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Consumption over the life cycle: How different is housing?

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ABSTRACT

Micro data over the life cycle show different patterns for consumption for housing and non-housing goods: The consumption profile of non-housing goods is hump-shaped, while the consumption profile for housing first increases monotonically and then flattens out. These patterns hold true at each consumption quartile. This paper develops a quantitative, dynamic, general equilibrium model of life-cycle behavior, that generates consumption profiles consistent with the observed data. Borrowing constraints are essential in explaining the accumulation of housing stock early in life, while transaction costs are crucial in generating the slow downsizing of the housing stock later in life.

1. Introduction

Micro data show different patterns for consumption for housing and non-housing goods over the life cycle. Consumption expenditure on non-housing goods is hump-shaped over the life cycle: It starts low early in life, rises considerably around middle age, and then falls at more advanced ages. On the contrary, household holdings of the housing stock are not hump-shaped: The lifetime profile of housing stock is monotonically increasing and rather flat in old age.

Consider a life-cycle model without leisure, borrowing constraints, and transaction costs in trading housing. Suppose further that households have time-separable preferences for consumption with constant relative risk aversion and constant elasticity of substitution between consumption from housing and that from non-housing. Utility maximization then implies that the ratio of housing to non-housing consumption should not be age-dependent. That is to say, housing consumption should follow the same pattern as non-housing consumption.[1]

These stylized facts of life-cycle consumption motivate me to ask which modifications of the basic life-cycle framework could produce consumption profiles that more closely resemble the US consumption profiles. To answer this question, I construct a general equilibrium life-cycle model of consumption and saving that explicitly models housing. Owner-occupied housing has a dual role: It directly provides utility, and it can be used as collateral. In my framework, households face several frictions: uninsurable labor-income risk; borrowing constraints; the lack of an annuity market to insure against an uncertain lifetime; and transaction costs for trading houses. Households save in order to self-insure against labor income and life-span risk, for retirement, and to enjoy services from housing.

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[1] This implication abstracts from leisure. If leisure has different complementarities with housing than with other goods, then the marginal utility from housing consumption could change differently from the marginal utility of non-housing consumption during the life cycle.

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I show that a plausibly parameterized version of my model accounts well for the empirical findings. Some parameters, such as the discount factor, are set so that the model-generated data match aggregate targets. Other parameters are based on existing results from the literature. The model is not calibrated to fit these two life-cycle consumption profiles.

The model generates consumption profiles consistent with the observed life-cycle consumption profiles. The interaction between housing (which can be used as collateral) and borrowing constraints leads to the accumulation of housing stock early in life, while transaction costs tend to slow the decline of the housing stock later in life. Households begin their economic lives without any housing stock. During the early part of their lives, because of the existence of borrowing constraints and the role of housing as collateral, they build housing stock quickly, foregoing non-housing consumption. As households age, they begin to decrease their non-housing consumption because the mortality rates are increasing along the life cycle. The high transaction costs associated with trading houses, however, prevent households from decreasing their housing stock quickly later in life.

In addition to explaining life-cycle consumption profiles, the model is able to generate homeownership rates by age. In the model, as in the data, young agents rent while accumulating financial assets. As time progresses, many households accumulate enough wealth to make a down payment and become homeowners. Homeownership rates continue to be high late in life. The benchmark model also matches observed life-cycle wealth portfolio profiles. In the model, as in the data, young households virtually own no liquid financial assets, but hold a major fraction of their wealth as housing. Later in life, households shift their portfolios to financial assets.

Several mechanisms have been offered in the literature to explain the hump-shaped life-cycle consumption profile, without considering the interaction of housing and non-housing consumption.[2] I account for most of these mechanisms in my analysis. I incorporate precautionary saving, borrowing constraints, and mortality risk in my model with housing. Instead of modeling the stochastic process for changes in family size, I directly control for the differences in household size when constructing consumption profiles.

There are several papers studying the consumption pattern in models with durable goods. Fernandez-Villaverde and Krueger (2002) build a life-cycle model to explain the expenditure patterns for durable and nondurable goods. However, their model abstracts from housing transaction costs and cannot generate the slow decline of the housing stock. Heathcote (2002) incorporates home production in an otherwise standard model to account for the drop in consumption at retirement. Neither paper incorporates a housing rental market.

This paper builds on the literature that studies various housing-related issues in an environment with borrowing constraints and transaction costs. Examples include Gervais (2002), Gruber and Martin (2003), Yao and Zhang (2005), Cocco (2005), Diaz and Luengo-Prado (2006), Luengo-Prado (2006), Li and Yao (2007), and Chambers et al. (2007, in press).

The paper is organized as follows. In Section 2, I present some empirical results from the Consumer Expenditure Survey (CEX) and Survey of Consumer Finances (SCF) documenting households' consumption and asset accumulation over the life cycle. In Section 3, I present my model. The calibration of the model is presented in Section 4. Section 5 presents the quantitative results of the benchmark model. Section 6 investigates the quantitative importance of the transaction costs, renting shock, down payment, and Social Security. Brief concluding remarks are provided in Section 7.

2. Empirical findings

This section presents empirical evidence on non-housing and housing consumption over the life cycle.[3] Consumption data from the CEX and asset data from the SCF is used to construct synthetic cohorts from each data set. I use the age of each household's reference person to define cohorts and follow them through the whole sample, generating a panel. I adjust the data for the change in household size using equivalence scales, which quantify the change in consumption expenditure needed to keep the welfare of families constant regardless of its size (see, for example, Zeldes, 1989, and Blundell et al., 1994).[4] I then control for cohort, time, and age effects by employing a semi-nonparametric partially linear model following Fernandez-Villaverde and Krueger (2006). All values are denoted in 1983 dollars. Appendix 8.2 describes those two data sets, the equivalence scales used, and the estimation procedure in greater detail.

Consider, first, the life-cycle profile of non-housing consumption per adult-equivalent for renters. Fig. 1 plots the household annual non-housing consumption per adult-equivalent against the age of the renting households' heads.[5,6] We observe that the average non-housing consumption for renters increases until age 25, flattens out, and then decreases late in life.

[2] Examples include, mortality risk (Hansen and Imrohoroglu, 2008), precautionary saving (Carroll and Summers, 1991; Carroll, 1997; and Gourinchas and Parker, 2002), borrowing constraints (Hubbard et al., 1994), variations in household size (Attanasio and Weber, 1995; Attanasio et al., 1999; and Browning and Ejrnæs, 2002), and the substitutability of leisure and consumption (Bullard and Feigenbaum, 2007).

[3] I differentiate goods and services into housing and non-housing categories. Housing has unique features: It is durable, therefore, household out-of-pocket expenditure on housing is not equal to its service flow; housing can be used as collateral to borrow in financial markets; and it incurs large transaction costs when traded. Other durables are included in the non-housing consumption category. They depreciate much faster than housing and are of less importance as assets in most household portfolios.

[4] The profiles without controlling for household size are similar. The results are available from the author.

[5] The sample is divided into owners and renters before estimation. To be consistent with the endogeneity, the model I propose in Section 3 allows the endogenous choice of renting or owning.

[6] Each graph is scaled so that the curves pass through the average values in the data at age 40.