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Modelling the demand for housing over the life cycle

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ABSTRACT

We model individual demand for housing over the life cycle, and show the aggregate implications of this behaviour. Individuals delay purchasing their first home when incomes are low or uncertain. Higher house prices lead households to downsize, rather than to stop being owners. Fixed costs (property transactions taxes) have important impacts on welfare (a wealth effect) and house purchase decisions (substitution effect). In aggregate, positive house price shocks lead to consumption booms among the old but *falls* in consumption for the young, and reduced housing demand; positive income shocks lead to consumption booms among the young and increased housing demand.

1. Introduction

Houses are complicated objects. They provide housing services and utility and, at the same time, they constitute an important store of value. They are lumpy and their transactions are subject to substantial costs. At the same time they constitute collateral that can be used to obtain credit. As a consequence, modelling the demand for housing is not a trivial exercise. Empirically, the extent of home ownership varies substantially over the life cycle and across cohorts (Bottazzi et al., 2011). This variation might in part reflect changes in needs and the process of asset accumulation over the life cycle but could also be attributed to differences in credit market conditions, to price fluctuations particularly when young, and to differences in realised incomes. Moreover, the demand for housing also exhibits important fluctuations over the business cycle. Changes to current and future expected income, to interest rates and to house prices are all likely to affect both the propensity individuals have to own rather than to rent and also the size (and value) of the house they would like to live in.

The aim of this paper is to model the demand for home ownership over the life cycle to understand the importance of these different factors. There are two aspects of the demand for housing we focus on: on the one hand, we want to understand the main determinants of individual housing demand. On the other, we also want to characterise the properties of aggregate housing demand, that is, how a particular model of individual housing demand is aggregated into the demand for housing in the macroeconomy and how different shocks to income and price levels are translated into aggregate demand for housing. We pay particular attention to the housing and mortgage market institutional constraints faced by consumers, who are assumed to live in an economy that, in these respects, resembles the UK.

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There are several reasons to be interested in the exercises we present. The characterisation of the individual demand for housing and how it is affected by different environmental factors is important because housing decisions have a significant impact on individual utility, directly through being a large consumption item as well as indirectly through being the largest asset for most households. Our model helps us to understand how these decisions could potentially be affected by policy changes, such as a tax on buying or selling homes (such as, the UK Stamp Duty) or subsidies to first-time buyers. The characterisation of aggregate demand highlights the overall impact of these factors. This is an important first step in understanding the determination of house prices, especially since, in a country like the UK with a very stable supply of housing, it is likely that demand factors are a major driver of the considerable variation observed in house prices. In what follows, we establish how aggregate demand (for different types of houses) moves with different types of idiosyncratic and aggregate shocks.

We construct a model which incorporates a number of realistic features: households choose throughout their lives whether or not to own a home, and choose between houses of different sizes, which we will call 'flats' and 'houses'. If consumers buy or sell a house, they are subject to (proportional) transaction costs. Housing services give utility interacting with the consumption of non-durable consumption. Housing and consumption choices are made in the face of uncertainty about earnings and about house prices and in the presence of various capital market imperfections. The earnings and house price processes are calibrated from the data and are taken as given by individuals. The features of the capital market are also taken as given and are meant to mimic some of the institutional features present in the UK mortgage market: consumers are able to borrow only a fraction of the value of the house, and only able to borrow up to a multiple of their earnings. A novel and realistic assumption we make is that the restrictions on the size of the mortgage relative to earnings and house values are enforced only at the moment of purchasing the house or when consumers re-finance their mortgages. Given that house prices and earnings do fluctuate, these conditions can be violated for a consumer with an existing mortgage. Indeed, consumers can have negative equity if house prices decline sufficiently. While this complication adds considerably to the numerical burden of the exercise, it constitutes an important element of realism. There is no explicit mechanism in the model through which consumers can insure themselves against fluctuations in house prices. However, because we force consumers to always pay interest and, eventually, all debts, they will never borrow more than they can repay with probability one. Given the parameterised model, the exogenous processes for earnings and house prices and the rest of the stochastic environment, we use the model to simulate the demand of many individuals facing a given realisation of earnings and house prices shocks. We can then aggregate individual behaviour and derive aggregate demand.

Our main results follow from two types of exercise. First, we characterise properties of individual demand and, in particular, how housing choices change in response to changes in the features of the mortgage market and of the stochastic processes. Demand among young individuals is particularly sensitive to lifetime income: higher income leads to the purchase of housing earlier in the life cycle, and to an increase in demand for ownership of houses at the expense of ownership of flats, whereas greater uncertainty leads to delays in purchase. Borrowing constraints, particularly the earnings related constraint, influence the timing of ownership and especially the choice between a house or a flat. Strikingly, an increase in the price of housing (and of rents) causes the home-ownership rate to rise. This reflects a fall in the demand for houses but a rise in the demand for flats as individuals downsize rather than moving out of home ownership and into renting (with its increased price).

Our second exercise is to take a particular stochastic environment and demographic structure, and show how aggregate demand and aggregate consumption react to certain shocks. The realisation of a high house price shock reduces aggregate demand for housing, as the young decide not to buy and the old decide to sell. This leads to non-durable consumption rising substantially for the old due to reinforcing wealth and substitution effects, but falling somewhat for the young, who are faced with an increased need to save up to satisfy a down-payment constraint and are also affected adversely by the comovement of rent with the house price. The realisation of a positive income shock boosts aggregate demand for housing, but the cross sectional pattern differs from the case of the house price shock, particularly with regard to consumption responses: the young respond more to the income shock than the old, and consumption rises more for the young than the old. These results suggest that a consumption boom among the young rather than the old indicates a positive aggregate income shock rather than a positive aggregate house price shock.

Our analysis is related to a growing set of recent papers that have built a house-type asset into a life-cycle consumption saving framework. One example is Li and Yao (2007), who consider the behavioural and welfare consequences of house price shocks. The nature of the housing asset in our model and our modelling of mortgage borrowing distinguish our paper from theirs. Distinguishing features of our model are: the modelling of mortgage-related borrowing constraints, so that these are only checked when the household buys or has to renegotiate the mortgage to increase its value; and the modelling of housing as an asset that takes a discrete number of possible sizes so that there is a housing "ladder", but the dwelling is not continuously adjustable (even at cost). Nichols (2005) used a similar two-size structure for the housing asset, but did not have the same detail in modelling borrowing constraints. Rios-Rull and Sanchez-Marcos (2008, in preparation) have a similar structure to ours but embed it in an equilibrium setting and concentrate on macroeconomic outcomes, rather than life-cycle decisions and welfare.

The rest of the paper is organised as follows: Section 2 presents and calibrates life-cycle model of housing choice. Section 3 analyses how life-cycle decisions and welfare are affected by the parameters of the housing market (including credit constraints and fixed costs as well as the house price) and of the income process. Section 4 shows how decisions are affected by shocks that occur during the lifetime. Section 5 concludes.