (yes in Nottingham, Manchester, London; no in Leeds, Southampton). It also shows clearly that low density detached housing developments are always far less affordable than mixed or flatted higher density developments. Clearly, there is an overall need to expand total housing supply (Barker 2004) and in some regions that may necessitate some shift of balance towards outer areas because of the sheer availability of land. It does not make sense to promote compaction to the exclusion of all other considerations, a reasonable critique of English planning policy in the period 1998-2003.

The second question was whether to promote high density apartment development to support affordability, if this was going to be at the expense of longer term welfare and social sustainability. The evidence suggests that the market was quite capable of promoting high density apartment schemes itself, and also that these were often apparently more affordable, particularly in locations away from the central city. However, such apartments clearly do not provide an affordable solution for families with children, and appropriate mixed schemes for these groups were less likely to be promoted by the market. Such provision might be helped by using density/mix requirements of planning, and could be further reinforced by s.106 agreements, but in areas where underlying demand and values were lower this would not work without additional direct public subsidy. The hedonic price models clearly show that higher density and flat living are negatively evaluated by consumers, implying some welfare loss from relying heavily on this form of provision. In addition, social survey evidence on aspects of quality of community or ‘social sustainability’ suggest that such high densities are also negative from this perspective. For these reasons we would argue that it would be imprudent for planning to support large scale provision of this kind in all areas.

The third question was whether to promote medium density mixed schemes, which appear to optimise affordability and social sustainability, even where this is not the likely choice of developers. For the reasons given in the previous paragraphs, the implicit answer to this question must be yes. This comes to the nub of where planners might actually wish to intervene on the issue of mix and density, rather than leaving it to developer initiative. However, there is some danger in lower demand regions of this running into viability issues, particularly if combined with over-ambitious affordable housing quotas.

The fourth question was whether to allow significant development of low density, larger detached single-family houses, which are often favoured by market forces, and rely on filtering processes to help access and affordability for lower income groups. We cannot give a complete answer to this question on the basis of the evidence presented in this paper. It is not even clear that low density detached housing is so widely the preferred option, under the market conditions of 2007. However, in more subdued or 'typical' market conditions, such as those reflected in Bramley & Brown (2008), this might be the case. It has been argued, for example in NHPAU (2007, 2008) that building the same number of larger houses would have more impact on market affordability than the given number of smaller units. While this makes some theoretical sense, and this option can be run through the official 'affordability model' developed for the government by Meen and colleagues (2005, 2007), one has to say that the detailed working through different layers or submarkets of this adjustment process has not been demonstrated in detail. At the planning coalface, low density detached houses themselves look unaffordable, as clearly shown in this paper. The spirit of current planning policy is not that planners should ban such developments, but that they should be balanced with other kinds of developments, entailing smaller houses, flats and higher densities, either on the same sites or on a broader portfolio of sites. It is also clear, as argued above, that such proposed developments would be a particularly prime target for s.106 planning obligations in respect of affordable housing.

The final question posed was how far to use 'planning gain' mechanisms (such as 'Section 106' in England) to deliver specifically 'affordable' housing, even though this may risk reducing the overall volume and pace of development. The evidence presented here provides only a limited and partial answer. We have not investigated (here) the supply behaviour of the construction industry or landowners, so we cannot provide any quantified estimates of any impacts on volume or pace of development. What we have done is estimated residual values at the peak of the English housing market after allowing for a baseline level of planning obligation. This shows that not all locations and development mixes would support additional affordable housing quotas beyond that, without direct public subsidy. In higher demand regions, and particularly with development types favoured by developers (low density detached, and high density flats), quotas in the range 10-20% (in London up to 30%) might be feasible without public subsidy. But this of course was at the peak of a market which has now crashed. Any planning quotas have to provide, if not for exceptional market crashes, at least for a range of market conditions and not just the peak. Therefore, considerable care, and some assessment of viability, is needed before planners impose such quotas, particularly where they are not backed with public cash.

This whole discussion has been couched in terms of a normative-rational planning discourse in the light of empirical evidence from a range of subregional markets. What it has not touched on is the actual or likely political process by which local planning authorities and their emergent subregional partnership arrangements would actually operate and interact with central government targets and exhortation, to produce actual planning decisions. That is, as they say, a whole other ballgame.

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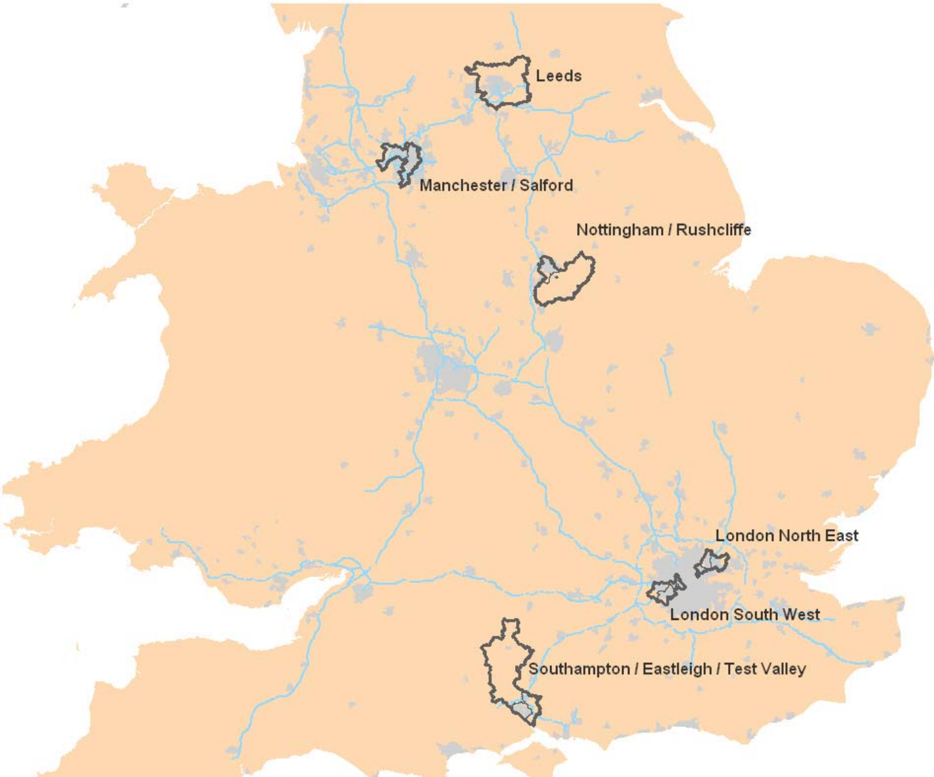

Leeds
Manchester / Salford
Nottingham / Rushcliffe
London North East
London South West
Southampton / Eastleigh / Test Valley

Map 1

Table 3

Monetary Values for Density and Mix Variables

Case Study	Mean Value (£s) for one more dwelling per hectare	Mean Value (£s) for 1% more domestic space	Mean Value(£s) for 1% more "garden"	Value (£s)for Detached house dominated area^	Value (£s) for Terraced house dominated area^	Value (£s) for Flat dominated area^	Value (£s) for areas not dominated by a house type^
Southampton	-577.329***	104.513	-259.530*	12496.601***	-4999.157*	13857.294***	3140.625
Nottingham	-442.093***	152.491**	-320.257*	12723.612***	-7350.197*	28458.803***	8571.817***
Leeds	-745.553***	311.248***	-326.942***	-1760.250	-5948.860***	23543.856***	3685.173***
Manchester	-198.574**	128.262*	127.367	-3053.429	-7064.731**	7417.699	-3380.630
London SW	-26.885	554.913***	-2366.367***	169134.303***	-12821.460	51970.566***	15908.998*
London NE	-354.899***	376.268***	-866.888***	76974.561***	-11168.400**	19333.255***	7385.772

***= coef. significant at p < 0.01; ** = significant at p< 0.05; *=significant at p < 0.10; No asterisk means that the coefficient is not statistically significant.