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Glen Bramley

Housing market models and planning

This paper reviews the application of economic housing market models to planning in the UK context. It reviews the evolution of planning policy and practice in relation to new housing supply numbers, and shows how since 2000 a new economic paradigm has contended for attention. The main economic model-based contributions are examined, including both academic studies and models actually used in the planning and policy process. A number of issues which arise in such applications are reviewed, and the paper concludes with reflections on why it is difficult to get economic perspectives to be fully accepted and utilised within a localised and politicised planning system.

Keywords: housing markets, economic models, planning, new housebuilding, affordability

Introduction

This paper reviews the application of economic housing market models to planning in the UK context, with a primary focus on England. It begins with an historical review of the development of planning policies for new housing supply, charting changes in policy approaches from the 1970s to the Barker Review and beyond. The post-Barker period is a particular focus before the paper moves on to explore (in a non-technical way) the issues arising from the contributions of housing economists. It examines mainstream models that have been designed to assess the scale of the impact of the planning system on housing market outcomes, as well as providing a central input into the development of policy targets. It will draw on specific models developed for Government departments and agencies, intended to estimate housing affordability and to inform housing supply targets. The paper will exemplify the conceptual and practical challenges associated with model development and will reflect on the way in which outputs are used within the policy world

Recent history of planning for housing in the UK

Britain has had a comprehensive land-use planning system in place continuously governing all significant forms of urban development, including housing, since 1947. The essential feature of this system is that development rights are vested in the state and any specific development requires planning consent from the local authority. Planning consent is a *discretionary* decision by the local authority (Grant, 1992), although it must have regard to the operative *development plan* and to other material considerations including national planning policy guidance. Development plans are

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prepared periodically with a typical time-horizon of 10–20 years and these contain both numerical estimates of housing requirements and the allocation of specific sites or more general locations for development.

The key issues in practice revolve primarily around the ‘numbers game’ of how much new housing should be provided for in plans, so bringing into play different kinds of evidence, including demographic projections and, in recent years, economic models, although there are also important issues about the processes of approval (e.g., delay) and any obligations which may be placed on developers seeking permission.

Bramley (2007; 2010) argued that one can discern quite distinct phases of policy since the Second World War. Until the early 1970s there was broad consensus around the existence of a major housing supply shortfall and the need to promote both public and private sector housebuilding. After 1975, housing supply went off the national policy agenda, due to a combination of perceptions that the post-war shortages had been overcome, lower demographic growth and public spending cutbacks which particularly affected public housing and general infrastructure (Holmans, 2005). This lack of policy salience persisted until the mid-2000s, when the Barker (2004) Review brought the issue back to the forefront in a context of escalating affordability problems

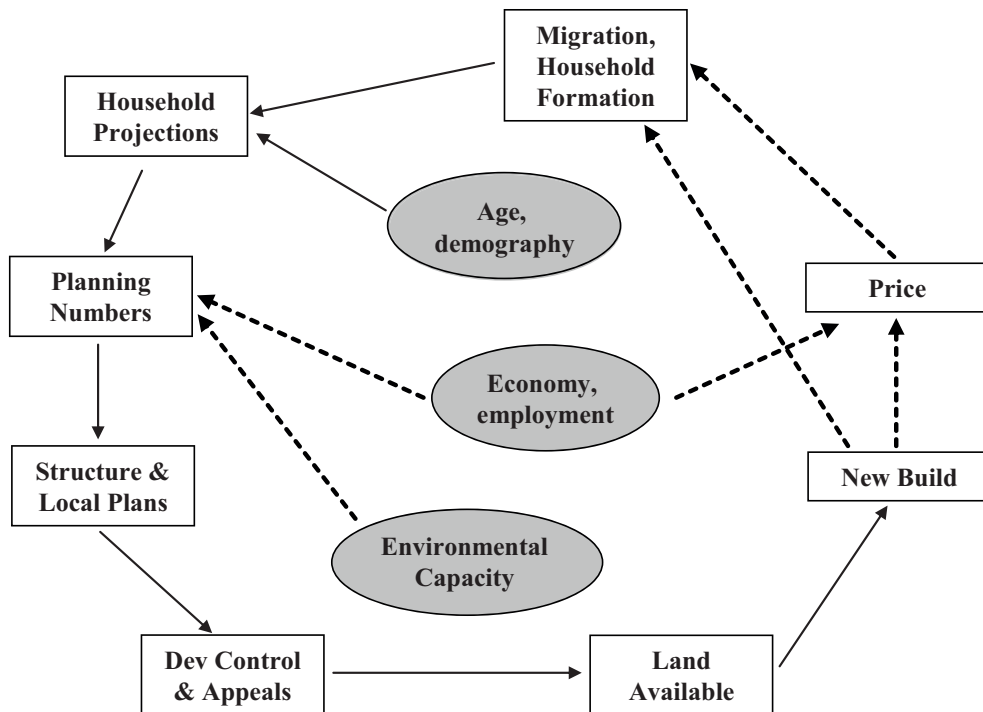


Figure 1 The old (1974–2004) paradigm – ‘predict and provide’.

and an apparent failure of the mainly private sector provision system to respond adequately. During the intervening period, and particularly after 1990, planning had become more preoccupied with issues of regeneration and sustainability, which in housing was interpreted to mean an even stronger emphasis on urban containment, re-use of brownfield land and intensification in terms of density (DETR, 1998; 1999; 2000; Adams and Watkins, 2002). Although technical mechanisms of forward planning, based mainly on household projections, and of land availability monitoring were theoretically in place, these were weakened by the new ‘urban’ emphasis. Other developments in this period included the gradual evolution and acceptance of the use of planning agreements to secure the provision of ‘affordable housing’ as part of general market developments, as discussed in Crook and Monk (2011).

In this period, the dominant paradigm for the planning of new housing numbers was essentially as portrayed in Figure 1. Household projections, trend-based demographic extrapolations driven by past patterns of migration and household formation and the population age structure provided the main basis for planning targets, which determined the amount of land made available for new housing. Considerations of the economy and employment and of environmental capacity played some role, but these

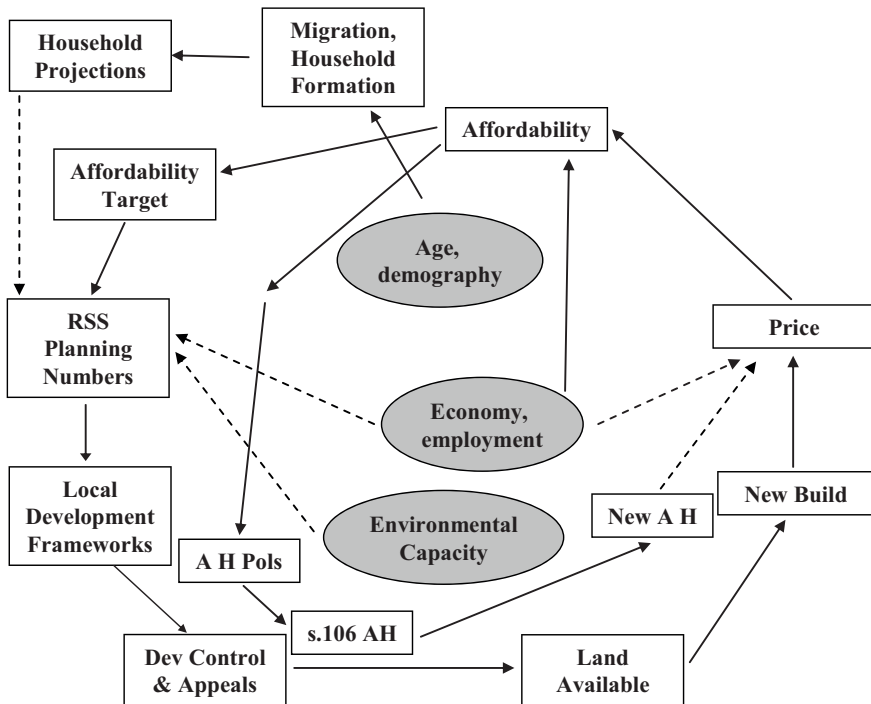


Figure 2 The newer post-Barker paradigm: ‘affordability targets’.

were less systematised. Economic housing market models, and outcomes in terms of house prices and affordability, played no direct role.

However, the problem with this system was that it was essentially circular, because plan targets determined land available, which substantially determined new build rates, which on any normal economic reasoning through supply and demand would affect house prices. But supply and house prices, as we argue further below, affect migration and household formation. Therefore, there was nothing to prevent a self-reinforcing process of inadequate supply suppressing household growth and the key measures used to determine future supply (Bramley and Watkins, 1995; Meen, 1998).

The circumstances of the early 2000s brought housing supply back onto the agenda, with a combination of renewed economic and demographic growth confronting an unresponsive housing supply and leading to ever higher house prices and affordability problems. The Barker (2004) Review was a comprehensive assessment of the problem from an economic perspective and pinpointed planning as the primary cause of unresponsive supply. It set a broad agenda for action which, although generally accepted by the then Government, was only partially implemented (Bramley, 2010; Stephens, 2011). It encouraged further reform of the planning system but, most interestingly from the present viewpoint, it also attempted to institute a new paradigm, as summed up in Figure 2.

This switched the central focus to ‘affordability’, and thereby sidelined the demographics, although they could still play some part: in essence, housing numbers should be based on the achievement of an affordability target, a rational shift towards an ‘outcome’ focus sensitive to market conditions rather than the old trend-based quantity planning. Thus a key economic feedback mechanism was introduced into the circle. A further, inner circuit was also present through the incorporation of ‘affordable housing’ policies, quotas and planning agreements. The economy and labour market was represented indirectly, through affordability, while environmental capacity still lurked there without any very systematic means of incorporation.

Although this new paradigm reflected an intellectual victory for economic analysis in central government, not all hearts and minds were won at the local and regional levels. That is important because planning is implemented at local level. Annual output in the period 2004–8 was 198,000 net additions, a mere 13,000 (seven per cent) more than in the previous period for housing supply (in the best year, 2007, the total was 225,000), and significantly less than the 240,000–300,000 range recommended by the National Housing and Planning Advice Unit (NHPAU). Clearly, good intentions alone were not enough! Many of the Barker recommendations were implemented but by no means all. The planning system was reformed but implementation in terms of new-style LDFs being approved was slow (Baker Associates et al., 2008) and development control delays continued to be of concern (Ball, 2010). Key regional bodies in the pressured south did not accept the economic reasoning in full and were unwilling to

raise planned numbers to the levels recommended by the body set up to advise them (NHPAU). Although reasons given were often to do with infrastructure inadequacy and funding (IPPR, 2005), or the behaviour of developers (Calcutt, 2007; OFT, 2008; IPPR, 2011), in reality the strategy failed politically.

The story since 2008 is dominated by the onset of the Global Financial Crisis (GFC) and associated recession, which has hit the housing development sector particularly hard over an extended period, and political change culminating in the election of a Conservative-led Coalition Government in 2010 with quite different ideas about the planning system (Conservatives 2009). There are three key themes in the new Coalition approach to planning for housing

- Localisation of decision making on new housing, with the abolition of top-down targets and regional planning machinery
- More explicit incentives to encourage local authorities to permit new housing, particularly through the ‘New Homes Bonus’
- Simplification of national planning policy guidance with a new overarching ‘presumption in favour of sustainable development’

It is too soon to assess fully the impacts of this package of changes on housing supply, as well as being perhaps beyond the scope of this article. We can say that there is evidence that localisation per se is likely to lead to a reduction in land and housing supply in the key areas of southern England where pressures are greatest, both from early decisions made by local authorities and from new evidence on public attitudes to local housing development (Bramley, 2011a; 2011b). It is not difficult to argue that the incentives introduced will be insufficient to overcome these tendencies (Bramley, 2010). The third feature, the new ‘presumption’, may be something of a joker in the pack, although it is not completely new (there was always a presumption in favour of development in accordance with the development plan) and it is unclear what tests of sustainability will be applied. The crucial point would seem to be that, if this is not to be in complete contradiction with the first principle (localisation), then it would appear that if a local authority has a ‘sound’ LDF core strategy for housing provision then it will retain control of supply; however, if its local plan is out of date or not sound in terms of evidence, it will be more vulnerable to appeal.

We turn next to a review of economic models of the housing market and their implications for planning. From this brief historical review, we can see that economic models played no more than a background critique role in the pre-2004 regime. The Barker aftermath brought economic models into the centre of the system for a few years, briefly institutionalising their role in formal, top-down guidance to the regional planning system. In the post-2010 regime, it is less clear what their role will be, but there could be a greater role for sub-regional and local models in the evidence base for LDFs.

Contribution of housing economics – the main models

We now go on in this section to review the contribution of housing and urban economics to understanding and informing planning for housing. This review is quite selective, focusing first on the UK/England rather than the very different context of the USA (the focus of most such published literature) and second on the main types of model most relevant to the central question of housing supply.

Theoretical perspectives

There have been only limited attempts at economic theorising on the operation of planning and its impacts on the housing market. Particularly important contributions are associated with Evans (1973; 1983; 1991; 2005) but one can also refer to Harrison (1977), Bramley et al. (1995), Monk and Whitehead (1999) and Adams and Watkins (2002), with White and Allmendinger (2003) providing a fairly thorough review. Most of these analyses provide a ‘comparative static’ view. A greater focus on processes of change over time has come only relatively recently.

Planning (particularly in Britain) is seen as imposing an overall constraint on the amount of land available for housebuilding. This supply restriction reduces the number of houses which can be built, which for any given level of demand increases the price of houses (both new and second-hand, given the interconnected markets). Because it is land which is restricted, it is the part of house prices which reflects the value of the land which rises most, rather than the part which reflects construction costs. Housebuilders compete for the scarce available land and bid its price up. The disproportionate rise in land values has a further effect on housing supply, which is to encourage developers to try to cram more houses onto a given area of land, in other words raising housing densities. Gardens are smaller, single-storey dwellings become rarer and flats become more common (Evans, 1991).

The long-established character of planning restriction in Britain has been to impose ‘containment’ on existing towns and cities, primarily through green belts around the existing built-up areas (Hall et al., 1973). Yet these are the areas which would, in the natural course of urban development, be most in demand for new building, because of their ready access to the jobs and services of the towns. Economic theory and experience both suggest that this exaggerates the price and density effects while also encouraging ‘leapfrog’ development in more dispersed locations, which increases commuting journeys and infrastructure costs (Evans, 1973; Muth, 1969; Bramley et al., 1995; Adams and Watkins, 2002). However, there are some complications which need to be considered.

The first complication is that planning does not just affect the quantity of housing supplied. It also should have some positive effect on the quality of the environment and the efficiency of the urban infrastructure and services. Higher prices in a planned

settlement may well be because of these positive amenities and services, rather than because of the restriction in supply. There is a tradition of research which attempts to value these environmental effects using statistical ('hedonic') models, discussed further below. There is also a substantial body of US literature which argues that mobility equalises the net environmental and economic advantages of different cities, through the adjustment of both wages and house prices (Roback, 1982).

The second complication is that the nature of the planning regulation may be less to do with the total quantity of housing land than with restrictions on the type and density of housing (Monk et al., 1991; Bramley et al., 1995; Adams and Watkins 2002). Such regulation restricts the ability of the market to respond flexibly to demand in terms of house type and density, and so can be argued to be inefficient (Harrison, 1977), although this has to be weighed against the value of the residential amenity which it protects. These policies are also criticised for having adverse distributional effects, 'excluding' poorer households from suburban areas.

The third complication is that allocating or zoning land for housing does not ensure that housing will necessarily be built on that land, now or in the future. Developers may not choose to build if house price levels or expected growth make it look unprofitable or risky. The land may be poorly located or lacking infrastructure and services. The owner of the land may be in no particular hurry to sell the land for development. The whole nature of land development when planning is not operative, or not a binding constraint, is discussed in Evans (1983), Titman (1985), Neutze (1987) and Bramley et al. (1995). One general conclusion from this work is that it would not be realistic to expect either (a) that all land would be developed quickly if freed from planning constraint, or (b) that the supply of housing would be infinitely elastic in this situation. A further implication may be that institutional and behavioural perspectives may be relevant to understanding developer behaviour (Leishman and Adams, 2008).

Empirical Studies

In this and the succeeding subsections the main empirical contributions to systematic economic/econometric analysis of the effects of planning on housing markets in the UK are reviewed. Table 1 provides a summary comparison of nine models, distinguishing the type of model, coverage of the study, key outcome variables, main findings, and highlighting some limitations. This includes some models covered by the comprehensive review of White and Allmendinger (2003), as well as more recent work, but does not cover purely theoretical, institutional or case-study-based studies.

Empirical econometric models of housing have until recently followed two traditional approaches: (a) macro and regional time series models, and (b) hedonic house price models and related urban models. The former have become increasingly sophisticated in their treatment of dynamics and trends over time, including the application

of co-integration techniques (Meen, 1994; 1998; 1999; Giussani and Hadjimatheou, 1990; Muellbauer and Murphy, 1997). While the major emphasis has been on cycles in demand and house prices, there have been quite sophisticated models of new building supply and/or investment in this tradition (Tsoukis and Westaway, 1991; Ball, 1996b). However, up until very recently this type of research has lacked any data to estimate the effects of land supply, including the influence of planning policy and practice, on housing supply levels or responsiveness. These models can provide an answer to the question: if a given amount of housing is built in a region over time, what level of house prices will result? – essentially the question tackled by the CLG–Reading Affordability model discussed further below. Also, the construction supply models within this tradition can be used to estimate different supply elasticities (responsiveness to price) in different regions, and these results may provide indirect evidence on the possible effects of planning and other supply-limiting factors (see Ball et al., 2010, for recent examples).

The latter type of research (hedonic price models), the dominant tradition in US urban economics, typically involves cross-sectional analysis at either individual property level or at small area level. On the whole, the main thrust of this work has concerned questions about demand, including measuring the demand for different attributes within the housing bundle, and measuring the demand/willingness to pay for environmental benefits (e.g., Cramer et al., 1988; Michaels and Smith, 1990). Cheshire and Sheppard (1989; 1997) explore this approach to measuring some of the benefits of planning regulation, for example urban open space protection. A good part of this kind of work has been concerned with the emergence or maintenance of ‘submarkets’ (Schnare and Struyk, 1976; Goodman, 1981; Adair et al., 1996; Maclellan and Tu, 1996), and part of the reason for the existence of these may be supply constraints (as recognised by Maclellan, 1977; 1982; Ball and Kirwan, 1977). Another tradition within urban economics has been the analysis of housing supply in terms of the intensity of land use (following Muth, 1969; see reviews in Bartlett, 1991, or Bramley et al., 1995, chapters 2 and 8). However, there seems to have been relatively little intra-urban and cross-sectional analysis of new build supply itself.

Many US studies have employed hedonic house price modelling to examine the effects of zoning and the recent proliferation of growth controls; useful reviews include Fischel (1990), Monk et al. (1991), Podogzinski and Sass (1991), Malpezzi (1996), School of Planning and Housing (2001) and White and Allmendinger (2003). There is a lack of unanimity across different studies, some showing that land use controls are not an effective constraint whilst others argue that they do reduce supply and push up housing and developed-land prices – the latter would seem to be increasingly the dominant finding.

Arguably the most robust attempt to measure the impact of British planning controls on the housing market through such an hedonic approach is found in the work of Cheshire and Sheppard (1989; 1997; 2002). They combine hedonic house

price techniques with microeconomic demand theory, and apply this to particular towns (Reading, Darlington, Nottingham) with different degrees of planning restraint. They then use these models to simulate (a) the effects of changes in the planning restrictions or other provisions for these towns, and (b) the likely impact of changes across a wider system of localities. In the first study they found that the impact of planning controls on the representative 'restrictive' locality (Reading) were to raise the average price of houses on the market by six to eight per cent, which seems a rather small effect. Perhaps more significant is the finding that removing restriction on the outward development of the town (i.e., containment) would in the long run lead to a dramatic reduction in housing densities. In their more recent study, they estimated that the loss of welfare from this restriction was quite substantial, of the order of 10–13 per cent of total income. This research employs sophisticated theoretical and methodological tools but arguably suffers from some limitations in the conceptualisation and measurement of planning intervention and its aims (Bramley, 1998).

A second series of studies, led by the present author, involved a more aggregated modelling approach with more emphasis on the supply side, including testing the effects of different forms and degrees of planning restriction (Bramley 1993; Bramley et al., 1995; Bramley and Watkins, 1996; Bramley, 1999). These studies used district councils as the unit of analysis and experimented with various ways of simulating the feedback effects from planning-policy changes to house prices. The last of these papers estimated that the elasticity (proportional sensitivity) of house prices to structure plan land release lay in the range -0.15 to -0.29 . Thus, releasing ten per cent more land could lower house prices by 1.5–3 per cent; releasing 50 per cent more could reduce prices by 7.5–14.5 per cent. These studies also explored supply elasticities and impacts on density and housing type. Pryce (1999) reworked the data to suggest that supply might actually 'bend backwards' (i.e., reduce in response to higher prices) in some circumstances. They also provided the first systematic attempt in the UK to develop and compare a range of measures of planning and land supply restriction based on a mixture of survey, administrative and GIS data (Bramley, 1998). The author has recently updated this approach to 2008 for districts in England (Bramley, 2011b). Such approaches to measuring planning and other restrictions on land supply may be compared with a burgeoning US literature (e.g., Glaeser et al., 2006; 2008; Glaeser and Ward, 2009; Gyourko et al., 2008; Quigley and Raphael, 2005).

Almost all of these approaches in the 1990s used cross-sectional data. However, this is unsatisfactory as a basis for estimating the economic effects of regulation or other factors in terms of housing supply, house prices, migration or wages. Cross-sectional aggregate models suffer from problems such as the 'ecological fallacy', where relationships observed between average measures for areas are assumed to apply to the micro units (households, firms) within those areas. Other problems include spatial units which vary in size, diversity and functional self-containment, and unmeasured/

Table 1 Summary comparison of key UK economic models relating housing market and planning

Study	Type	Coverage	Key outcome variables	Main findings	Limitations
Cheshire and Sheppard (1989), (1997)	Micro-hedonic price/demand model	2-3 cities; Simulation for wider system using proxies	House price Density Welfare level Value of green space and other amenities	Planning restraint has moderate effect on ave. price, but large effect on density, this makes for significant welfare losses despite provision of amenities; distribution	Assumes flexible adjustment of existing urban form Implicit policy of 'sprawl' unrealistic Policy proxy (success rate of planning applications) weak
Bramley (1993), (1998); Bramley and Watkins (1995)	Local level aggregate	120 IAs in selected regions, 1988 and 1992	Planning regulation composite measures New completions House price (density, type mix)	Formal planning constraints more powerful than informal New build driven more by land available than price:(low supply elasticity) Weak implementation of strategic plans, but local plan allocations better Price impacts moderate Brownfield land imposes some penalty Reworked including simultaneous equation treatment: 'backward-bending' supply possible	Cross-sectional; dated; issues around identification and endogeneity; spatial units not consistent with HMAs; modelling system-wide price impacts crude
Pryce (1999)	Local level aggregate	As Bramley and Watkins (1995) (same dataset)	New starts House price		Cross-sectional; dated; spatial units not consistent with HMAs; modelling system-wide price impacts not discussed
Bramley (2002); Bramley and Leishman (2005)	Sub-regional level aggregate panel	90 zones covering England over 10/20 years	New completions: House price: Gross migration: Vacancies	Allowed for spatial interactions; confirmed low supply elasticity and weak link from land (permissions) to output; reasonable price benefits from greater supply in medium term	Spatial units closer to HMA but still not consistent; planning inputs data somewhat limited Migration equations had some unexpected features: price benefits from greater supply in medium term necessary to impose additional feedback in simulations
CLG-Reading Affordability Model: ODPM (2005); Meen et al. (2008); Meen (2011)	Regional simulation based on regional time series models and some micro-simulation	9 regions of England over c.25 years	House price Earnings Affordability Migration: household formation (Tenure; vacancies)	L. i. adverse trend in affordability likely with given supply Affordability benefits of supply are very long term and gradual More housing needed in south to stabilise affordability More complex models with more flow terms suggests slightly more responsiveness	Spatial units too large No explicit supply function or measure of planning restriction - direct input of new build numbers Micro-simulations cumbersome Some coefficients imposed Dwelling stock - household reconciliation not fully addressed (e.g., negative vacancies) Regime change (credit crunch) only partially addressed

Table 1 Summary comparison of key UK economic models relating housing market and planning (cont.)

Study	Type	Coverage	Key outcome variables	Main findings	Limitations
Leishman et al. (2008)	Sub-regional simulation based on regional time series and some micro-simulation	6 sub-regions in Scotland	House price Earnings Affordability Migration Household formation; (Tenure)	Stability of affordability likely with given supply Affordability benefits of supply are long term and gradual Model made considerable use of spatial interaction terms	As above
Hilber and Vermeulen (2010)	Local level aggregate panel	LA districts in England c.25 years	New completions House price level House price volatility Success rate of planning applications (through IV treatment)	Quite large price level and volatility effects of regulation. Regulation has bigger impact than physical/topographical constraints Claims instruments to represent planning restrictiveness	Spatial units not consistent with HMAs Data in earlier period not true district level Does not address spatial diffusion of price impact Key regulation measures limited
Bramley (2011a), (2011b) ('Gloucestershire' model)	Sub-regional simulation based on sub-regional panel models	102 'best fit' HMA areas in England, 1997–2007	New completions House price, rent Affordability Migration Household formation Housing need	Time required to build up supply Relatively greater affordability effects from supply Interdependence of adjacent sub-regions	Panel for estimation rather short Uncertainties about best estimation technique; Uneven planning/land supply data
Ball et al. (2010); Meen and Nygard (2011)	Local/ neighbourhood level, (MSOA and adjacent regions)	Thames Gateway (part of London and adjacent regions)	New completions Supply elasticities	Supply more responsive to price changes than levels Supply more responsive on brownfield land Larger firms more responsive Historical legacies, environmental constraints and planning policies all important	Market area level model applied to small units? 'local' model purely cross-sectional Planning variables limited (LA dummies; existing land use)

unobserved environmental effects. Better tests of economic impacts can be achieved if we can observe changes over time in plans or regulations in different areas and trace the impacts on economic variables while allowing at the same time for the effects of changes in economic demand and financial conditions. Thus, the current generation of models are more likely to be panel-based, as in some examples reviewed below.

An early US example of the panel approach is Mayer and Somerville (2000). This used quarterly data over 12 years for 44 US Metropolitan Areas to show that more regulation reduces construction level and responsiveness, even when allowing for some potentially confounding effects. Several versions of a sub-regional panel model for England have been developed by Bramley and Leishman (2005; Bramley et al., 2008; Bramley and Watkins 2008). Simultaneous equations are estimated to predict house prices, new build completions, in- and out-migration and vacancies, and these take account of spatial interactions between contiguous areas and some of the dynamics of adjustment. Applying the results of this set of economic models suggests that, in order to get average annual completions in England up from 200,000 to 230,000 (15 per cent), it would be necessary to raise the flow of new permissions by 85,000 p.a. (43 per cent), while also increasing social housing outputs by 10,000 (20 per cent). This would however only reduce house prices (or improve 'affordability') by ten per cent mid-way through the 20-year period. The former findings, on the weak effect of new permissions on new build, are particularly striking and give a pessimistic view of the ability of government to deliver higher supply through the existing system, given that private developers/landowners control the actual rate of building.

Another important recent study is that of Hilber & Vermeulen (2010), undertaken for NHPAU, which constructed a longer-period panel model for all the districts in England and attempted to measure the effects of varying degrees of planning restrictiveness, and other physical constraints, on the level and volatility of house prices. The focus on volatility reflects recent US literature (Mayer and Somerville, 2000; Glaeser et al., 2008) and Barker (2004) in arguing that regulation affects the responsiveness (elasticity) of supply and therefore makes house prices more volatile in response to changes in demand. This study was ambitious in its approach, trying to use the panel data structure to separate out the effects of fixed, unmeasured effects associated with localities or time periods from the effects of measured variations in key variables. It faced considerable data limitations, especially in the earlier years, and relied on a measure of restrictiveness (approval rate of planning applications) which (as argued earlier in Bramley 1998) is unsatisfactory in various respects (Bramley, 1998; 2011). It also examined the effects of physical and topographical limits on potential land supply. The headline finding was that house prices in the average locality would be 22–38 per cent lower if no planning applications were refused, while price volatility would be 30–50 per cent less. These effects of regulation were substantially larger than the effects of physical and topographic constraints tested.

The CLG–Reading Affordability Model

Perhaps the most debated economic model actually used in the policy system in England during recent years has been the CLG–Reading Affordability model (ODPM, 2005); Meen et al., 2008; Meen, 2011). This model was specially commissioned by the Government (former ODPM, now DCLG) to provide a policy analysis tool and a basis for advice to regional planning bodies on housing targets post-Barker – subsequently channelled through NHPAU.

The overall product was a spreadsheet-based simulation model which provided forward forecasts over 25 years of a range of key variables at the level of the nine English regions. The most important output (outcome) variable was ‘affordability’, defined as the ratio of lower quartile prices to lower quartile earnings. The component models varied in character, with some being aggregated regional economic models calibrated on time series data, as in the case of house prices and migration, while others were more ‘micro’ in character, being fitted to data from individual or household surveys (for example, labour market status, earnings and household formation).

The basic determinants of house prices were real income/earnings (+ve effect), housing stock relative to number of households (-ve), the nominal mortgage interest rate (-ve) and prices in contiguous regions (+ve); slight differences in sensitivities were found between three broad regions of England, and some coefficient values were imposed in certain regions. A basic property of this model is that, given the values of the income and price elasticities of demand, if real incomes rise then for a given number of households it is necessary to raise housing supply to maintain constant affordability.

This model is clearly quite different in its treatment of household demographics from the conventional household projections approach. Both inter-regional migration and household formation are influenced at the margins by incomes and house prices, although the authors of the study did emphasise that these economic effects on household formation were not particularly strong. That should mean that model forecasts of household numbers would deviate from the official trend-based projections.

Perhaps the most important property of the model is that it shows that affordability responds to supply but through a very long, slow adjustment process. To give a flavour for this, Table 2 tracks the impact of high and low supply scenarios, compared with a baseline scenario, for the whole of England over the period 2016–31. Although supply starts to increase from 2010, its effects are still quite small by 2016 and only gradually build up to a more noticeable impact by 2031. So, for example, increasing supply by up to 90,000 units per year above a base level similar to the mid-2000s performance of around 200,000 units per year reduces the affordability ratio by only 0.12 (or 1.5 per cent) in 2016. By 2031 this has built up to 0.86 (9.1 per cent). On average over the period the impact would be 0.52 (5.9 per cent). The ‘elasticities’ at the bottom of the table are a way of summarising this relative (in)sensitivity, as they express the relative proportional change in affordability versus supply.

Table 2 Affordability impacts of high and low supply scenarios for England , in CLG-Reading Affordability Model

Scenario	Year	2016	2021	2026	2031	Ave
Low Supply	Output	119,000	130,000	130,000	129,000	127,000
	HPIR	8.21	8.59	9.29	9.83	8.98
Base Supply	Output	204,000	202,000	201,000	200,000	201,750
	HPIR	8.05	8.41	9.01	9.48	8.74
High Supply	Output	276,000	291,000	290,000	288,000	286,250
	HPIR	7.93	7.99	8.33	8.62	8.22
Elasticities						
Low		-0.05	-0.06	-0.09	-0.10	-0.07
High		-0.04	-0.11	-0.17	-0.21	-0.14

Notes: September 2009 version of model; supply measured as net additions; affordability measured by house price : earnings ratio (HPIR); elasticity measures proportional change in HPIR from baseline over proportional change in supply from baseline.

Another feature of the model predictions is that the absolute level of the affordability ratio appears to rise in the future to levels above those seen in the mid-2000s, which themselves were well above historic levels. Even the ‘high supply’ scenario does not quite succeed in stopping this continuing rise in the affordability ratio. This stems from the model’s high values for the elasticity of house price with respect to income, as discussed in Meen et al. (2008).

Some of the difficulty entailed in using this model to influence and inform regional planning strategy flows from these basic findings. Sceptics could argue that, however much planning strained to increase supply, the beneficial effects in terms of affordability would be slight and beyond most political horizons. Secondly, they could argue that these findings showed that house prices were clearly being driven by other factors, probably on the demand side. Perhaps therefore policy should pay more attention to these factors. Thirdly, they might well argue that, given these scenarios, it was more important to pay attention to delivering affordable housing than to overall housing numbers.

The model inspired or informed certain spin-off models. The Scottish Government commissioned a similar model for Scotland (Leishman et al., 2008) for example, which operates at a somewhat lower geographical scale of sub-regions within Scotland. The headline results of this model were similar to those obtained in England, albeit in a context of less overall pressure on the Scottish housing market. Raising net additions from 25,000 p.a. to 35,000 p.a. (40 per cent) would reduce the house price : income ratio from 6.8 to 6.2 (nine per cent). Slightly surprisingly, the model results suggested that price and affordability effects were smaller in the more pressured regions like Edinburgh and Aberdeen.

The CLG commissioned a Housing Needs model developed by the present author (Bramley et al., 2010) which took a range of key inputs from the CLG–Reading Affordability model. This enabled the affordability and other quantitative elements of the scenarios to be translated into a range of housing need outcome forecasts.

The main user of the model in the period 2007–10 was the NHPAU, which used it as a key tool to inform the Regional Spatial Strategy process. Several reports utilised output from the model and two rounds of advice were issued to regions on supply ranges to be planned for, based partly on use of the model (NHPAU, 2008). In general, these supply ranges drew on two methodologies, the economic-based affordability model and a more traditional demographic method using household projections and estimates of certain backlog needs. Typically, the affordability model, based on trying to stabilise affordability nationally, produced higher supply numbers and hence underpinned the top end of the supply range advice.

The NHPAU was not in existence long enough to see complete planning cycles through in most regions. Its economic arguments about affordability did not become the centrepiece of planning inquiries. Regions which were really in the front line in the debate about increasing supply, namely the south-east, east of England and south-west, were to varying degrees resistant to pressure to increase supply significantly in the 2000s. This reached the stage of legal challenges in the run-up to the 2010 election.

Sub-regional models

It can be argued that regions (such as the nine former Government Office Regions in England) are inappropriate units for the modelling of housing markets and/or the planning of housing provision. Most US literature on the economic effects of growth controls and land-use regulation use functional metropolitan area units. That view was gaining strength in the 2000s, with more local authorities working collaboratively at a sub-regional scale to undertake ‘Strategic Housing Market Analyses’ (CLG, 2007) and in the planning of new housing provision. The 340-odd district local authorities in England are often too small for this purpose and constitute part of larger ‘Housing Market Areas’ (HMAs). Therefore a logical next step beyond models like CLG–Reading would be to develop sub-regional models of housing markets and affordability, as was recognised by NHPAU in a major programme of work it supported over the period 2009–10. This included a study of the geographical basis for HMAs in England (Jones et al., 2010; see also Hincks and Wong in this volume); and a feasibility study of the development of economic models at this level (Andrew et al., 2009; Andrew et al., 2010).

The feasibility study argued that migration was more important and subject to somewhat different influences at sub-regional scale, with more emphasis on housing and environmental factors. More cross-boundary migration makes sub-regional HMAs more open and ‘substitutable’, and this will affect market responses (more elastic demand, more spatial dependence). It was argued that it is more important to

model supply explicitly as a function of planning and land availability/constraints, but that it was difficult to fit wholly satisfactory models.

One attempt to develop a sub-regional model, inspired by this feasibility study, is a study carried out for a group of local authorities (Bramley, 2011a; 2011b). This model uses some elements of the NHPAU feasibility study directly (e.g., the migration models), but combines them with other elements reflecting earlier work (e.g., Bramley and Leishman, 2005; Bramley and Watkins, 2008) or directly developed for this application. Most of the components of this model were estimated on data for England covering the period 1997–2007, broken down to the level of 102 HMAs based on interim output from the Jones et al. (2010) study. A flavour of this model may be obtained by looking at its predicted impacts of supply scenarios on affordability at national level (Table 3), in the same fashion as was presented in Table 1 based on the CLG–Reading model.

The main point to note is that the elasticities linking affordability to output are higher at each stage of the process. Additional supply has an earlier and proportionately larger impact on affordability. This reflects a number of elements in the model including its greater use of flow as well as stock variables. It also appears that the general level of affordability in all of these scenarios is lower (easier) than in the Table 1 examples. This reflects both model characteristics, such as the lower elasticity of prices with respect to incomes, but also scenario assumptions embodying rather more pessimistic economic prospects.

Extending this kind of economic model down to a local or neighbourhood level might be seen as ‘a bridge too far’. There is a considerable amount of economic modelling of urban housing markets which is much more local and micro in character,

Table 3 Affordability impacts of high and low supply scenarios for England, in the ‘Gloucestershire’ sub-regional model

Scenario	Year	2016	2021	2026	2031	Ave
Low Supply	Output	127,380	191,647	230,066	255,679	201,193
	HPIR	6.63	6.91	6.95	7.00	6.87
Base Supply	Output	156,452	231,642	265,135	286,363	234,898
	HPIR	6.46	6.55	6.53	6.50	6.51
High Supply	Output	186,513	270,077	296,902	314,785	267,069
	HPIR	6.28	6.22	6.16	6.10	6.19
Elasticities						
Low		-0.15	-0.32	-0.49	-0.70	-0.39
High		-0.14	-0.30	-0.47	-0.63	-0.36

Notes: December 2011 version of model; supply measured as completions; affordability measured by house price : earnings ratio (HPIR); elasticity measures proportional change in HPIR from baseline over proportional change in supply from baseline.

particularly in the USA. However, some of this work is different in character and aims, much of it based on the hedonic price model and concerned with valuing amenities or constructing better price indices. Some work was done in the 2000s to inform strong policy interest at that time in neighbourhood renewal and housing market restructuring (Meen et al., 2005; Bramley et al., 2007; 2008; Ferrari and Rae, this volume). Nevertheless, hedonic-based methods can be used to attempt to measure the impacts of planning, as in the work of Cheshire and Sheppard reviewed above or recent US work like Glaeser and Ward (2009), although the spatial displacement/substitutability factor makes it difficult to estimate the full price effect system-wide.

More recent work focused on the East London–Thames Gateway region is reported in Ball et al. (2010) and Meen and Nygaard (2011). The former study finds that housing supply elasticities (responsiveness) are greater for price changes than for price levels (paralleling some US findings), and (rather surprisingly, and contrary to some other evidence) that responsiveness is greater on former built-up land. Both level and responsiveness of supply are strongly influenced at this level by historical legacies and environmental constraints, including local planning policies.

Economic models and planning targets

How fit for purpose?

How sound are these economic models, and how ready are they to use to directly inform and shape the planning for housing in the UK? Broadly speaking, the models reported here represent the key recent attempts by economists to address the issues of planning and housing supply in the UK context. To varying degrees they deploy a range of techniques of analysis and econometric estimation which reflect current good practice, although this may not be exhaustive and models tend to be partial in some respect or other and to make compromises because of data and other limitations. Limitations are summarized in Table 1.hhh

The models vary in the extent to which the findings or outputs they produce might be directly usable in planning practice. Studies like Hilber and Vermeulen (2010) or Cheshire and Sheppard (1999; 2002) are useful for establishing the case that planning makes a significant difference to house prices or to welfare, but do not tell you directly how plans or planning decision rules should be changed (other than indicating a general direction of change). The CLG–Reading model is more geared to the planning system as it was 5–10 years ago, with its focus on regional targets. It can tell you how much you need to increase supply, in terms of starts or net additions, to achieve certain long-term targets for affordability (e.g., stability; some degree of regional convergence). However, it cannot tell you what exactly needs to happen in terms of Local Development Frameworks and the granting of planning permissions. A model like the Gloucestershire sub-regional model comes closer to this, because it

does model the supply process explicitly, although its treatment of planning remains crude, and because it works down to a more local level.

A number of problems lurk within the modelling of housing market–planning interactions, and the models discussed here do not necessarily deal adequately with all of these.

- *Relative price effects versus system-wide market equilibrium.* Models built on the hedonic approach or relatively disaggregated local data may not measure the whole, or even the larger part, of the impact of planning control on prices, because of the displacement effects through migration/mobility to other areas. This generally requires a whole system simulation to capture.
- *Positive benefits of planning capitalised.* It has long been recognised that planning can create environmental or economic benefits which may then be capitalised into house prices, but there have been very few British attempts to measure and distinguish these, apart from Cheshire and Sheppard in respect of open space.
- *Regime changes, for example in respect of credit.* The Credit Crunch of 2007 onwards greatly affected the availability and terms of mortgage credit, and also development finance for the construction industry. As of the time of writing (2012) it cannot be said that ‘normal’ conditions comparable to the pre-2007 situation have been restored. It is difficult to measure and estimate the effect of these factors in housing market models, especially those calibrated over the period up to 2007, and some of the ways used to represent these factors in forward forecasts and simulations are somewhat ad hoc.
- *Endogenous growth.* The possibility that housing supply changes might feed back and affect sub-regional economic growth, earnings and employment levels, was explored in the NHPAU feasibility study (Andrew et al., 2010), and also features in a paper by Fingleton (2008) and some US work (e.g., Saks, 2008). Given the significant positive effect of earnings on house prices, the possibility that increased housing supply might increase the dynamism of key regional economies could then have the somewhat perverse effect of weakening the benefits in terms of affordability.
- *Endogenous planning.* It was argued above that in the context of sub-regional models it was desirable to model the supply process explicitly as a function of planning policy and land supply factors at that level. However, it can also be argued that local planning decisions are in part endogenous within the overall system, that is, affected by other variables in the system such as house prices and incomes. This issue was explored to some extent in Hilber and Vermeulen (2010) and earlier in Bramley (1998) and Bramley et al. (1995), and has also been raised in some of the US literature on growth controls and land-use regulation

(Mayer and Somerville, 2000; Glaeser and Ward, 2009). With planning decisions being more devolved to local level in England post-2010, this issue may become more important. It can be demonstrated from existing data that the flow of new planning permissions can be predicted using a model rather similar to that used to predict new-build completions, but with some differences (Bramley, 2011). This indicates that the flow of permissions is affected by economic variables such as house price, unemployment and poverty as well as variables representing the characteristics of the local land supply, environmental constraints and the local planning policy stance, which itself reflects factors like local political sentiment.

- *Measurement issues.* A number of issues arise in trying to construct housing market models suitable for the analysis of planning issues, particularly at sub-regional level. Although house price data are generally plentiful, there are problems in properly adjusting these to reflect the mix of dwellings traded. The private rented sector is of growing importance, but data on market rents is deficient, particularly going back in time. Full modelling of the supply side requires systematic data on planning and land supply, but it is difficult to construct adequate measures on a time-varying basis going back sufficiently far to construct the kind of panel model generally sought for economic model calibration.
- *Logical constraints and non-linearities.* When a full simulation model is constructed for the housing system it is necessary to address the situation which may arise when the combination of numbers predicted freely by econometric equations runs up against certain logical constraints. In particular, the number of dwellings is linked to the number of households by a definitional identity involving vacancies, second homes and sharing of dwellings. Given the shortfall in supply relative to projected household numbers which is very apparent currently in England, these constraints bite quite quickly in any simulation. With the CLG–Reading Affordability model these issues were discussed in Meen et al. (2008), but mainly in the context of longer-term scenarios of supply running ahead of household numbers, and the need to envisage higher rates of demolition. The shorter-term problem of negative vacancies in regions like London was not really addressed. In the sub-regional Gloucestershire model, and earlier models such as Bramley and Watkins (2008), it was necessary to introduce additional functions to generate additional changes in house prices and household formation in these circumstances, in order to maintain the definitional link between households and dwellings. These effectively imply non-linear relationships (i.e., increasingly strong feedback) in conditions of low vacancy rates. Similar issues arise in tenure-choice elaborations of these models, for example to deal with the rationed supply of social rented housing.

Using Economic Models in Planning

Over the last decade there has been some attempt to get the planning system to take more seriously the effects of its decisions on housing market outcomes, particularly affordability, much reinforced by the Barker (2004) Review. Planning guidance was amended to insert affordability as one of the factors to be considered in determining new housebuilding targets. Guidance on Strategic Housing Market Analysis (SHMA) (CLG, 2007) set out a framework within which current and future affordability considerations were expected to be reflected in local authority or sub-regional assessments of future housing requirements. However, this guidance was light on detailed prescription about how future affordability conditions should be forecast, with no ready-to-use model which could be plugged in at this level. External reviews of SHMAs prepared in this period were critical of many aspects of these studies and suggested that there was much room for improvement.

Strong economic arguments for increased regional housing supply targets were made by NHPAU, drawing primarily on the CLG–Reading Affordability model, but the Regional Planning Bodies were reluctant to take these arguments on board. While their position doubtless reflected sentiment within their regions which was hostile to extra housing development (Bramley, 2011b), it was often dressed up in arguments about infrastructure inadequacy and costs, environmental constraints and the balance between urban regeneration and greenfield development.

Following the change of government in 2010, as explained above, regional planning has been quickly dismantled in England and decisions are effectively devolved to local authority level. The key issue now is how the core strategy for new housing within the Local Development Framework is determined, and in particular the nature of the evidence which is utilised to establish and demonstrate the soundness of the strategy. In principle, economic models could be deployed at this point, alongside other more traditional kinds of evidence like household projections. However, many practical, political and cultural factors may in practice militate against this.

On a practical level, there is still a lack of established, proven and credible economic housing market models which operate at the appropriate sub-regional and local levels. The political problems arise from the government's commitment to localism and the fact that it clearly campaigned on freeing local authorities from top-down targets in the run-up to the 2010 election. Local sentiment is generally against more housing development in most areas which need to provide more housing if progress is to be made on improving affordability (Bramley, 2011b). Local politicians are likely to pay more attention to relatively short-term electoral considerations than they are to relatively long-term forecasts of affordability, and may argue that current depressed conditions in the market mean that housing supply is not much of a short-term issue, especially given the large backlog of permissions not currently being built out.

They may also point out, with some justice, that the level of house prices seen in recent years has more to do with macroeconomic factors and lax financial regulation than with planning. However, local politicians may be more willing to countenance additional housing if it can be shown to bring improved infrastructure or enhanced local economic growth.

There is also arguably something of a cultural problem in getting planning to address economic arguments, models and evidence. Most professional planners are not well educated in these matters and not particularly comfortable in engaging with these in their everyday work, as has been shown in the context of negotiations over planning gain and assessing the viability of development sites (Crook and Monk, 2011). Experience both at NHPAU and in more local contexts suggests that planners (and planning inspectors) are much more comfortable in working with the traditional demographic approach to housing requirements.

In the light of the above considerations, it would seem rather unlikely that the use of economic models to inform local planning targets for housing will become widespread in the short term. However, at the same time, the reality on the ground is of very low levels of new housing supply, scarce public spending resources for subsidized affordable housing and extreme difficulty for younger households in accessing home-ownership, which may serve to increase the pressure for the issues of housing supply and affordability to be addressed more effectively. In this context, there is an opportunity for economists, whether working within academia or a consultancy context, to develop and offer credible forecasting models which could be widely used and replicated within the system.

Reflections

Over the last decade, housing supply, affordability and the links between housing and the economy have all become much more important in national policy debates. There has been considerably more and concerted research effort on these issues, and this parallels rapidly expanding international academic literature on the economics of housing, finance, land-use regulation and urban growth management. National policy became much more economically informed and oriented following the Barker (2004) Review, economic criteria (particularly affordability) were given formal priority in the planning system, and an officially sponsored economic model was developed to inform regional planning.

However, as we progress into the second decade of the twenty-first century, there is a sense that this great leap forward has been something of a flop. Housing supply is languishing in a prolonged recession, regional planning and national/regional targets have been abandoned, and the immediate prospects of the now localised planning system routinely utilising economic models seem slight.

What lessons can be drawn from this experience? There is always a danger that brute politics trumps rational economic argument. Beyond that, one can make the observation that there was a failure to translate a consensus among a relatively narrow group of economists in central government and academia about the issue to a wider consensus across the policy community of planning at national, regional and local levels. Cultural blinkers may apply to both groups. Furthermore, some of the doubts raised about the economic analysis in Barker and the CLG–Reading model may not have been without foundation. The economic models, with the benefit of hindsight, probably gave inadequate attention to the role of lax financial regulation and the massive flows of funds stemming from international economic imbalances in generating high house prices. The importance of these factors was underlined by the credit crunch, although in the UK the extent of subsequent price falls has been surprisingly limited. There are puzzling anomalies in the models (e.g., negative vacancies) as well as the general problem that these ‘long run’ models suggest that the affordability benefits of greater supply are rather modest and very long term.

Reviewing the limitations of the different models summarized in Table 1, it can be seen that progress has been made in developing more appropriate forms of model, particularly panel models applied to appropriate spatial units (sub-regional HMAs), and in tackling some of the inherent econometric issues. Further work is needed on the modelling of credit-rated housing demand, interactions with the rented sector, and the behaviour of the market under stress in terms of vacancy levels. However, to get full benefit from such approaches would require more consistent investment in statistical measurement of planning regulation and land supply at local level over time.

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