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THE RISE AND RISE OF THE PRIVATE RENTED SECTOR – INSIGHTS FROM SUPPLY AND DEMAND SYSTEM MODELLING IN NEW ZEALAND

Glen Bramley
(Institute for Housing, Urban and Real Estate Research, School of the Built Environment, Heriot-Watt University, Edinburgh, EH14 4AS, UK; g.bramley@hw.ac.uk)

Chris Leishman
(Urban Studies, Glasgow University, UK)

David Watkins
(Institute for Housing, Urban and Real Estate Research, School of the Built Environment, Heriot-Watt University, Edinburgh,)

Abstract

Most academic attention seems to focus on owner occupation or social renting, but the big story of the last decade or more in many countries has been the resurgence of private rented housing. Both UK and New Zealand have seen large and sustained rises in the relative and absolute size of the sector, with relatively low increases in rents. After briefly reviewing literature on the institutional and broader economic context for this phenomenon, the paper will suggest an appropriate framework for modelling the sector. This adapts the classic demand and supply model to yield a system entailing a rent and supply stock or flow function, embedded in a wider housing market system addressing house prices and supply, at a sub-regional scale. Implementations of such models for New Zealand are presented and assessed, and implications for current views of investor and consumer behaviour drawn out. A simulation model for the wider housing system in NZ is used to look at a range of potential future scenarios, leading to the conclusion that the rise of private renting is very likely to continue.

Introduction

The most striking feature of recent years in the story of housing tenure has been the remarkable rise of the private rented sector, after many decades of decline and displacement. This rise has largely blindsided housing policy attention and debate, which tends to focus largely on social renting and on home-ownership.This feature clearly applies to the UK but also apparently to quite a number of other countries, notably the Anglo-Saxon ones (Pawson 2012, Oxley et al 2010). Between 1991 and 2010, the stock of private rented dwellings in England increased by 123% and the PR share of all dwellings increased by 92% (DCLG Live Tables 209). Most of this increase occurred after 2001. There has been a corresponding fall in the share of home-ownership from 70.0% in 2002 to 64.8% in 2010. In New Zealand, the particular focus of this paper, the stock of PR dwellings increased by 81% over the same period, and the share by 45%, from a relatively higher base, with the home-ownership share falling from 69% to under 60%

There are many interesting policy issues raised by the private renting revival phenomenon. These include issues of the optimal extent of (de-)regulation, tax treatment of rental investors and owner occupiers, support for new and marginal home-owners, security of tenure regimes, housing allowances, and use of private renting to house households experiencing or at risk of homelessness. However, this paper does not attempt to discuss these policy aspects.

The focus of the paper is on gaining an understanding of the systematic determinants of demand for and supply of private rented housing and from this to develop a capacity to forecast future growth (or decline) of the sector and its key characteristics, particularly rent levels, and their regional distribution. After a discussion of our prior expectations on these, based on theory, descriptive data and other recent literature, we proceed to develop and test models for PR supply and demand in a particular national contexts, New Zealand. New Zealand is of interest as an example of a country with less social housing, a strong owner occupation tradition but a large, growing and unregulated private rented sector (on which it has good data).

Understanding changes in the private rented sector, and an ability to predict future change, are of great interest, not least because of the recent large and unexpected increase in the scale of the sector. Recent academic research has dipped into particular issues around the sector but presented few general models of its interaction with the mainstream market. There has been extensive modelling of house prices but few UK examples of modelling of private rents, perhaps because of data limitations. The sector provides the main option to most households potentially at risk of experiencing homelessness, affordability or other housing need problems, unless they can get access to an often scarce social rented sector. Therefore understanding and modelling the sector is likely to be important when attempting to model housing needs (Bramley et al 2010). Its increasing importance, in conjunction with Housing Benefit/Allowance reforms and cuts, gives it an added importance.

Recent literature

We have reviewed recent literature on PRS markets in connection with our study of New Zealand. However, the recent literature surveyed does not seem to contain many contributions which look at the fundamental relationships between rental and ownership markets and how these adjust to one another and to major influences on housing supply and demand. It may be necessary to refer back to work published in the 1980s and 1990s, mainly relating to the US, to get this broader perspective (e.g Borsch-Supan 1986, Haurin et al 1996, Alm & Follain 1994, Read 1993). Some relevant recent contributions have been identified, for example Verbrugge (2008) who discusses the puzzling divergence of rents and user costs, questioning some assumptions in received theory. Otherwise, literature on how the markets function tends to be focussed on particular issues, such as search behaviour (Read 1993), time on market (Allen et al 2009), key money (Ben-Shahar et al 2002), or size of landlord effects (Larsen & Sommervoll 2009).

A particular theme of some recent literature is the impact of deregulation, particularly in UK after 1988 (Gibb 1994; Crook & Kemp 1996), and on particular forms of regulatory restriction on rental market contracts. For example Smith (2003) looks at rent decontrol on vacancy in Canada, Munch & Svarer (2003) look at rent control and tenancy duration. Some of this work focuses on descriptive information on landlord size and other characteristics, as well as more theorized views about the behaviour of different classes of landlord. One of the paradoxes is that in some European countries (Germany, Switzerland), large and vibrant private rental markets coexist with forms of regulation (Weczberger 1997, Knoor-Siedow 20xx), something which Anglo-Saxon economists would not expect to find. The overwhelming impression from most of this work, certainly that looking at UK and Australasia, is that the dominant landlord class is small individuals or households, and that this concentration has increased (e.g DCLG 2011, Berry 2000, Yates 1996).

Another side of intervention is tax concessions and subsidies to the sector or other housing sectors or investments. This is reflected in UK work on schemes like BES, HITS (Crook & Kemp 2002) and wider work (Capone 1995). A variation on this theme is work looking at the impact of rental assistance schemes on tenancy conditions (Stamso 2010)

Much recent literature on private renting is concerned to describe, account for and interpret changes in the role of the sector in terms of who it is housing and over what time periods (Kemp & Keoghan 2001, Gibb, K. & Nygaard, C. 2005, Norris et al 2008). Some of this seeks to relate this evidence to broader theories about housing and welfare regimes (Hoekstra 2009). Other work is more focussed on particular niche markets like students (Rugg et al 2002). There is limited work relating the role and profile of the sector to the nature of supply, for example the role of conversion or condominiums (Steele 1993). Of particular concern in countries like Spain is the role of the sector in housing migrants (Bosch et al 2010). There is some limited literature on the role of PRS in East Asian countries (Li 2008, La Grange & Petrorius 2002). Some of this literature is more relevant to issues about how people get into housing need and interactions with social housing (Whelan 2009, Morris 2009, Jacobs et al 2007, Kemp & Rugg 2001).

Theory and Expected Determinants

Demand

The demand for housing can be conceptualised as comprised of three elements: household formation, tenure choice and the quantity of 'housing services' consumed (i.e size and quality). The demand for private renting nests within this broader framework. Household formation has traditionally been projected by extrapolation based on age structure and marital/family status, but there has been growing recognition of the influence of economic variables, particularly income and employment but also housing market conditions and supply including social renting (Bramley et al 1997, DETR 1999, ODPM 2005, Andrew & Meen 2003). Newly forming households are likely to enter private renting initially and so this flow is particularly relevant to the sector and the size of the key age groups for household formation (20-34) is likely to be important.

Tenure choice is central to private rental demand, although it is usually approached from the viewpoint of people's ability to enter owner occupation (Bramley & White 2011). Ownership entails the acquisition of a typically costly capital asset, whereas renting involves ready access with little up-front investment.. In general, home ownership is seen (by public and governments) as a more desirable tenure, a badge of success more associated with higher socio-economic groups, giving greater security and control as well as the ability to accumulate asset value. Therefore, on this view the most important issue in tenure choice is the ability to surmount the economic barrier to homeownership, 'affordability' to use the contemporary term, and the 'choice' is more a matter of constraint than preference – anyone who can buy, does so, while those who do not buy were (clearly) not able to..

This polarised view is too simple. Firstly, in some countries and cultures renting has a more positive image and home-ownership is viewed in a more mixed way, particularly in the light of periodic problems like the US sub-prime debacle of the mid-2000s. Secondly, much of the 'intrinsic' appeal of home ownership may reflect its frequently fiscally privileged position (Stephens 2005). Thirdly, tenure is often bundled with combinations of housing type, quality and locational attributes which are desired or not in their own right. Fourthly, and most fundamentally, in any well-established market system (including a flexible credit system) there should be some equilibrium relationship between the costs of owning and renting, so that at the margin people are choosing the tenure that suits them better – accepting that some at the bottom of the income distribution are unlikely to have the option to buy, at all or a housing unit of minimum acceptable quality.

An extension of the first view is to note that, once ownership is achieved, few households revert to renting. This gives rise to cohort effects and path dependence in tenure, whereby affordability/access conditions in one period are reflected in differing ownership rates for older households in later periods

In practice, therefore, the propensity to buy will be a mixture of choice, based on relative costs and benefits, and constraints, particularly those associated with obtaining mortgage credit including lenders' norms in terms of loan-to-value and loan-to-income ratios. In some periods (such as post-2007) credit rationing has been a major factor, with large deposit requirements being imposed (in UK) to limit or delay access to households without access to significant wealth or savings. For those exercising choice, key considerations are price levels and interest rates (affecting mortgage outgoings), prospective capital gains (or losses), and their expected length of stay (the inverse of expected mobility) – transaction costs mean that home-ownership is rarely worthwhile for households expecting to move again within a couple of years. These factors (along with tax rates and reliefs) may be combined in a composite measure of 'user costs' which may be compared with the alternative cost of private rents. Income is important but it is often argued by economists that expectations of income (or 'permanent income') is more important than current income; this may in practice be proxied by variables such as occupation or qualifications and age.

So the demand for private renting, given overall household numbers and growth rates, will be the inverse of the effective demand for owner occupation. Variables which are positive in their effects on home-ownership may be expected to be negative in their effects on renting. However, if they are also positive in relation to household formation, then that may override this in some cases.

Mobility is important in a number of ways. We have already noted that high expected mobility is associated with a greater propensity to rent. Secondly, mobility affects the flow demand in the market. Thirdly, geographical mobility (migration) redistributes demand between geographical areas. Areas (e.g. cities) which are receivers of large inflows of (younger) households are likely to have a big demand for private renting. It is easier to move within the private rented sector and people may choose this tenure initially pending becoming settled in and familiar with an area. International migration has become more important in UK since the 1990s and EU migration expanded greatly after 2004, directing substantial flows of working age migrants to areas previously having few such migrants, and this has also clearly boosted private rental demand. Students area also a group displaying high mobility and a high propensity to rent privately.

How far can the recent rise in private renting, in countries like the UK and NZ, be explained by the above demand side factors? Demographic factors are mixed, with positive effects expected from the greater share of single person or single adult households, because these have only one income and may be more mobile. In addition, the increased international migration has undoubtedly been a plus factor in UK. On the other hand, the population is ageing and this is expected to become more pronounced in the longer term, which will dampen down housing demand generally and renting demand specifically. There has been a large sustained increase in participation in higher education, and this is undoubtedly another positive factor. Fiscal factors may have had modest effects – the ending of mortgage tax relief in the 1990s and the increased impact of Stamp Duty (Wilcox 2009), but these are relatively marginal. The alternative social rental tenure has also seen a marked decline in availability of lettings since the late 1990s. Probably the biggest factor, however, and especially in the recent period of most rapid tenure shift, has been the 'unaffordability' of home-ownership for would-be first-time buyers resulting from the substantial real rise in house prices (+132% in UK,1997-2007; +85% in NZ, 1996-2007). This has been reinforced by the effects of limited mortgage availability and tighter rationing through deposit requirements since 2007 (especially in UK).

Supply

Any economic model of private rental supply is expected to have rent level or change as an explanatory variable. In the UK prior to 1989 most private rents were regulated according to the so-called 'Fair Rent' system. Since that time,nearly all new lettings have been deregulated with rents determined freely by landlords or in negotiation with tenants. In NZ rents have been relatively unregulated over a long period. Whereas under regulation rents could be seen as exogenous (and generally below any market-clearing equilibrium), under deregulation rents must be viewed as endogenous within the system, and presumed to represent an approximation to market-clearing equilibrium.

The private rented sector may be expected to interact with the owner occupier market. Landlords/investors look at their potential return in terms of rent against the cost of acquiring the asset, or the opportunity cost of houses already owned, which is given by the house price. Investors may have to borrow to finance the purchase, in which case the mortgage interest rate (applicable to BTL) will enter their cost function. Alternatively, for equity investment there is an opportunity cost, which may be taken as some representative interest rate or market return on relatively low risk alternative investments, such as government bonds. They will also have running costs to consider, including management, maintenance, insurance, depreciation and any relevant taxes. These are generally taken as some fixed proportion (e.g. 2%) of house price, although theoretically a replacement/rebuilding cost might be a better basis. In modelling supply, there is a choice between entering these variables (e.g. price, interest rate) separately or combining them into a 'user cost' function appropriate to investors, rather analogous to that often used for owners as described above.

In any event, it is also generally argued that investors pay considerable regard to their potential returns from capital appreciation as well as from rents. As investors, they may be expected to take this factor more seriously than would-be home-owners, who are more consumption-oriented and have to live in the property. On the other hand, they are (unlike owners) potentially liable to capital gains taxation on this appreciation. User cost expressions generally contain an assumed allowance for expected capital gains, but it is unclear a priori what this is based on. There is some evidence that expectations are adaptive and backward-looking, but they are likely to be discounted although we cannot say a priori by how much. There is a case for estimating models with the capital growth variable entered separately rather than bundled in user costs, and we show below that this suggests that prospective gains are heavily discounted.

There is another specific factor which links the owner occupier and private rental markets, related to the dynamics of the market cycle. If the owner occupier market is very weak, and getting weaker, existing owners who need to move for personal or job reasons may find it difficult to sell or may be reluctant to sell for a low price. In an unregulated market they have the low-risk option of letting their former home and moving to rent in their new location. These 'involuntary landlords' were a significant feature in the 1990-93 period in the UK and again post-2007. As pointed out by Pawson (2012), this group also add to the demand side as well as the supply side. However, as the market revives they may be expected to sell their rented property and buy for their own occupation.

The overall supply of new build housing in a region may be positive factor in the supply function for private renting. There is some evidence that new build, particularly in certain locations and of certain types (e.g. city centre flats) has a higher than average propensity to become private rental stock. However, very little new build is directly promoted for private rental by large companies or institutions in the UK or NZ. The evidence shows an overwhelming emphasis on small scale individual investors (DCLG 2011, Pawson 2012). Insofar as new build housing commands any price premium, investing in cheaper secondhand property is likely to yield a better return. Therefore, the main mechanism of supply is tenure switching, whereby stock sold on the market by former owner occupiers provides the main net additions to supply in the sector, alongside the sale of formerly rented and vacant stock.

Running costs (M&M) may be treated as an independent variable in PRS supply modelling (Stroombergen 2004 provides a New Zealand example). However, we lack specific price/cost indices for these running costs, and would generally assume that they broadly track general inflation and/or construction costs. .

Subsidies and tax reliefs would be part of any general PRS supply model, with a particular emphasis on differences between the regime facing landlord investors and that facing (a) owner occupiers and/or (b) other forms of investment. In UK and NZ the tax regime for landlord investors is pretty much the same as that for investors in other assets, but less favourable than that applying to owner occupiers. In practice, over the time periods we are looking at here, the relative treatment has not changed significantly over time or varied significantly over space. Therefore, this factor does not feature in the models considered below.

We would argue that types of housing stock available in a market area may be expected to impact on the scale of private renting. Certain property types, for example flats, are more likely to appeal to private renters, who tend for example to be mobile and smaller households. Thus we would expect the stock profile of a local or regional market to account for some of the cross-sectional variation in the size of the PRS. Changes in the stock profile, as when new build is concentrated on these house types, may account for some change in PRS over time.

A final factor we would expect to be important in explaining private rental investment is the distribution of wealth. A more unequal distribution of wealth would be expected to be associated with more private renting, as there are more people at the top of the distribution with resources to invest, at the same as more people towards the bottom of the distribution are excluded from owner occupation (a demand side effect). Regressive changes in wealth distribution, such as have been seen recently in UK, NZ and other countries, could help to account for increases in private renting. It is also argued that such a pattern is to some degree self-reinforcing, as the skewed ownership of housing assets interacts with rising real values to further skew the distribution of wealth. This factor may also interact with the return on other forms of investment. In a period (such as the 1990s) when stock market returns were high, wealthier investors might be more likely to choose that form of investment, rather than housing. Conversely, in a periods such as the 2000s, when stock market returns have been low and uncertain, housing may look a better investment. This tendency may have been reinforced by a general disillusionment with a range of investments offered by the financial services industry, including private pensions, unit trusts, endowment plans and the like. This factor may be particularly important for individuals with moderate wealth.

It may be difficulty, however, to operationalise wealth distribution in a supply model. We do not have very good measures of this, particularly on a consistent basis over time, and neither do the measures we have disaggregate easily to sub-regional levels. In any case, the relevant distribution of wealth may not be the local one but that for a wider region or the whole country.

What then would a supply side explanation of the recent PRS expansion in the UK or NZ look like, and how much of a role did these factors play relative to the demand side factors? Clearly, deregulation represented a major regime shift which led to a step change in the scope and appetite for private landlordism in the UK. Interest rates (both mortgage rates and long term/bond rates) fell in the 1990s and have remained low through the 2000s, and this factor will have been a significant positive influence on the growth of the sector – comparative studies of housing tenure have drawn attention to the association of low inflation and low interest rates in Germany partly explaining the strong PRS there [Ref]. Lower real prices in the late 1990s will have encouraged PRS growth, while the rise in prices in the 2000s will have had mixed effects on supply – the higher level reducing supply, but the high capital appreciation boosting it. This does not however explain the very big increase since 2007 in

the UK, where the lack of attractive alternative investment opportunities seems to be a big factor, including post Credit Crunch, whereas in NZ the biggest increase occurred during the 1990s. Widening inequalities in wealth in both countries over most of this period may well be important. New supply as a whole has been fairly sluggish but the shift towards many more flats in urban locations in the 2000s may well have further boosted the PRS in UK particularly.

The overall story, seems to be one where both demand side and supply side factors have pointed to an increase in the sector. Perhaps the key evidence that supply expansion has matched the demand shift is that rents have not increased very much in real terms, in either country.

Formal Model Structure

It is customary to model the owner occupier housing market using an inverted demand function with price on the left hand side and supply together with demand-shifting variables on the right hand side (Meen 1994, 1998). Therefore it seems that one natural approach to the private rental market could be similar, with an inverted demand function expressed as a rent level equation, with mainly demand side variables plus (endogenous) supply on the right hand side. This would be complemented by a supply equation to predict the stock and/or flow of rental units in terms of supply-influencing variables. It is assumed that the main source of supply is from the existing private housing stock, although some new build units may go directly into renting.

A formal if stylised demand and supply model for private renting could take the following form.

$$QRD = HH.(1 - HO/HH - HS/HH) \qquad (1)$$

Where
QRD = Demand for private rental units
HH = Number of households
HO = Demand for owner occupier units (ho=HO/HH)
HS = Stock of state/social housing units (hs=HS/HH)

This demand function can be decomposed into two components, a household formation function and a tenure choice function.

The household formation function could take the following form

$$\ln(HH/N) = \ln[\sum_{a=1}^{A} b_a.(N_a/N)] + \{b_{ho} + b_{h1}Y - b_{h2}r.P - b_{h3}R + b_{h4}E + b_{h5}HE + b_{h6}M + b_{h7}K + b_{h8}hs\} \qquad (2)$$

Where
N = Population
a = age groups
Y = income or earnings
r = mortgage interest rate
P = house price
R = market rent
E = employment rate
HE = higher education students
M = in-migration
K = wealth
b's = coefficients (expected signs indicated as +/-)

The tenure choice function for home ownership could take the corresponding form

$$\ln(HO)/HH) = +\{b_{oo} + b_{o1}Y - b_{o2}r.P + b_{o3}R + b_{o4}E - b_{o5}HE - b_{o6}M + b_{o7}K - b_{o8}hs \qquad (3)$$

Note the change in expected signs of coefficients on R, HE, M and hs.

Substituting (2) and (3) into (1) we obtain the following expression for QRD

$$\ln(QRD/HH) = \ln(N) + \ln[\sum_{a=1}^{A} b_a.(N_a/N)] + \{b_{ho} - b_{o0} + (b_{h1} - b_{01})Y - (b_{h2} - b_{02})r.P - (b_{h3} + b_{o3})R + \lambda R\}$$

(4)

where

$$\lambda R = \{+(b_{h4} - b_{o4})E + (b_{h5} + b_{o5})HE + (b_{h6} + b_{o6})M + (b_{h7} - b_{o7})K + (b_{h8} + b_{08})qs\}$$

If we equate QRD with QRS in equilibrium, and re-arrange (invert) the function to place Rent on the left hand side, we obtain the following expression for Rent

$$R = \{\frac{1}{(b_{h3} + b_{04})}\}.\{\ln(N) + \ln[\sum_{a=1}^{A} b_a.(N_a/N)] - \ln(qrs) + [b_{ho} - b_{o0} + (b_{h1} - b_{01})Y - (b_{h2} - b_{02})r.P + \lambda R]\}$$

(5)

Turning to the supply side, we posit a supply function for private renting share as follows

$$\ln(QRS)/D) = +b_{so} + b_{s1}\Delta P/P - b_{s2}r.P + b_{s3}R + b_{o4}D_f/D - b_{s5}D_s/D - b_{s6}\Delta D/D + b_{s7}K - b_{s8}TPR$$

(6)

Where
QRS = private rental supply units
D = dwelling stock units
D_f = flats
D_s = small dwelling units
TPR = tax rate applicable to private rental investment

The first term in (6) represents the expected capital gain based on previous price growth rate, the second term reflects the cost of capital, the third term is the rent level,the fourth and fifth terms reflect types of housing stock suited to renting, the seventh term reflects net additions to the stock through new build, and the final term allows for differential tax treatment of private rental investment.

This demand-supply system may be estimated by fitting an equation such as (5) to rent data and an equation such as (6) to the stock share of private renting. This stylised presentation brings out the point that the coefficients in equation (5) are a composite of the effects of a particular variable (such as income) on household formation and on tenure choice (i.e. income elasticity), divided by the effects of rent on household formation and tenure choice (ie. the rental elasticity of demand)

The above structural model treats supply and demand as stocks and assumes that equilibrium is readily achieved. Possible alternative formulations could adapt this to focus more on flows, particularly the flow of private rental lettings on the supply side and possibly flows of new household formation and moves between tenures on the demand side. This could still embed the same broad structural influences but allow more explicitly for the process of adjustment. However, when modelling lettings it is necessary to allow for the phenomenon of turnover/mobility as well as net changes in supply of stock. We explore this possibility further below, along with possible refinements to account for spatial and temporal lags.

Private Renting Demand and Supply in New Zealand

Background and Context

In this section we report on attempts at modelling PRS demand and supply in New Zealand, informed by the above view of model structure and expected determinants. The occasion for this exercise is the undertaking by the authors of a large scale model-development project for Housing New Zealand Corporation, the wider purpose of which is to develop a demand and supply model for New Zealand which provides a capacity, at national regional and local levels, to forecast and test different scenarios for future demand and supply in the wider housing market and in terms of the particular needs and demands for state/social housing.

In that context, the motivation for seeking to model the PRS is quite clear. Private rent levels and the availability of private lettings are important because this sector provides the main alternative for most clients of State housing in NZ. Rent levels will impact on affordability problems and the likely tenure security of low income households while the availability of lettings supply may impact on the expressed demand for state housing through the waiting list.

The private rented sector is relatively more important in NZ than in UK and some other similar countries, partly because of the smaller size of the social rented sector. Private renting rose from 20.6% of all households in 1991 to 29.1% in 2006. It appears that relatively good data on rents and new tenancies are available from the rental bond system covering most new lettings over about 20 years. In addition, the Censuses have data at five year intervals (back to 1981/86) on rents and private renting households as well as a wide range of socio-demographics, at local level.

There are a few recent studies of the rental market in NZ which are relevant. Coleman & Scobie (2009) present a simple national model of housing rental and ownership with policy simulations, based on a priori views on the likely strength of key relationships. While the results are mainly as expected, they are often complicated by the interaction of the tenure sectors. Paradoxically, higher interest rates are associated with higher owner occupation rates, and vice versa, a finding which is replicated in our simulation model (see below). In general, they argue against targeting owner occupation share as this is difficult to shift and the consequences in terms of welfare of renters may be adverse. The most generally beneficial results stem from lower construction costs.

DTZ (2008) provide a descriptive account of the private rental market in NZ, focussing on trends in market since 1996 and prospects. The key feature is a rising number and share of ‘intermediate renters’ (working but can’t buy); it also foresees a potential rise in ‘well-off renters’ (i.e. those who could buy). This is mainly driven by problems of affordability of owner occupation and there is a concentration in three major city regions. Expected low price growth is associated with continued expansion of PR including intermediate and better-off subsectors.

Stroombergen (2004) looks at the effects of the Accommodation Supplement (a form of Housing Allowance) on Market Rents. This includes and updates a basic rent model which operates on national time series data. This model links change in rent to lagged rent change, difference between rental and bond yield, change in rental stock (supply), change in housing specific costs (rates, insurance, maintenance), change in occupancy (popn/occup dwgs), seasonal and other dummies. The conclusion on AS is that it had minimal effects (based on variety of ways of modelling it)

For this study two different datasets were assembled and two correspondingly different sets of models were tested, one based on pooled census cross-sections from 1986 to 2006 at territorial local authority (‘TA’) level (n=72) and the other an annual time series from 1993 to 2011 at a sub-regional (‘MOTU’)

level (n=15). The former dataset is suited to a stock-based model, whereas the latter enables exploration of aspects of a flow-based model and of processes of adjustment, as well as providing a better basis for estimating the effects of time-varying economic and financial variables. However, we were not able to obtain satisfactory data on all of these factors specified a priori, particularly on the supply side, for example wealth distribution.

The variable used to represent supply in the first model is the percentage of all households renting (pallrent). It is acknowledged that this is not exactly the same as private rental supply, owing to the presence of HNZC stock. The modal value is 32%, compared with the overall mean of 30.5%. The distribution appears to be approximately normal, apart from a spike towards the high end at 44%. In the second model an alternative flow supply variable, the rate of new private lettings, can be modelled, although this also really requires a supplementary function for turnover to enable net change in supply to derived. The rent variable in the first model is from the census and refers to the average rent paid by all existing tenants, regardless of their length of time in the property; in the second model it is rents for new lets.

NZ Local Rent Level Model

As outlined above, we interpret the rent level model as being an inverted demand function, with rent on the left-hand side and supply (pallrent) together with a range of demand shifters on the right-hand side. The final version is estimated using 2SLS and most insignificant or statistically problematic variables are excluded.

The model in Table 1 provides quite a good fit to the data (adjusted R-squared of 0.87; std error of estimated rent $20 per week). Nearly all of the variables have effects in line with expectations, with one or two exceptions.

Table 1: Structural Demand Equation for Rent Level at TA Level in New Zealand
(2SLS estimation– $ per week, 2011 prices; pooled TLA level 1991-2006).

Short Varname	**Description**	**Coeff B**	**Std coeff Beta**	**Signif**	**VIF**
	(Constant)	231.104		0.000	
prpallrent	Predicted % Renting Hhd	-1.380	-0.155	0.000	3.508
lqmcostinc	LQ Mort Cost:Income ratio	38.325	0.136	0.000	2.050
Hhdgpa	Household growth % pa	7.509	0.127	0.000	2.334
pvac	Vacancy rate %	-9.978	-0.010	0.705	1.627
pflat	Proportion of flats	371.967	0.575	0.000	7.296
pyngh	Propn young HRPs (15-24)	-430.200	-0.145	0.000	2.138
opall	Propn one person hhd	-233.605	-0.155	0.000	3.024
b4	Propn dwgs 4 plus beds	84.497	0.072	0.086	3.738
workall	Propn working	-86.570	-0.089	0.013	2.727
talla	Propn Asian	322.861	0.335	0.000	5.367
L1Renta	Renters resident <1yr	74.516	0.043	0.060	1.094
eg6tot	Propn degree level qualifs	171.185	0.254	0.000	9.159
city	Dummy 3 cities	-15.535	-0.122	0.002	3.188
Dep Var	Rlmdrent2				
Weight Var	tahhdwgt				
	Model Summary	R	R Sq	Adj R Sq	S E Est
		0.936	0.876	0.869	20.075
		SS	deg frdm	Mn Sq	F ratio
	Regression	754006	13	58000	143.925
	Residual	107196	266	403	Sig.
	Total	861202	279		0.000

Given the inverted demand function formulation we expect the share of private renting (‘supply’) to be negative in its effect on rent, and this is clearly the case. The size of this effect does not look very large (judging by the beta value), but it should be remembered that this is the reciprocal of the rental elasticity of demand. Thus this implies fairly elastic demand (-4.5), implying in turn fairly high substitutability (in terms of areas as well as other housing options). This may be compared with an assumed value of -2.0 in Coleman & Scobie (2009).

The second variable included represents the affordability of home-ownership for marginal new buyers, which is expected to have a positive effect on rental demand, and this is indeed the case. This underlines the point that this rental demand model can be viewed as the complement of an implicit model for home ownership demand,i.e. part of a tenure choice model. A classic demographic measure of general demand in the housing market, the household growth rate (previous 5 years) has the expected positive effect at a clearly significant level. The vacancy rate has the expected negative sign but is not statistically significant (possibly reflecting data inconsistencies).

The proportion of flats in the housing stock has a strongly positive effect in this model, but is open to several interpretations. The proportion of larger dwellings has a modest positive effect on rents, which may be a general quality proxy. Two demographic variables, proportions of younger household heads and one-person households, have negative effects on rents, which is somewhat counter to our initial expectations. One interpretation is that small and young households generally have lower incomes and less purchasing power. Another might be that areas with more households of these types will have

higher levels of new household formation, in part a response to lower rents (a form of reverse causation) as well as a response to higher incomes (which would shift demand towards owner occupation). The proportion of working households has a negative effect on rents, consistent with working households being more likely to buy. However, the proportion of higher (degree level) qualifications has a positive effect on rents, proxying both higher incomes and locations with significant higher education facilities. The proportion of Asian ethnic population also has a significant positive effect, probably for similar reasons.

The model also includes the proportion of households who are renters resident in their present accommodation for less than one year, but perhaps such a measure of rental turnover is endogenous and belongs more in the later discussion of flow supply and turnover. There is also a dummy variable for the three larger cities in New Zealand, which actually has a negative effect, controlling for other variables mentioned above, possibly suggesting that the quality of rental accommodation in the cities is poorer owing to age of units etc.

Overall, we feel that this initial model for private rents is reasonable, in terms of overall fit and in terms of the effects of key variables and the story which can be told about the role of other variables..

NZ Local Rental Stock Share Model

The corresponding structural equation for rental stock level is shown in Table 2 below. We interpret this model as essentially a supply function for rental housing within the overall housing stock. The model formulation takes the previously existing (5 year lagged) stock share as a starting point and predicts current stock as a proportion of this (0.832) plus changes related to economic drivers including rent levels, house price level and change, interest rates together with measures of overall market size, overall supply change, second homes, size mix of stock, and ethnic population shares.

The overall fit of the model is very good (adj r-sq =0.93); however, much of this is achieved through including the lagged value of rental stock share. The model reported is mainly satisfactory in terms of collinearity, except in respect of the variables for rent and price which show high VIF values. The five year lagged rental stock has a strong positive effect as expected. There is considerable path-dependence or persistence in tenure structure. The economic market variables all act in the directions expected from theory. Rent levels have a significant positive effect on rental supply reflected in share within the stock. The elasticity here is 0.313, which may be compared with Coleman & Scobie's assumed value of 1.0, and our English value of 0.264.

Table 2: Structural Supply Equation for Rental Stock in New Zealand
(2SLS estimation, % of households; TLA level five yearly 1991-2006).

Short Varname	**Description**	**Coeff B**	**Std coeff Beta**	**Signif**	**VIF**
	(Constant)	3.782		0.000	
pallrent_5	5 year lagged rental hhd %	0.832	0.841	0.000	2.316
prrlmdrent2	Predicted real median rent 2b	0.045	0.375	0.000	17.834
Rllqprck	Real lower quartile price $k	-0.025	-0.345	0.000	19.457
Rlmint	Real mortgage interest rate %	-0.559	-0.201	0.000	1.610
Rlhpgpa	Real 5 yr house price grwth %pa	0.098	0.078	0.006	3.164
Dwgnok	Size of market 000 dwellings	0.003	0.021	0.491	3.601
Dwggropa	Dwelling growth 5yr % pa	-0.248	-0.043	0.032	1.565
Bachp	Propn empty Bach of all dwells	2.533	0.024	0.201	1.349
b2	Propn all types with 2 beds	4.898	0.038	0.187	3.313
Tallm	Propn of all Maori popn	5.186	0.067	0.001	1.692
Tallp	Propn of all Pacific popn	5.263	0.051	0.048	2.662
Dep Var	Pallrent				
Weight Var	Tahhdwgt				
	Model Summary	R	R Sq	Adj R Sq	S E Est
		0.966	0.933	0.930	1.684
		SS	deg frdm	Mn Sq	F ratio
	Regression	10610.1	11.0	964.6	340.320
	Residual	759.6	268.0	2.8	Sig.
	Total	11369.7	279.0		.000

House prices have a significant negative effect (-0.146 in elasticity terms). This reflects the higher cost for investors getting into the sector in times and places where prices are higher, which in turn will reflect stronger demand from owner occupiers. There is also a negative effect from mortgage interest rates, which are a key element of investors user cost (elasticity -0.123). However, higher house price growth in the preceding period is positively associated with rental share supply, consistent with the view that investors are partly motivated by prospective capital gain and that expectations for this are essentially backward-looking or adaptive. The elasticities for price and interest rates are lower than the -1.0 assumed in Coleman & Scobie (2009). Also, some of the findings just given are not consistent with those from the flow/change models reported below, nor with some comparable English results.

New build supply (dwelling growth) in the preceding period is associated with a lower rental share. This is against expectations may be a location-type effect, proxying expanding suburban areas where the dominant tenure is owner occupation, and/or general tendency for new supply to be mainly geared to an owner occupier market rather than rental investors. By implication, rental investors are mainly working within the existing housing stock. This finding is at variance with later results from the lettings flow model and also comparable English results.

The variable measuring second homes (Bach) has a weak positive effect, not quite statistically significant. One housing size/type mix variable is included – the proportion of 2-bed dwellings. This has a marginally insignificant positive effect. Our interpretation would be that stock in this size category may be more relevant to the rental market.

The last two variables reflect two of the main ethnic minority populations, and in both cases the effect is significantly positive. While there may be supply effects associated with these groups, it is likely that this is capturing mainly demand side effects, insofar as both of these groups have a greater

propensity to rent (or a greater difficulty of access to home ownership). With the benefit of hindsight, and having regard to the second model reported below, the assignment of some variables as between the demand and supply models may be questioned.

It is useful to look at the overall pattern of the actual and predicted values for NZ, and the differences between them (i.e. residuals) for both rents and rental stock share, over time and space. Table 3 shows the predicted and residual values for these two variables over time and for the 15 MOTU sub-regional areas.

The rise in real rent levels over the 15 year period is quite moderate at about 1.2% pa. Most of this increase occurred in the period 2001-06. New let rents from the Rental Bond dataset also showed a real rise of 1.2% pa between 2006 and 2010. The predicted value for 1991 slightly overestimates rents for that year, but otherwise there is no obvious pattern in the residuals over time.

For most sub-regions over the period as a whole the predicted rents are on average quite close to the actual. Exceptions are North Auckland, where actual rents exceeded predicted by over $20 pw (8%), and Wellington East where actual rents were $17 (8%) less than predicted. Three of the four South Island areas had actual rents below predicted.

Table 3: Predicted and Residual Rent Level and Rental Stock Share by Time Period and Sub-Region

Category	Pred Rent $pw	Resid Rent	Pred % PR	Resid % PR
Total New Zealand	205.05	0.00	30.45	0.00
Year				
1991	197.15	-10.99	26.91	-0.60
1996	200.22	4.99	28.40	1.01
2001	193.35	9.04	32.27	-0.03
2006	227.11	-3.64	33.58	-0.37
MOTU Sub-Region				
Northland	170.35	-5.21	29.84	-0.71
Nth Auckland	250.94	21.09	25.88	0.44
Auckland City	281.93	-0.92	41.46	0.13
Sth Auckland	238.94	6.56	30.87	0.04
Waikato	171.20	-0.48	31.25	1.06
Bay of Plenty	172.50	2.10	31.99	-0.67
Gisborne/Hawkes Bay	171.98	0.48	31.40	-0.02
Taranaki	152.60	0.03	27.59	0.17
Manawatu	160.94	-3.87	30.86	0.41
Wellington West	243.16	1.64	33.82	-0.22
Wellington East	197.57	-16.74	29.45	-1.23
Nelson Tas West C	176.83	0.72	25.70	0.28
Canterbury	195.79	-8.74	27.64	-0.49
Otago	174.63	-6.23	28.84	0.03
Southland	129.64	-6.30	23.88	-0.65
Total New Zealand	205.05	0.00	30.45	0.00

NZ Regional New Let Rent Level model

Based on an assessment of the limitations of the first set of models just described, it was decided to develop a somewhat different set of models using the second (sub-regional time series panel) dataset mentioned above. The motivation for this approach is partly to get a better estimation of the effect of time-varying economic and financial variables. Secondly, it reflects our assumption that sub-regional areas are the best units for modelling housing market adjustments. Thirdly, with a reasonable length of annual time series such as this it is possible to employ some time series techniques to take account of auto-regressive effects and dynamics of adjustment . Fourthly, we also take the opportunity to include potential spatial spillover effects from adjacent regions. Finally, the attention shifts to rents determined for new lets rather than rents across the whole stock, and again we would expect this to better pick up market adjustment effects.

We first report a model for rent level which is loosely comparable with Table 1, but this time the focus is on new let rents (the current active market) and the endogenous supply variable is private lettings rather than private stock. The model in Table 4 is estimated using Instrumental Variables (IV) in Stata with robust standard errors and with observations weighted by relative stock size. The model achieves a high r-squared but this is mainly down to the strong role of 1-year lagged rent level, and there are indications of some positive serial autocorrelation.

Table 4: Model for New Let Rent level for NZ sub-regional annual panel 1993-2010
(IV estimation, $ week, 2-bed ,real terms @ 2011 prices, 15 'Motu' sub-regions)

Varname	*Variable description*	*Coeff*	*Robust Std. Err.*	*t-stat*	*signif*
constant		72.097	16.779	4.300	0.000
Pplets*	Private lettings % all hhd	-1.717	0.871	-1.970	0.050
rlrnt_1	Lag real med rent 2br n l	0.954	0.027	35.010	0.000
b2	Propn stock 2 bedroom	-65.250	29.801	-2.190	0.029
b4pl	Propn stock 4+ bedroom	-133.591	39.465	-3.390	0.001
eg6tot	Degree level qualifs prop	55.925	22.927	2.440	0.015
mcostinc	Med mortgage cost:income	11.844	5.644	2.100	0.037
unempct	Unemployment %	-2.315	0.422	-5.490	0.000
pchwapop	Change in wkg age pop % pa	0.357	0.154	2.330	0.021
Psh	State housing % all stock	0.915	0.341	2.690	0.008
*Instrumented					
	Number of obs	285		R-squared	0.980
	F(9, 275)	1416.17		Root MSE	8.619
	Prob > F	0.000			

Nevertheless, the model is encouraging in that all of the other variables included are significant and most have effects in the expected direction, from a demand perspective. A greater supply of private lettings reduces rents; more people with high qualifications increases rents; higher mortgage cost to income ratio (less affordability to buy) increases rents; higher unemployment reduces rents; higher demographic growth in terms of working age population numbers increases rents. The two dwelling size variables (2-bed and 4+bed) both appear to be associated with lower rents. The final variable included, state housing stock share, has a positive effect on rents, which is against expectations – a

possible reason is that this is acting as a proxy for the Auckland region which has the highest general demand but also the largest state housing stock.

Partial adjustment rent model

A variant rent model also tested on this dataset is a partial adjustment model, a form often used in modelling house prices in time series. The dependent variable is the first difference, in natural logs, of real median rent (ld_mdrent). Modelling in first differences deals with any possible issues of non-stationarity in the series. Explanatory variables in this form of model include the lagged log rent level (a 2-year lag works best) and variables measuring in levels the same kind of demand-shifting variables as were included in the previous rent models. The coefficients as estimated can be transformed back to the underlying long run structural relationship coefficients by dividing by (minus) the coefficient on the lagged rent level

This model is estimated on panel data in Stata, and the statistical outputs from the model shown in Table 5 are slightly different from those provided previously for the OLS models on pooled cross-sectional data.

Overall we feel that this model is quite successful in capturing movements in rents. It is clear that time series variables are doing the 'heavy lifting' in this model, as is shown by the higher 'within' R square values compared with the 'between' values (which capture the cross-sectional effects).Variables expected to act as 'error correction' terms are significant ('pchwapop', the percentage change in working age population, is positive; 'mdmcostinc', median mortgage cost to income ratio is positive). These variables serve to bring rents back towards their long run equilibrium level.

Other demand shifter variables mainly have impacts in the expected direction. Rental growth is reduced by higher unemployment (unempct) and higher lettings supply (pplets). It is increased by higher government bond rates (as suggested in other research on NZ private rental market, as cited in Coleman & Scobie). It is also higher where qualification levels are higher (eg6tot), in line with the previous levels models.

Table 5: Partial Adjustment Model for New Let Rents in New Zealand, MOTU Region Level 1992-2011

(log differences, annual panel data by MOTU Region Level, 1992-2011)

Varname	*description*	*Coefficient*	*z statistic*	
Constant		0.6810	5.65	***
l_mdrent(t-2)	Log real median rent t-2	-0.1186	-4.54	***
Mdmcostinc	Med Mort Cost:Income	0.1504	4.59	***
Unempct	Unemployment rate %	-0.0069	-4.35	***
Mint	Mortgage interest rate %	-0.0063	-3.43	***
pplets(t-1)	Private lettings % hhd, t-1	-0.0075	-3.23	***
GBond10(t-1)	Govt. Bond int rate % t-1	0.0071	2.31	**
Psh	State housing %	0.0074	4.85	***
rlmdrnt2_s(t-2)	Real med rent spatial t-2	-0.0002	-2.39	**
eg6tot	High degree qualifs propn	0.2928	3.6	***
Pchwapop	Change working age pop %	0.0015	2.47	**
	Rho_ar	0.2501		
	sigma_u	0.0078		
	sigma_e	0.0283		
	Rho_fov	0.0709		
	Theta	0.2364		
	R-sq:	0.4681	Within	
		0.0786	Between	
		0.2912	Overall	
	Wald chi2(11)	106.3	***	

Notes: rho_ar is the autocorrelation coefficient
*** significant at 1%, ** significant at 5%

Two variables have effects which are not quite as expected. There is a negative association with mortgage interest rates (mint), but it should be remembered that this variable is also included with a positive effect in the mortgage cost term. There is a positive association with the proportion of state housing, whereas we might have expected a negative effect – this might be mainly proxying the Auckland region as noted.

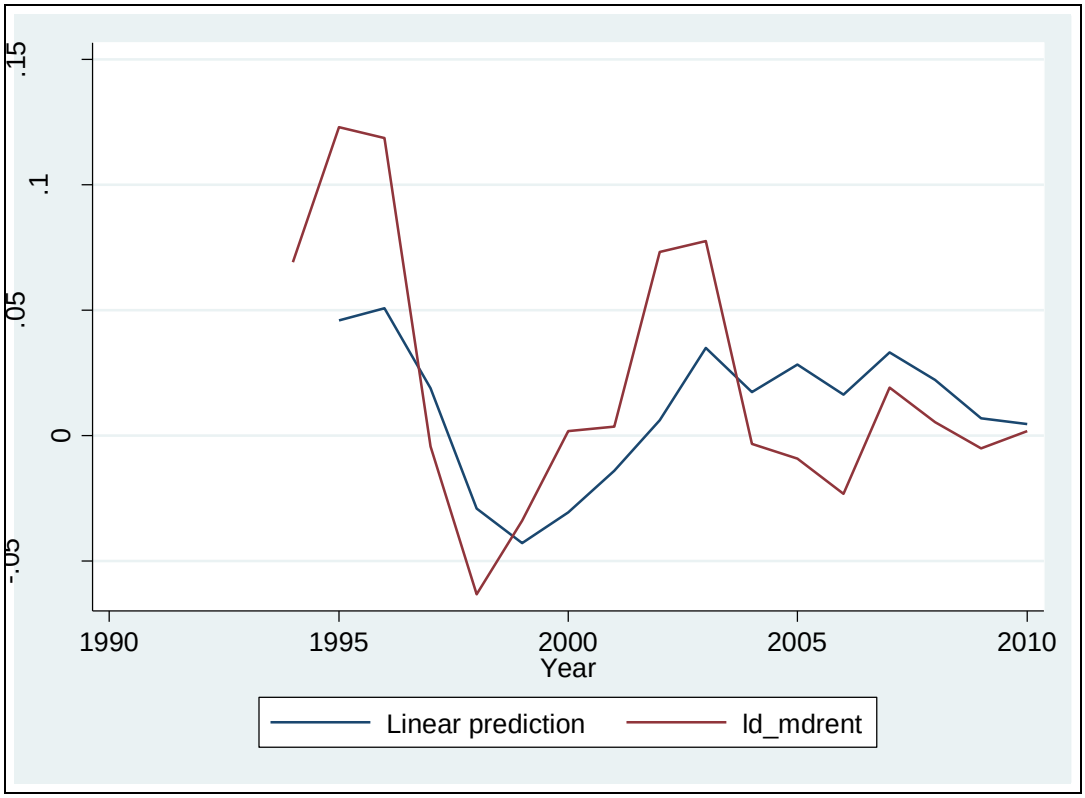
The lagged spatially contiguous rent variable (rlmdrnt2_s(t-2) also has a negative effect. This may be capturing part of the time adjustment process as well as spatial effects. Speed of adjustment is low (the -0.12 coefficient on lagged rents), but negative, which suggests that high rent levels reduce rent growth, other things being equal

The R squares may seem low (0.29 overall), but are not bad for a model estimated in log differences.

This model may be compared in a general way with Stroombergen (2009) which also models rental change at national level, but there are many detailed differences in the models. Similarities include the effects of supply, occupancy and government bond rates; however, our model places more emphasis on economic demand factors like unemployment and affordability of home ownership.

The predicted values capture turning points quite well , as is shown by Figures 1 below, which shows actual and predicted log differences (i.e. changes) in median rent over the period for four Auckland City – similar charts may be produced for the other regions.

Figure 1



mID=3 Auckland City

Overall, this model shifts the emphasis to a time series framework which captures economic and financial effects on rental change better than the pooled cross-sectional model. It deals with the autocorrelation effects in a more satisfactory fashion. We therefore believe that this model could provide a sounder basis for forecasting rents than those previously-described, particularly the TA level model.

Private lettings

We have tried to develop a flow-based supply measure to model alongside rents in the time series panel framework. This is feasible up to a point, insofar as we can estimate the flow of lettings as a percentage of the overall stock (pplets). We have developed a model of this kind, as shown in Table 6 below. This is estimated in levels using IV on the annual panel data, yielding a good fit (r-sq of 0.94) and with quite a number of variables significant. The endogenous variables include both the rent level and an additional function to predict turnover rates within the private rental sector.

.

Table 6: Sub-Regional Model for Private Lettings in New Zealand
((IV estimation, % of households, 15 'Motu' sub-regions, annual 1993-2010)

Varname	*Variable description*	*Coeff*	*Robust Std. Err.*	*t-stat*	*signif*
constant		-7.292	0.757	-9.630	0.000
rlmdrnt2*	(pred) Real Med Rent 2br n l	0.004	0.001	3.950	0.000
pprturn2*	(pred) Private Rental Turnover	0.292	0.014	20.490	0.000
ppletss1	Spatial lag priv lets	-0.093	0.027	-3.490	0.001
pprvrent	Priv Rent % all stock lag1	0.228	0.016	14.310	0.000
pvac	Vacancy rate propn	3.595	2.092	1.720	0.087
pchhpr2	Real house price grwth 2yr %pa	-0.006	0.007	-0.920	0.359
pchdwstk	Net change dwelling stock %	0.488	0.045	10.870	0.000
gbond10	Government Bond rate (10 yr)	0.062	0.060	1.030	0.302
* instrumented	Number of obs	285		R-squared	0.944
	F(8, 276)	300.33	(2SLS)	Root MSE	0.613
	Prob > F	0.000			

This model includes spatially lagged lettings in contiguous regions, and this has a significant negative coefficient. Intuitively, this indicates substitutability of supply between regions (more supply in adjacent regions reduces supply in this region). There is a large positive effect from the lagged private rental stock, as we would expect. For every 1000 units of private rental in the area we would expect 228 new lets on average. This reflects a sort of baseline turnover rate, although it is lower than the average turnover rate (around 30%), because the model also includes the endogenous turnover rate variable as well.

The level of rents has a significant positive effect on new lettings supply, although the coefficient value is quite low (beta :=0.1, elasticity of 0.11). This is consistent with theory and the other models, although the elasticity remains much lower than that assumed in Coleman & Scobie (2009).

Higher vacancies appear to be associated with greater PRS lettings supply, suggesting that where stock is vacant and perhaps difficult to sell it is more likely to be let. Real house price growth (last 2 years), included to reflect the widely-believed view that rental investors are motivated by capital gain, and have short period adaptive expectations, is not statistically significant in this model and the sign is negative. New supply (net change in dwelling stock) has a large and significant positive effect on lettings. For every 100 new units, 49 on average extra new PR lettings occur – these may be either of the new units themselves, or of existing units released through filtering. This is quite a large effect, suggesting that new build drives expansion of the PRS. This effect is also different from that found in the TA-level rental share model (Table 2), which was negative, although consistent with findings from England.

The Government Bond rate was included in the model, as a measure of the opportunity cost of capital invested in rental housing, but this does not have the expected negative effect and not statistically significant.

Overall, this model is quite interesting and mainly fairly plausible. It is important to emphasise that private lettings is a hybrid of (a) the effects of private rental stock size, (b) turnover in that existing stock, and (c) net changes in stock and lets reflecting investors moving in and out of the sector. We

have tried to distinguish these effects both in the estimation and when utilising these findings in simulations. The auxiliary function for turnover is not reported in detail, but basically the model for turnover includes mortgage interest rates (-ve), 2-bedroom accommodation, vacancy rate (-ve), higher qualifications, younger households and Maori and Pacific population (-ve). Given predicted values from the lettings and turnover functions and new build we can indirectly derive net change in PR stock share, in a simulation context.

Simulated Scenarios

The models discussed above provide an interesting and mainly plausible explanation of patterns and changes in the PRS seen over recent years in one country (NZ), but what do these models tell us about the prospects for the PRS in the coming years? Can we generate some reasonable 'central' forecast, and can we look at sensitivities around that dependent upon key contextual or policy variables?

Obviously, to do this one needs to create a simulation model framework, which looks at the whole system, with an appropriate level of spatial disaggregation, and generates values for key variables in future years which measure the main dimensions of the housing market and the particular aspects of interest (in this case private rents and size of stock or flow of lettings). In order to use the models described above to provide such scenario outputs, it is necessary for the simulation framework to have ways of generating values for the driver or explanatory variables in the particular equations of interest. These values may be derived from varied sources, including judgemental assumptions about future trends, adaptations of past trends, independent forecasts, simple auxiliary formulae, or full-scale econometric models (e.g. to predict house prices).

In the last part of this paper we draw on such a simulation modelling framework for New Zealand, in order to address this. However, lack of space prevents more than the most cursory description of this simulation framework.

New Zealand Simulation Model

The simulation model developed for New Zealand has the following key features:

- Numbers are generated for 15 'Motu' regions 72 local authorities (TAs) and New Zealand overall.
- Base data are partly 5-yearly censuses (1981 or 1986 to 2006) or annual regional series up to 2011 while forward forecasts run annually to 2031
- Demographic household and population numbers are currently derived from official Stats NZ projections
- Employment and income variables are projected forward based on judgemental parameters and past local trends
- House prices are modelled on a 30-year annual panel at regional level in a partial adjustment framework
- Private market rents generated by the equation in Table 4 above at regional level, with local rents moving pro rata

- Private rental supply is generated from the regional lettings flow model in Table 6 above, with net changes in PR stock inferred using the auxiliary function for turnover

- Model also generates measures of housing need, not considered here

Key variables from the baseline scenario have been expressed as index numbers (1986=100) and timelines are plotted in Figures 2-4 below. Although NZ is widely seen as an owner occupier dominated system, owner occupation has actually been falling since 1991, and the baseline forecast sees this decline continuing (Figure 2) but at a somewhat more modest rate. Corresponding, private renting rises from that date and is forecast to continue rising noticeably, although at a somewhat lessening rate. The state (social) housing sector also declines in share throughout the period considered. Some questions have been raised about whether such a scenario is fully realistic, given demographic trends of ageing in the population. However, comparisons with a simple demographic model suggests that some further fall in owner occupation would not be surprising, and would require a sharp reversal of recent trends to be avoided.

Real house prices rose gradually from 1991 to 2001 and very steeply from 2001 to 2007 (Figure 3). The forecast shows a substantial downward movement in real prices to about 2018, with a further rise after this date. Private rents are again less volatile, but show a moderate rise from 1986 to 2008, with a more stable but slightly rising tendency after that.

Affordability indicators for private renting and owner occupation are plotted in Figure 4. Home-ownership affordability started at a very adverse level due to high interest rates, then fell to 2001 as rates fell. From 2001 to 2007 mortgage affordability deteriorated sharply due to rising prices. There is a sharp fall (with interest rates) after 2008, followed by a gradual fall to around 2016, with a later gradual rise. Rental affordability (rent/income) rose (i.e. deteriorated) from 1986 to 1996 and again from 2005 to 2010, but is forecast to fall gently in future years, while remaining above pre-1996 levels.

Figure 2

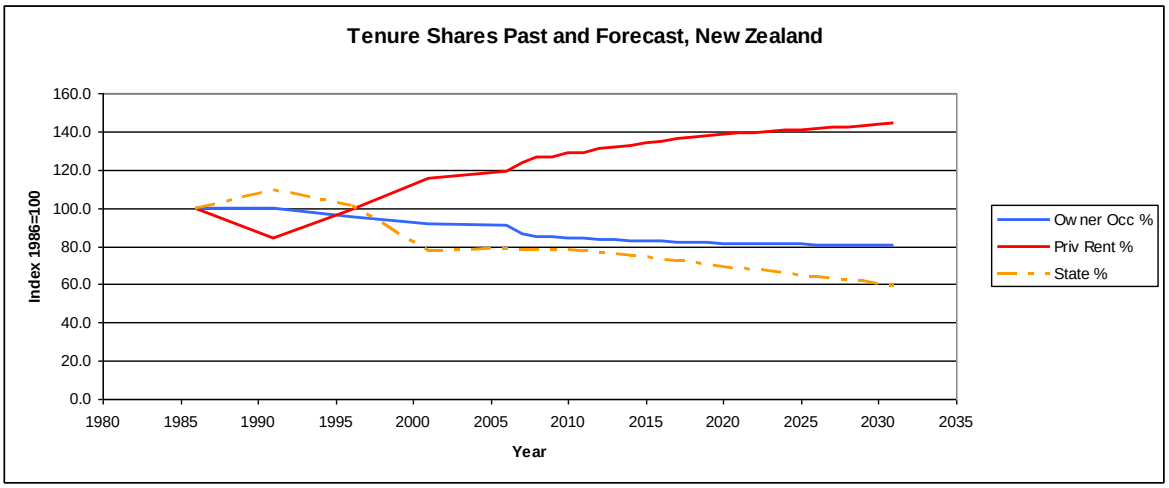


Figure 3

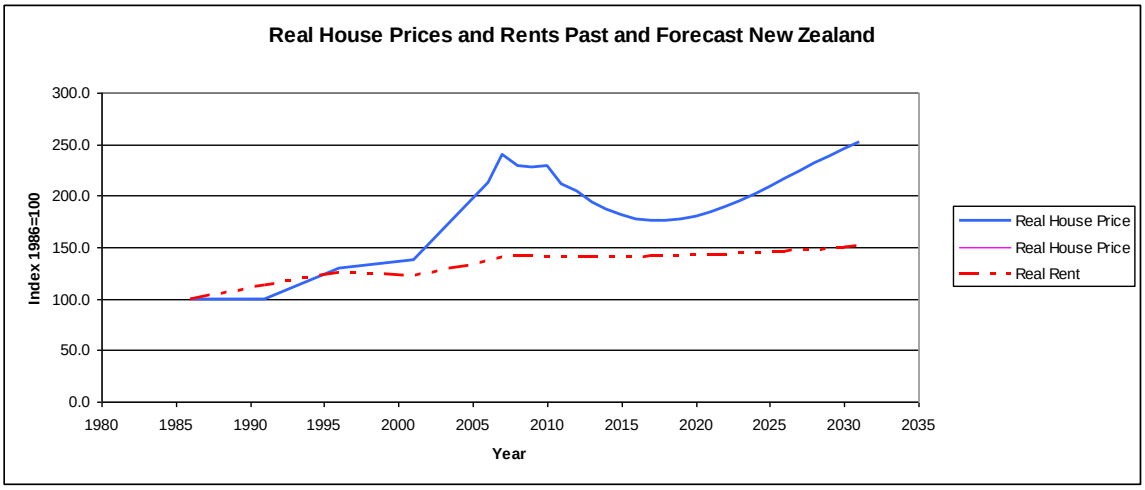
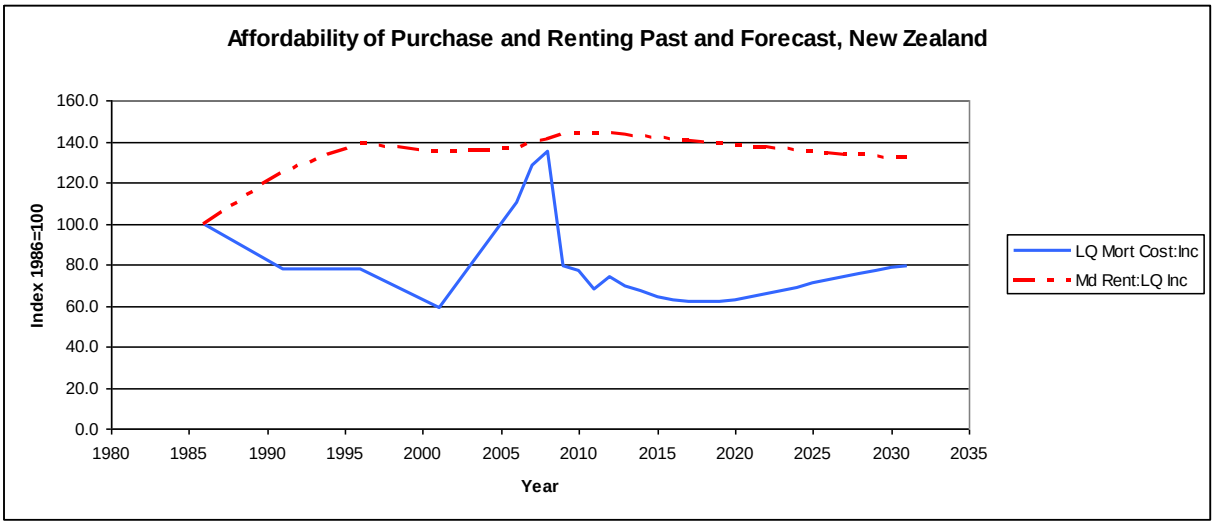


Figure 4



NZ sensitivity tests

The NZ simulation model is designed to test impacts and sensitivities to economic, financial and policy variables. We can use this to illustrate the possible impacts on the future size of the PRS and on rent levels, as summarized in Table 7. This looks at two forward time horizons, 2016 and 2031. The baseline scenario suggests continued slight growth in PRS share of stock to reach 35.2% by 2031, while rents increase slightly in real terms.

Poorer economic performance (incomes, employment) over the longer term would *reduce* the size of the PRS, with the main effect on the longer time horizon. Rents would be a somewhat lower in this case (although rental affordability would be slightly worse due to lower incomes). The lower rents would be driven by improved homeownership affordability and greater unemployment, and this would be the transmission mechanism leading to lower lettings and stock share. Favourable economic trends would have the opposite effects, increasing the PR stock share and increasing rents (although these would be slightly more affordable). Scenarios for worse (deeper-longer) or better (shallower-shorter) recession have more effect in the shorter term and less (but not no) effect in the long term, with effects in the same direction.

Table 7: Sensitivity Tests for New Zealand Private Rental Sector share of stock and rent levels

Scenario & Year	PRS Share	Real Rent
	% all hhd	$ pw 2b
Baseline 2016	33.0	232
Baseline 2031	35.2	248
	% diff	% diff
Poor economic 2016	-0.1%	-1.6%
Poor economic 2031	-2.1%	-9.1%
Fav economic 2016	0.1%	1.4%
Fav economic 2031	2.2%	8.4%
Worse recession 2016	-1.2%	-1.9%
Worse recession 2031	-2.5%	-2.3%
Better recession 2016	0.9%	1.1%
Better recession 2031	2.4%	1.6%
Adverse financials 2016	2.5%	1.7%
Adverse financials 2031	9.7%	1.6%
Fav financials 2016	-1.2%	-1.0%
Fav financials 2031	-4.1%	-1.8%
Low supply 2016	-2.0%	0.1%
Low supply 2031	-7.9%	0.1%
High supply 2016	2.0%	-0.1%
High supply 2031	9.2%	-0.2%

Adverse financial conditions (higher interest rates, worse stock market performance) would increase PRS stock share and increase rents in the shorter term, and increasing stock share more substantially in the longer term while having quite small effects on rents in the longer term. Favourable financial conditions would have effects in the opposite direction, on a smaller scale, with a tendency for stock share to be lower in the longer term. In understanding these results it is important to be aware that interest rates impact strongly on house prices as well as on house-purchase affordability. The effects on the rental sector are relatively muted.

Low supply of new build appears to have relatively slight effects on the rents, but a more noticeable effect in reducing the PRS stock share particularly in the longer term (and vice versa). These findings reflect the model finding that private lettings have quite a strong positive relationship with new supply. This is not because much new build is explicitly intended for PR investment, but it provides a supply which can readily be let (especially in more urban areas) and also loosens up the system to enable more marginal households to form (although this process is not explicitly modelled in the current NZ model). Price effects from new supply might be expected to work the other way, but we are not satisfied that our current house price model for NZ fully reflects supply effects.

We have also conducted a simulation using the local stock-based model, although we do not report results of this in detail. It is interesting to note, however, that this version of the model gives somewhat different results, both in terms of a greater future growth of PRS stock share and in terms of different effects from the economic and financial scenarios. On the whole we feel that the regional time series

models are better for capturing market adjustment, but nevertheless these differences in results do sound a note of caution.

Conclusions

The revival of the private rented sector is a big story in housing, one which has not been adequately understood or modelled yet in the research community, and one which is not confined to the UK by any means. In this paper we have attempted to review explanations offered for the phenomenon and to locate these in a more general economic framework of demand and supply (investment) analysis. We have attempted to operationalise this in terms of econometric modelling of rents and private rental stock and lettings in one country, New Zealand, while referring to some comparable UK findings. Drawing on these specific models within broader simulation frameworks we look at possible future scenarios and impacts of key variables.

What explains the big rise in the PRS (and its timing)? In a sense this question is easy to answer – there are lots of plausible explanatory factors on both the demand and the supply sides, but it is not so clear a priori what their relative importance is. Our general view is that in UK the balance of significant factors pushed both demand and supply outwards, particularly during the 2000s, so the sector expanded quantitatively, and broadened its coverage of groups and areas, without rents rising greatly in real terms. The recent NZ story is similar, although the background and starting point was different. The larger increase in PRS took place in the 1990s and this slowed down in the 200is; however it is forecast to continue increasing in the coming period.

Among the specific factors identified a priori, we find good empirical support on the demand side for unaffordability of house purchase and expected mobility, as well as general income levels, higher education qualification levels and population/household growth, although some of the expected demographic influences (while apparent at the macro level) are less consistent or significant in modelling a sub-regional and local levels.

On the supply side we find consistent evidence for the effects of rents although the supply elasticities are not very high; also for the positive effects of new build supply on PRS, and for certain housing types (flats and terraces) to be more readily supplied for rent. Findings are less consistent on the role of house price level or change and interest rates, and our data and time periods do not permit adequate testing of hypothesized effects of wealth distribution or tax regimes. The evidence does not support the proposition that PRS investment is strongly motivated by and geared to capital appreciation based on recent local price performance. However, we believe that the supply side story is a good deal to do with perceived poor returns on alternative investments post-2000, as well as cheap credit.

What would cause further rise, or reduction? Our baseline scenario forecasts show continued moderate growth of the PRS in NZ, under reasonable economic/financial scenarios. Paradoxically, more favourable economic conditions could see greater growth in private renting and rent levels, although favourable financial conditions would see less PR growth and more owner occupation. Similarly, greater housing supply could further increase the absolute and relative size of the sector without much impact on rents.

What will happen to rent levels? Our models suggest that rent levels will not increase greatly in real terms in the short term, but that there will be some moderate rise in the medium to longer term. Rent levels are not very volatile over time (market adjustment is slow) and it is hard to shock them into changing a lot, with the main effects coming from incomes.

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