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The loan structure and housing tenure decisions in an equilibrium model of mortgage choice ☆

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ABSTRACT

The objective of this paper is to understand how loan structure affects (i) the borrower's selection of a mortgage contract and (ii) the aggregate economy. We develop a quantitative equilibrium theory of mortgage choice where households can choose from a menu of long-term (nominal) mortgage loans. The model accounts for observed patterns in housing consumption, ownership, and portfolio allocations. We find that the loan structure is a quantitatively significant factor in a household's housing finance decision. The model suggests that the mortgage structure preferred by a household is dependent on age and income and that loan products with low initial payments offer an alternative to mortgages with no downpayment. These effects are more important when inflation is low. The presence of inflation reduces the real value of the mortgage payment and the outstanding loan over time reducing mobility. Changes in the structure of mortgages have implications for risk sharing.

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1. Introduction

Housing and its financing are important for both households and the overall economy. For households, the importance of housing is evident, as this purchase is typically the largest transaction. The manner in which this purchase is financed is equally important for expenditure patterns and asset accumulation. From a macroeconomic perspective, housing investment (both residential and nonresidential structures) accounts for about half of all gross private investment, and the liabilities from home mortgages are approximately equal to two-thirds of gross domestic product.

Historically, innovations in housing finance have preceded important housing booms that have had ramifications for prices and homeownership rates. In the 1920s, loan-to-value (LTV) ratios increased and the use of high interest rate second loans became more commonplace. The 1940s saw an expansion of long-term self-amortizing fixed-payment mortgages (FRMs) with even higher LTV ratios, as exemplified by 20 percent downpayment loans offered by the Federal Housing Administration. The boom in the early 2000s coincided with the expansion of prime and subprime lending and further in-

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creases in LTV ratios and changes in the loan structure that allowed for flexible repayment schedules coupled with initially lower entry costs. The connection between housing finance, housing markets, and the macroeconomy has become apparent given recent turmoil in the subprime mortgage market. The financial turbulence resulting from the housing meltdown has preoccupied policymakers because of the consequences for the aggregate economy.

There is relatively little research that focuses on the implications of the structure of the mortgage contract for either households or the aggregate economy. In a standard textbook model that excludes financial frictions, all mortgage loans are equivalent. However, the evidence suggests that households are subject to constraints that are not fully captured by the canonical model. This partially accounts for the large empirical literature that focuses on the choice between adjustable-rate (ARMs) and fixed-rate mortgages (FRMs).[1] The importance of the loan structure has been ignored in the dynamic general equilibrium literature. One reason is that the standard model often employs a one-period mortgage where the downpayment constraint is the only relevant factor that impacts tenure decisions. We argue that it is important to separate the effects of changes in the loan structure from the relaxation of downpayment constraints in an environment with long-term mortgage contracts.

It is important also to acknowledge that the precise mechanisms through which changes in housing finance affect the productive economy and financial markets are not completely understood. The research analyzing the connection between housing finance and the economy is limited partially because of the necessity of first understanding the determinants of mortgage choice. Given the array of mortgage products, the optimal mortgage choice for a household is a complex problem. Households have to take into consideration many dimensions such as the downpayment, maturity of the contract, repayment structure, the ability to refinance, the possibility of being subject to borrowing constraints, and the evolution of economic variables such as the interest rate, inflation, house appreciation, and income growth. For instance, the optimal choice for a buyer moving into the housing market might be different from a homeowner looking to purchase a larger house. Therefore, understanding mortgage decisions requires a framework that explicitly acknowledges the heterogeneity of households across age, income, and wealth dimensions. In addition, these decisions must consider the complexities of the tax code that favors owner-occupied housing. Only in such a framework can we understand mortgage choice across households and its impact on the performance of the overall economy.

The objective of this paper is to understand the effects of mortgage structure, in the form of alternative repayment and amortization schedules, for the household's choice of financing a house and the implications of this choice for the aggregate economy. We want to separate the effects of changes in the structure of the loan from the relaxation of downpayment constraints. Given the complexity of the problem, we restrict our attention to stationary equilibrium in an environment with a restricted set of nominal mortgage contracts that are free from interest rate risk. This restriction does not seem to be major, as more than 90 percent of the households use FRMs. The failure to consider variable interest rate mortgage products could be important for refinancing questions. At the household or individual level, the structure of housing finance affects the patterns of housing consumption, tenure, and mobility. For example, mortgage loans with an increasing repayment structure that track the profile of average labor income growth early in the life-cycle may be attractive to younger, poorer, or borrowing-constrained households. However, for households that are not borrowing constrained and/or have consumption levels that are less correlated with income growth, this loan structure should be less relevant to the participation decision. From a macroeconomic perspective, the available choice of mortgage products can increase the participation in owner-occupied housing markets and residential investment and also improve risk sharing (housing and nonhousing goods). Changes in the aggregate level of mortgage debt and the aggregate demand for owner-occupied housing can affect the interest rate and the rental price of tenant-occupied housing.

To understand how the structure of mortgages affects mortgage choice and the aggregate economy, we develop a quantitative equilibrium theory of mortgage choice. In the model households face uninsurable mortality and labor income risks and make decisions with respect to consumption (goods and housing services) and asset allocations (capital and risky housing investment).[2] The model stresses the dual role of housing as a consumption and risky investment good. Investment in housing differs from real capital as a long-term debt (mortgage) contact must be used. This debt contract is nominal. Households can choose from a menu of mortgage contracts that differ in downpayment requirement, payment structure, and maturity so that in equilibrium different long-term mortgage loans coexist. House sales are subject to an idiosyncratic capital gains shock that affects the value of the property.[3] Allowing mortgage choice increases the complexity of the computational problem. An environment that allows households to choose over a *large* set of mortgage products is computationally infeasible. As a result, we examine mortgage choice in an environment with a restricted set of mortgage products.

[1] Most of the literature is empirical and includes Alm and Follain (1984), Dunn and Spatt (1985), Kearl (1979), LeRoy (1996), Stanton and Wallace (1998), and Shilling et al. (1987). Follain (1990) has written a survey of this literature prior to 1990. An exception is Campbell and Cocco (2003), who solve a numerical model with household mortgage choice over FRMs and ARMs. They show that FRMs should be attractive to risk-averse borrowing-constrained households, in particular those with high mortgage debt relative to their income. However, they do not consider different dimensions of FRM products or the implications for prices and the aggregate economy.

[2] It is important to note that in an environment with complete markets, mortgage decisions are irrelevant. Households can always offset any limitation of the mortgage loan (i.e., downpayment requirement) by borrowing or lending in the asset market. Mortgage choice is meaningful in an environment with incomplete markets and with borrowing constraints.

[3] There has been a lot of discussion about the high growth rates of house prices. In this paper we do not seek to explain the joint movement of house price and homeownership. The idea behind the introduction of idiosyncratic capital gains is to partially capture the risk associated with investing in real estate that is realized at sale.

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