Discussion of "Dynamics of Housing Debt in the Recent Boom and Great Recession" by M. Adelino, A. Schoar, and F. Severino

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I will organize my discussion in three parts, each corresponding to a separate section. In Section 1, I'll put the question addressed by the authors in the broader context of the literature on the housing crisis. In Section 2, I'll reflect on the identity of the *marginal borrowers* whose role in the crisis is key to separate alternative explanations. I'll end this section by arguing that it is very hard to interpret the micro data without some additional theoretical structure. This conclusion motivates the last part of my discussion, Section 3, where I will summarize what we can learn from the existing quantitative macro literature that has developed dynamic stochastic equilibrium models to make sense of the recent housing boom and bust.

1 The question in context

This paper belongs to a large, by now, body of work that tries to shed light on the dynamics of the US economy around the Great Recession. In a series of influential articles, Mian and Sufi (see, e.g., Mian and Sufi, 2009, 2015) have put forward a compelling housing-driven narrative of the Great Recession that has become the consensus among economists, commentators and policymakers. We can summarize this narrative as follows:

1. The sharp fall in employment and consumption expenditures in the Great Recession was not driven by a drop in productivity, but it was demand driven.

2. Consumer demand declined because of the collapse in house prices, possibly paired with nominal or real rigidities.

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3. The high level of household leverage that existed at the peak of the housing boom amplified the consumption response to the house price shock, what Mian and Sufi have called the household balance sheet effect.

Adelino, Schoar, and Severino (2017) agree with this interpretation. In particular, they concur on the key role played by housing and on the household balance sheet as a transmission mechanism of the primitive shock to consumption and employment. It is useful here to recall that other authors have drawn attention to alternative amplification mechanisms, such as firms' balance sheet (e.g., Giroud and Mueller, 2015; Gilchrist, Schoenle, Sim, and Zakrajšek, 2017) and banks' balance sheet (e.g., Gertler and Kiyotaki, 2015; Chodorow-Reich, 2013).

The disagreement occurs on what can be thought of as the fourth point of the narrative, i.e. the origins of the housing boom and bust. According to the Mian and Sufi narrative:

4a. The root of the housing boom-bust was the disproportionate expansion of credit towards marginal borrowers (households previously unable to obtain credit). Following the credit supply expansion, these households levered up and increased their demand for housing which, in turn, pushed up house prices. Later, this excessive debt meant many subprime borrowers found themselves unable to make their mortgage payments. The consequent wave of foreclosures started pulling down house prices and set in motion a vicious circle of low aggregate house prices and unsustainable debt that culminated with the housing bust.

Adelino et al. (2017) label this mechanism the *subprime view*. They, instead, favor an alternative interpretation of the origins of the boom and bust —which they call the *expectations view*— that replaces **4a.** with:

4b. The root of the housing boom-bust was an optimistic shift in expectations about future house prices. Households levered up and increased demand for housing which, in turn, pushed up house prices. Later, expectations turned and this led to a fall in demand and house prices.

According to Adelino et al. (2017), a central feature of the subprime view is that a credit relaxation leads to a cross-sectional dislocation in credit flows toward marginal borrowers. Instead, the expectations view implies that the credit expansion should be more broad-based as all households, including prime borrowers, bought into the belief of fast house appreciation. Given micro data on credit flows, debt, and borrowers characteristics one can thus make an attempt to test this prediction.

In their paper, the authors document a set of facts that they interpret as being in contrast with the subprime view. In this respect, this paper belongs to a growing literature that includes Albanesi, De Giorgi, and Nosal (2016) and Foote, Loewenstein, and Willen (2016) as well as another recent paper by the same set of authors (Adelino, Schoar, and Severino, 2016) that is challenging some aspects of point **4.a**, which is the current and more popular narrative of the events.

Before moving to the discussion of how best to separate these two views in the data, I will point out that, by reading Mian and Sufi, it is not obvious that their interpretation of the Great Recession is entirely consistent with what Adelino et al. (2017) attribute to them. In their book, House of Debt, Mian and Sufi (2015) write "The mortgage expansion to marginal borrowers kicked off an explosion in household debt in the United States from 2000 to 2007. This is how it all began." (page XYZ). However, in an essay written two years later (Mian and Sufi, 2016), their view seems to have evolved —perhaps thanks to better data not available at the time of their initial investigation— as they clarify that: "It is crucial to emphasize that the credit supply view of the mortgage boom does not imply that the lowest income or lowest credit score individuals were responsible for the aggregate rise in household debt. [This rise in debt] was driven by home owners borrowing against the rise in home equity, and [...] this was prevalent in most of the distribution [...]" (page 21).

Adelino et al. (2017) stick to the first explanation offered by Mian and Sufi. One could argue that this view —which emphasizes the subprime borrowers as the drivers of the unsustainable growth in mortgage credit— is a somewhat narrow interpretation of the more general credit-supply view that Mian and Sufi further articulated in their 2016 piece.

2 Identity of the marginal borrowers

The key distinction between the subprime and the expectations views is about the role played by marginal borrowers. In order to make this distinction testable, one has to take a stand on the identity of these marginal borrowers. For much of the paper, Adelino et al. (2017) define marginal borrowers as low-income households. If one accepts this association, the evidence against the subprime view is quite solid. But, are low-income borrowers the marginal ones, i.e., those previously excluded from credit in mortgage markets?

Identifying marginal borrowers in the data is notoriously difficult. The classic approach (Jappelli, 1990) uses direct information from survey or administrative data on individuals

	HMDA 2000 (mortgages)				SCF 1998-2003 (all credit)		
% of MSA median	Conventional	FHA Insured	Refi	Home Impr.	Quintile	% Denied	% Discouraged
< 50	43	33	38	50	Q1	42	24
$50 - 79$	27	24	32	42	Q2	40	21
$80 - 99$	20	22	29	35	Q3	34	20
$100 - 119$	16	21	27	30	Q4	23	10
≥ 120	10	21	23	23	Q5	12	6

Table 1: HMDA: % of applicants denied by type of loan (HMDA Tables 5-1, 5-2, 5-3, 5-4). Household income measured as percentage of median income of the applicant's MSA. SCF: All type of credit (not just mortgages). Household income grouped by quintile of the national income distribution.

whose request for credit has been rejected by financial intermediaries. I will try to use this approach here, exploiting two sources of data. First, the Home Mortgage Disclosure Act (HMDA) data.[1] This database allows one to compute the fraction of loan applications denied by financial institutions by income level of the applicant. Separate tabulations exist for conventional home-purchase mortgages, for FHA, FSA/RHS, and VA insured home-purchase mortgages, for refinance loans, and home-improvement loans.

Second, the Survey of Consumer Finances (SCF) data has consistently asked over the years two useful questions: (a) *In the past five years, has a particular lender or creditor turned down any request you made for credit?* And, (b) *Was there any time in the past five years that you thought of applying for credit at a particular place, but changed your mind because you thought you might be turned down?* These two questions have been used extensively in the literature to identify individual characteristics of individuals who were denied credit. Since the SCF records household income, we can tabulate the share of applicants denied by income level. The disadvantage of the SCF question is that it applies to all forms of credit, not just mortgages. The advantage is that question (b) allows to overcome the problem —present in the HMDA data— that some households may be discouraged and do not even apply.

Table 1 reports the results for both data sets. I focus on the year 2000, or the period around 2000, since I wish to understand who were the marginal borrowers just before the credit expansion of the 2000s. In both datasets it appears that there are marginal borrowers, i.e., borrowers whose demand for credit was denied, across the entire income distribution. As expected, the denial rate falls with income, but even around the median (i.e., for the middle class) there is a nontrivial fraction of households who got denied credit

[1]HMDA requires lending institutions to make annual disclosures of their home mortgage and home improvement lending activity. Data are publicly available on the Web at: `https://www.ffiec.gov/hmdaadwebreport/NatAggWelcome.aspx`

when applied for it.

These findings suggest that identifying marginal borrowers with low-income households, as done by Adelino et al. (2017), can be somewhat problematic. The fact that credit growth increased similarly across all income levels, as convincingly documented by the authors, does not rule out the possibility that much of this credit growth accrued to marginal households who were, until then, excluded from mortgage markets by lenders.

This empirical analysis highlights how hard it can be to interpret the micro data without additional theoretical structure providing some guidance. Luckily, the macro literature has made some progress in this direction. In the next section I will discuss what we can learn from it that can be helpful to understand the separate roles of credit and expectations in the boom and bust.

3 More structure is useful

I'll begin by illustrating the key economic forces at work in structural models of the credit supply view, and then I'll move on to models of the expectations view.

3.1 Models of the credit supply view

Prominent examples of this class of models are Favilukis, Ludvigson, and Van Nieuwerburgh (2015), Justiniano, Primiceri, and Tambalotti (2015), and Greenwald (2016). These papers develop dynamic stochastic equilibrium models of the US macroeconomy and show that credit shocks of plausible magnitude *can* induce substantial movements in aggregate house prices. They are important papers because they demonstrate that the Mian and Sufi narrative of the crisis emerges as quantitatively relevant also using a different methodological approach.

The key question is: what does it take for credit booms to generate large house price swings in this class of models? My own reading of these papers is that one needs an economy where, in the equilibrium before the credit shock, there is a very large number of constrained households that would like to consume more housing but they can't. Thus, when more credit becomes available (because maximum loan-to-value or debt-to-income limits are relaxed as in Favilukis et al. (2015) and Greenwald (2016), or because the supply of financial assets in the US increases thanks to foreign inflows of capital as in Favilukis et al. (2015) and Justiniano et al. (2015)), constraints are relaxed, households demand more housing, and the price goes up.

The main reason why there are many households who are constrained in their housing

consumption in these models is that there are *no rental markets*. Everyone must own, but only a small share of the population can afford a large enough downpayment to be at the unconstrained optimal level of housing consumption. Moreover, households close to the constraint are very concerned about potential busts in house prices because in these economies *mortgages are short-term and/or there is no option to default*. Therefore, price declines lead to sharp forced drops in consumption in order to quickly repay debt. This tight link between house price and consumption fluctuations makes the housing risk premium a powerful channel for house price dynamics, as explained by Favilukis et al. (2015). Credit relaxations lower the risk premium and push up house prices.[2]

This set of assumptions leading to a large share of constrained individuals is somewhat problematic. In the data, households can always rent a house of their ideal size, if they cannot afford its downpayment and indeed most young households do that: instead of living in an excessively small house they own, they rent a larger one until they have saved enough to afford to buy a house of similar or larger size. Moreover, in the data mortgages are long-term and thus, when prices fall, all borrowers need to do to remain in good standing is making the minimum repayment every period, i.e., they are not forced to aggressively cut expenditures. Finally, in the U.S., households have always the option to default on their mortgage in order to smooth consumption when they end up with negative equity and they are concerned about having to sharply lower consumption in the near future.

It seems clear that relaxing these assumptions and moving towards models with more realistic housing markets and mortgage contracts would significantly dampen the role of credit supply shocks for aggregate house prices.[3]

[2]To be precise, the economies in Greenwald (2016) and Justiniano et al. (2015) feature a form of long-term mortgages, but they have a representative borrower for whom constraints always bind. The model in Favilukis et al. (2015) is one with heterogeneous households and occasionally binding collateral constraints, but one-period debt. None of these economies features the option to default.

[3]For example, in the model of Kiyotaki, Michaelides, and Nikolov (2011), credit-constrained home owners are relatively few and own a small share of aggregate wealth as a group. As a result, the effect of relaxing the collateral constraint on aggregate prices is small. It is perfectly possible that cheaper credit could lead to very large appreciations in certain segments of the housing market where there are many constrained households. Landvoigt, Piazzesi, and Schneider (2015) document that in the San Diego metropolitan area, during the housing boom of 2000-05, house prices went up proportionately more (by a factor of three) in the lower segments of the market. Their assignment model implies that a relaxation of loan-to-value limits is consistent with this gradient in house price growth, since it is the low income households buying in the bottom segments that tend to be more constrained. However, even the top tiers of the market witnessed appreciation rates of 5-10 pct per year, and this same shock cannot produce a significant rise in housing demand for those segments, because most high-end buyers are unconstrained.

3.2 Models of the expectations view

Kaplan, Mitman, and Violante (2015) (KMV hereafter) develop a structural equilibrium model with a rental market, long-term mortgages and default.

As expected from the discussion above, in this model looser credit barely affects house prices. However, it does lead to a higher home ownership rate. How can the dynamics of home ownership be disconnected from those in house prices? In the model, renters are unconstrained in their housing *consumption* choice precisely because they have access to a rental stock. However, there are a numbers of renters who are constrained in their housing *tenure* choice because of down payment constraints. When these constraints are relaxed, they opt to buy instead of renting, but they don't demand more housing units: they purchase houses of similar size of the one (already of the optimal size) they rented and, as a result, total housing demand does not rise.[4] Why do these households choose to buy, if they are already consuming the optimal amount of housing services by renting? The reason is that housing is both a consumption good and an asset. For these households, buying housing is the right decision from the point of view of optimizing asset portfolio composition. Put differently, credit limits constrain portfolio allocation not housing consumption, thus relaxing them leads to higher home ownership rate but not higher housing demand.

Finally, in the KMV model, the credit shock induces a counterfactual rise in leverage during the boom, because aggregate mortgage debt rises but prices do not.

KMV also study the macroeconomic implications of an optimistic shift in expectations about aggregate house prices shared by both households and lenders.[5] This shift in beliefs induces many current homeowners to upsize in order to realize the expected future capital gain. This push in housing demand fuels house prices.

What happens to rents in the model? Consider the standard user cost condition that links rents ρ and prices p^h (also, let r be the risk-free rate and δ the housing depreciation rate):

$$\rho_t = p_t^h - \frac{1-\delta}{1+r}\mathbb{E}_t\left[p_{t+1}^h\right].$$

This equation shows that a rise in expected future prices that leads to more housing demand and higher prices today can keep rents roughly constant and pull down the rent-

[4] This result depends on the ability to convert rental units into owner-occupied units, and viceversa, without severe frictions.

[5] In KMV, households expect house prices to go up because they receive news of a likely future rise in the preference for housing consumption. Burnside, Eichenbaum, and Rebelo (2016) develop a more micro-founded model of contagion where waves of optimism and pessimism about future prices can slowly arise in the population.

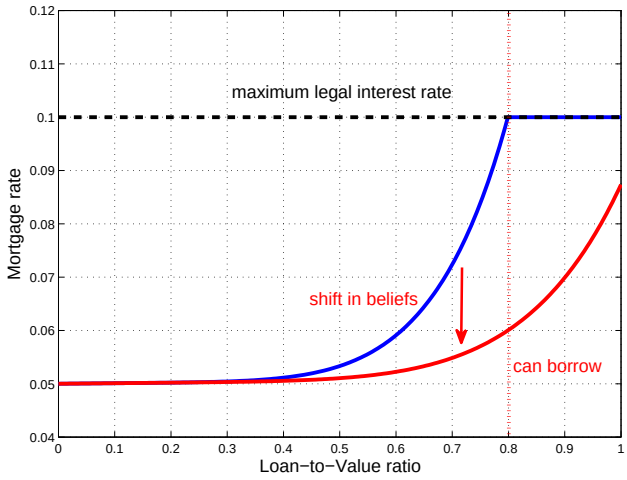

Figure 1: Example of an endogenous relaxation of credit limits following a shifts towards more optimistic expectations about future house price growth that reduces the default probability in the eyes of the lenders.

price ratio, exactly as observed in the data over the boom years. So far, so good. However, the fact that rents are now much cheaper relative to prices means that, in the model, home ownership falls slightly after the shift in expectations. This is counterfactual: in the data, home ownership rose by 3-4 percentage points over the boom.

3.2.1 Expectation-driven credit boom

A central feature of the expectation-based narrative is that it can generate, endogenously, a credit expansion towards the subprime borrowers. For this to happen, it is crucial that the optimism is also shared by lenders. Figure 1 illustrates the mechanism. Suppose that, before the belief shock, a certain share of the population is cut off from the mortgage market because, for instance, of a binding cap on interest rates due to anti-predatory laws. In the example of Figure 1, this cap is set at 10 percent. Mortgage rates are increasing in the desired loan-to-value ratio because the latter predicts the probability of default which, in turn, raises the risk premium. All households who wish to borrow more than 80% of the value of the house are excluded from credit. When expectations shift, lenders believe house prices will grow. This growth in prices makes defaults less likely and shifts down the mortgage rate curve. The cap stops binding and a whole set of new marginal borrowers can enter the market.

By pushing subprime borrowers with high leverage into the housing market, this endogenous slackening of credit constraints creates the seed for the spike in foreclosures

during the bust. At the same time, KMV note that, quantitatively, this endogenous credit loosening, alone, is not strong enough to match the dynamics of aggregate leverage. Under the belief shock, the model implies that leverage falls counterfactually over the boom, since the expectation-fueled rise in house prices is larger than the expectation-induced growth in mortgage debt.

To sum up, from the KMV model we learn that the shift in expectations is capable of generating the boom in house prices and an endogenous inflow of cheaper credit towards the marginal borrowers that is essential to explain the escalation in foreclosures. In order to account for the rise in home ownership and the constant leverage during the boom, the model also calls for a simultaneous exogenous form of credit relaxation.

4 Summary

This is an interesting and informative paper that belongs to an important growing empirical literature exploiting rich administrative micro data to shed light on the mechanism that triggered the boom and bust in house prices and transmitted it to employment and household consumption.

The authors reject the subprime view of the crisis because in their data they do not find evidence that marginal borrowers played any special role in the growth of credit, the rise in home ownership, and the spike in foreclosures. For much of the paper, they identify marginal borrowers with low-income households and I argued that is not necessarily correct. I find the mapping between marginal borrowers and low FICO-score individuals more compelling.

I argued that, eventually, one needs more theoretical structure to separate the role of credit supply shocks from expectations. State-of-the-art dynamic stochastic equilibrium models suggest that credit shocks are crucial to understand the dynamics of home ownership and leverage. However, looser credit is disconnected from the growth in aggregate house prices. The main reason is that the presence of rental markets and long-term mortgages are powerful ways to avoid collateral constraints from binding and from driving fluctuations in the marginal utility of consumption. Instead, house price dynamics are largely explained by shifts in household expectations. Finally, in these models, optimistic lenders' expectations lead to an endogenous credit expansion towards marginal borrowers. This result exemplifies how difficult it is, with data alone without theory, to distinguish between the subprime/credit-supply view and the expectations view of the crisis.

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