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Crises in the Housing Market: Causes, Consequences, and Policy Lessons*

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Summary and Keywords

The global financial crisis of the past decade has shaken the research and policy worlds out of their belief that housing markets are mostly benign and immaterial for understanding economic cycles. Instead, a growing consensus recognizes the central role that housing plays in shaping economic activity, particularly during large boom and bust episodes. This article discusses the latest research regarding the causes, consequences, and policy implications of housing crises with a broad focus that includes empirical and structural analysis, insights from the 2000s experience in the United States, and perspectives from around the globe. Even with the significant degree of heterogeneity in legal environments, institutions, and economic fundamentals over time and across countries, several common themes emerge to guide current and future thinking in this area.

Keywords: housing, mortgages, debt, crisis, foreclosure

1 Introduction

Ever since the 2008 global financial crisis, there has been a surge of interest in tracking housing markets across the world. As this article will argue, the heightened attention is warranted by an ample body of research that demonstrates the strong connection between housing and the broader economy. After all, housing is the dominant source of wealth for

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most families, just as its twin—mortgage debt—is the chief liability. Given the undiversified nature of house price risk, changes in home equity have major implications for household spending and debt repayment behavior. Consequently, housing plays an outsized role in the functioning of credit markets and the banking sector, which act as a critical transmission mechanism to the rest of the economy. Despite these linkages, much of the traditional macroeconomics literature has treated housing as just one of several components of output and wealth—lumping its production with other components of investment and its contribution to total wealth with that of stocks and bonds. Furthermore, canonical macro-housing papers that were written before the Great Recession, such as Davis and Heathcote (2005) and Iacoviello (2005), generally focused either on long-run trends or high frequency movements instead of boom-bust episodes. Recently, however, studies such as Jordà, Schularick and Taylor (2015) have pegged large housing market swings as a culprit behind financial crises, and Leamer (2007) has gone so far as to say that "housing is the business cycle." A parallel exists between housing crises and financial crises in that both are characterized by a large decline in the value of an asset—whether it be a house price drop, stock market crash, or currency devaluation—and the inability of an economic agent to meet payment obligations, thus leading to default. However, while asset price declines often generate sizable transfers of wealth across individuals, they do not always create macroeconomic distress. For example, the collapse of an asset may be confined to some isolated market, such as with the Dutch Tulip bubble or the numerous other episodes throughout history discussed by Kindleberger (1993). While the creation of central banks and macroprudential tools seems to have reduced their occurrence, these institutions must now contend with the globalization and liberalization of financial markets, which have synchronized the movements of local housing markets. What in the past might have been a local housing bust is now more likely to become a full blown crisis that causes broader disruption. The objective of this article is to provide perspectives on the causes and consequences of housing crises using empirical evidence, theoretical insights, and elements from state of the art structural models. Before proceeding to the main analysis, the next section provides a brief history of the evolution of housing markets over the past century. From there, the factors behind house price movements are discussed using a canonical asset pricing equation and findings from the literature. Crisis

episodes are then analyzed through the lens of the latest structural models and empirical research. Lastly, this article discusses policy implications and directions for future research. For a broader look at the intersection of macroeconomics and housing, readers are directed to Piazzesi and Schneider (2016) as well as Davis and Van Nieuwerburgh (2015).

2 The History and Evolution of Housing Markets

Contrary to conventional wisdom, housing has never been a "sure thing," and the 2006 – 2011 crisis was not the first such episode in the United States. In reality, such disruptions have often been the catalyst behind significant changes to the institutions shaping the housing market. This section gives a brief description of the evolution of housing market institutions in the United States and abroad, with a focus on the financing of home purchases.

2.1 The Transformation of Housing Finance in the United States

For example, prior to the US entering the Great Depression, houses were typically financed using mortgages that featured variable rates, short durations of less than five years, and balloon payments due at the end of the loan term. It was also common practice for these mortgages to be renegotiated every year. The onset of the Great Depression revealed the systemic risk inherent in these financing arrangements. Economy-wide deflation pushed up real interest rates and depressed house prices, which fueled a mechanical rise in household leverage. As mortgages came due, banks refused to extend credit and roll over the debt of existing homeowners whose equity was quickly evaporating. This credit contraction then led to a further deterioration in housing market conditions when a wave of distressed homeowners were forced to put their houses on the market. Eventually, the federal government established the Federal Housing Administration (FHA) and Home Owners Loan Corporation with the aim of restoring liquidity to the mortgage market. Whether these interventions turned around the housing market or simply took credit for auspicious timing is a source of unresolved debate.

Green and Wachter (2007) point out that the practical implication of these institutional changes was twofold: to set the precedent for direct Federal intervention in housing finance

and to make long term, self-amortizing, fixed rate with low down payment requirements at origination the dominant mortgage debt instrument, commonly named fixed-rate mortgages (FRMs). As later sections discuss, the design of mortgage contracts has a significant impact on housing market dynamics and macroeconomic stability. In the decades that followed the Great Depression, geographically specialized Savings and Loans institutions (S&L) emerged as the primary mortgage lenders. Although heavily regulated and insured, S&Ls proved vulnerable to interest rate risk when the yield curve became inverted throughout 1966 and subsequently in the late 1970s and early 1980s amidst soaring inflation. In response to the 1960s wave of insolvency, the government created Fannie Mae and Freddie Mac to enhance liquidity in the secondary mortgage market, thus taking a further step toward creating a more nationwide system of housing finance. However, S&Ls themselves were still confined to lending in their geographical area and were effectively barred from issuing adjustable rate mortgages (ARMs), leaving them vulnerable both to credit and interest rate risk. Unfortunately, both risks materialized in major ways during the late 1970s and early 1980s. First, soaring inflation pushed nominal interest rates above the maximum amount imposed by Regulation Q that S&Ls could pay to depositors. In response, savers shifted into money market funds that fell outside Regulation Q, causing S&Ls to lose a substantial source of funding. Second, the pace of nominal house price appreciation slowed and even turned negative in parts of the Rust Belt, which exacerbated credit risk. In the wake of the resulting S&L insolvency wave, Regulation Q was eventually phased out and regulations were loosened to allow the origination of ARMs. Thus, what emerged from the shadow of the S&L crisis—facilitated by the technological innovation of money market funds and push toward deregulation—was another step toward the transformation of America's housing finance system from one reliant on local depository institutions to one fueled by a national financial market built on securitization. The last phase of the transition occurred in the late 1990s and early 2000s as lenders made greater use of risk pricing and interest rates accelerated their downward march. Previously, borrowers who failed to meet traditional underwriting standards were simply rationed out of the market. However, as the use of credit scores gained widespread acceptance, lending shifted toward a risk pricing model that charged higher rates to riskier borrowers instead of issuing outright loan denials. These subprime loans were then frequently pack-

aged together into mortgage-backed securities and sold on the secondary market to investors seeking higher returns. Together with historically low interest rates that made borrowing against the value of one's house extremely cheap, this expansion in credit coincided with a boom in homeownership, home equity extraction, and of course, house prices. A significant portion of this article will analyze the extent to which these credit innovations were the cause of the boom and subsequent crisis or merely a symptom.

2.2 Institutional Changes Abroad

The United States is by no means the only country to have undergone a profound shift in housing finance over the past few decades. However, not all countries have followed the same path as the United States has in relying on fixed rate mortgages and financial market securitization. For example, although the Building Society Act in 1986 liberalized mortgage lending in the United Kingdom, depository institutions and adjustable-rate mortgages remain at the center of their housing finance model. The reforms primarily reduced barriers to entry into mortgage lending and reduced the degree of insulation from external forces in capital markets. Similar changes occurred in Spain and throughout Europe, paving the way for greater integration between traditional mortgage lenders and commercial banks. By contrast, Australia over the past twenty five years has developed a highly liquid market for asset-backed securities to finance mortgage lending. Therefore, while there has been no clear convergence in the modus operandi of countries regarding their reliance on depository institutions versus securitization, the trend toward liberalization has resulted in an expansion of credit and greater integration of housing finance with capital markets.

3 What Drives House Prices?

To explain housing crises, it is essential to understand what drives house price dynamics. While other housing variables are also important—residential investment, sales volume, etc.—house prices have particular significance for macroeconomic spillovers. When prices collapse, the deterioration of household balance sheets can lead to severe cuts to consumption and a wave of foreclosure activity that ripples through credit markets, thereby impacting

every sector. After presenting some stylized facts, this section analyzes the determinants of house prices through the lens of a simple framework that encapsulates the decision of whether to own or rent a property.

3.1 Stylized Facts

The most salient features of house price dynamics are their strong volatility, procyclicality, and short-run momentum. With regard to volatility, Case and Shiller (1989) report that individual house prices exhibit a 15% standard deviation in annual appreciation, while Piazzesi, Schneider and Tuzel (2007) report volatilities of 7%, 5%, and 2 3% at the city, state, and aggregate level, respectively. House prices also co-move positively with the business cycle. Hedlund (2016) reports a 0.5 correlation between house prices and contemporaneous GDP, and the correlation actually increases to 0.66 when looking at house prices and future GDP a year later. In other words, house prices tend to lead the business cycle in the US data. House prices also exhibit momentum in the sense that positive appreciation one year is often a precursor for further appreciation the next year, with mean reversion occurring over longer time horizons. Case and Shiller (1989) were the first to find that price changes in one year tend to be followed by further changes the next year that are up to half as large. Similarly, Head, Lloyd-Ellis and Sun (2014) report the autocorrelation of city-level house price growth to be 0.56 between 1981 and 2008.

3.2 A Simple Theoretical Framework

It has proven quite challenging to develop models that successfully replicate all of these stylized facts, and the literature has followed divergent paths in its attempt to provide an answer. Before delving into some of the more sophisticated modeling attempts, this section employs a simple no-arbitrage expression that reflects the trade-offs that a deep-pocketed, unconstrained agent faces between owning and renting a given house. Mathematically, this condition is given by

$$1 + i_{t+1} = \frac{(1-\delta)P_{t+1}}{P_t - R_t}.$$

In words, the agent must be indifferent between saving in financial assets—given by the risk-free rate i_{t+1}—and housing. The gross return to housing is given by the future resale value net of depreciation and transaction costs divided by the initial purchase price minus rent, which adjusts for the fact that the owner-occupier saves on the rent that he/she would otherwise have to pay or else can rent the house out as a landlord. Rearranging terms, the price today must satisfy

$$P_t = R_t + \frac{(1-\delta)P_{t+1}}{1+i_{t+1}}.$$

Thus, three factors drive prices in this model: rents, interest rates, and expected appreciation. If prices are expected to go up in the future, the house is more valuable today. Similarly, higher rents increase the return to owning. By contrast, higher interest rates depress current prices because they reduce the present value of future resale. Notice that the price equation above takes rents as given and is independent of the technology for building houses. It is simply a no-arbitrage expression that makes unconstrained agents indifferent between buying and renting. Equilibrium imposes additional discipline on the behavior of prices relative to rents. In particular, rents are given by the marginal rate of substitution between housing services and consumption of the marginal agent, and prices for new units equal the marginal cost of construction, which includes labor, materials, permitting, and any expenses associated with the purchase and development of land. Furthermore, interest rates themselves are determined by intertemporal substitution and credit conditions.

3.3 Decomposing the Determinants of House Price Dynamics

Ignoring these equilibrium issues for the time being, Campbell, Davis, Gallin and Martin (2009) follow the method of Campbell and Shiller (1988b) and Campbell and Shiller (1988a) to linearize and forward iterate on the equation above to arrive at the following expression for the log of the rent-price ratio:

$$r_t - p_t = k + \mathbb{E}_t \sum_j \rho^j i_{t+1+j} + \mathbb{E}_t \sum_j \rho^j \pi_{t+1+j} - \mathbb{E}_t \sum_j \rho^j \Delta r_{t+1+j},$$

where lower case denotes the log of a variable. After the constant k, the first term represents the present value (PV) of future rates, the second term is the housing premium over the risk-free rate, and the last term is rent growth. They then estimate a vector autoregression using a mix of aggregate and metro-level US data over 1975–2007 and compute the variance decomposition,

$$var(r_t - p_t) = var(PVrates_t) + var(PVpremia_t) + var(PVrents_t)$$
$$+2cov(PVrates_t, PVpremia_t) - 2cov(PVrates_t, PVrents_t) - 2cov(PVpremia_t, PVrents_t)$$

They find that housing premia are the largest source of variation in rent-price ratios from 1975 to 1996 and a smaller but still significant source of variation during the 2000s boom. Furthermore, they stress that trying to explain prices using only rents and interest rates is likely to be misleading.

The previous decomposition analyzes short-run dynamics of the rent-price ratio. Turning to longer horizons, Davis, Lehnert and Martin (2008) show that the rent-price ratio exhibited remarkable stability from the 1960s through the 1990s until being driven to historical lows during the 2000s housing boom. Recognizing that houses are a bundle of structure and land, Davis and Heathcote (2007) decompose house prices into the cost of the reproducible structure and the value of the underlying land. They find that, from 1975 until the 2000s housing boom, land accounted for approximately one third of a house's value, though enormous regional heterogeneity exists. Since then, and looking over even longer time horizons, land has become increasingly important in the determination of house prices. In fact, the authors also ascribe the lion's share of house price movements at medium and high frequencies to fluctuations in the value of land, not structures.

Lastly, a number of papers use structural models to study the impact of other factors on house prices. For example, Sommer and Sullivan (2018) show that eliminating the mortgage interest deduction would cause house prices and mortgage debt to decline, which is consistent with the result in Jeske, Krueger and Mitman (2013) that removing the implicit bailout guarantee for government sponsored enterprises like Fannie Mae would reduce mortgage originations. Along different lines, Kiyotaki, Michaelides and Nikolov (2011) find that house

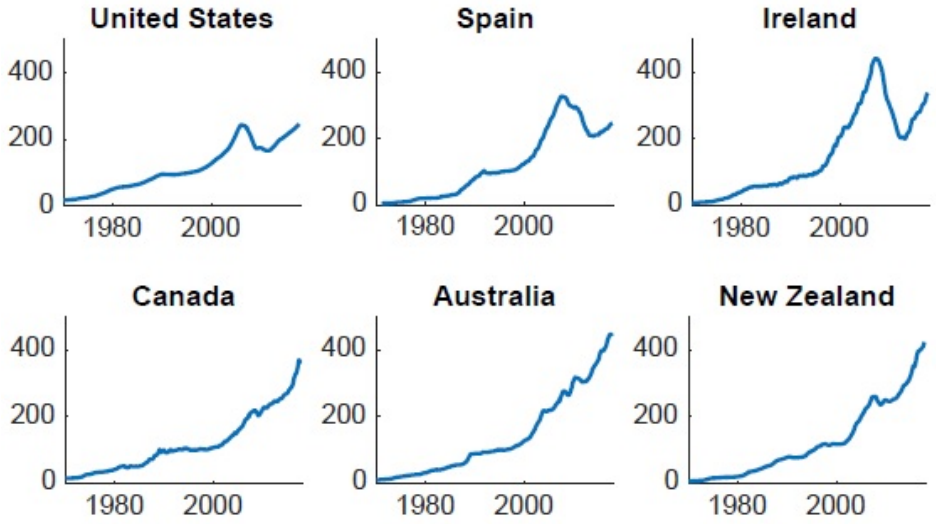
prices react more to an exogenous change in income or interest rates when land accounts for a larger share of housing costs. Chambers, Garriga and Schlagenhauf (2016) ascribe significant importance to productivity in explaining long run house price trends. Lastly, shocks to expectations and credit both feature prominently in ongoing research as candidates to explain the empirically important dynamics of the housing premium identified by Campbell et al. (2009), particularly during booms and crisis episodes. An extensive discussion of these topics is deferred to the next section.

4 Crisis Episodes

The unfortunate reality of housing crises is that they are easier to identify after the fact or in the moment than beforehand. In some cases, a prolonged increase in house prices may reflect a response to changing fundamentals, such as rising incomes, a rapidly expanding population, or demographic change. In other cases, a booming housing market may be the result of unsustainably lax credit, bubbly expectations, or some other combination of unstable forces. For example, the top row of 1 shows the boom and bust in house prices experienced by the United States, Spain, and Ireland in the last crisis. Turning to the bottom row, are the booming housing markets of Canada, Australia, and New Zealand poised for crises of their own, or can they sustain the current pace of house price appreciation, or at least manage a soft landing? Determining an answer to this question—which is undoubtedly on the forefront of policymakers' minds—is no easy task.

This section begins by gleaning lessons from across the globe on the causes of housing booms and when they turn into busts. In some cases, countries prior to a crisis may have undergone a change or experienced an event that was unique and not broadly applicable. However, in many cases there are common threads that connect the experiences of different countries. From there, this section zooms in on the experience of the United States from the early 2000s to the financial crisis of 2008 and beyond. The availability of rich micro-level data, and the presence of significant regional heterogeneity in economic conditions and legal environments has allowed researchers to put different theories to the test, whether using reduced-form empirical techniques or large structural models. Lastly, this section

Figure 1: Boom-Busts (Top) and Ongoing Booms (Bottom)



Source: IMF Global Housing Watch

discusses the latest research and avenues for future work on the macroeconomic consequences of housing crises.

As 2 illustrates, housing booms are not confined to any one country or time period, and neither are the busts that sometimes—but not always—follow. While it is appropriate to view each episode as resulting from a unique recipe of economic ingredients, there are also common themes undergirding many of the largest housing market swings observed over the past several decades. In an attempt to systematically approach the varying causes of booms and busts, it is useful to consider a modified version of the simple framework from the previous section. Consider a representative agent environment with utility $U(C_t, H_t)$, one-period mortgage debt M_t, and a loan-to-value constraint $M_t \leq \theta P_t H_t$ that implies a minimum down payment ratio of $1 - \theta$. The first order conditions of the household's optimization problem imply the following dynamic relationship for house prices:

$$P_t = \frac{R_t + \mathbb{E}_t \left\{ \Gamma_{t,t+1} (1 - \delta) P_{t+1} \right\}}{1 - \mu_t \theta}$$

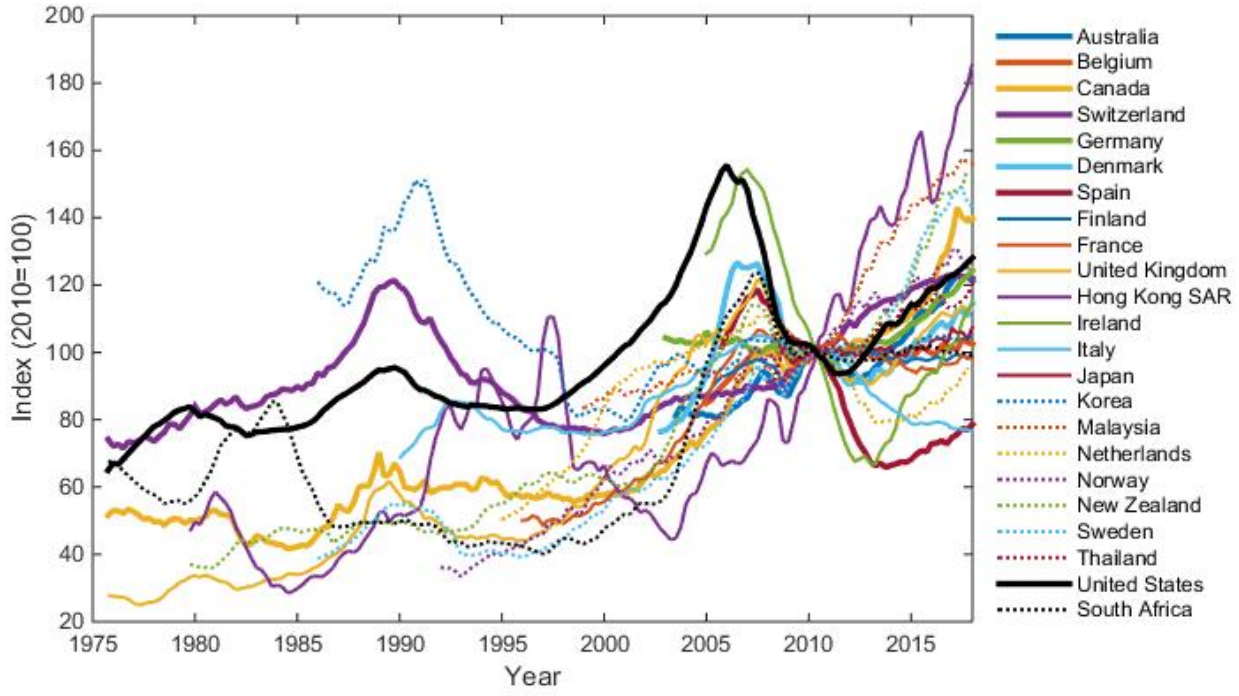
where $R_t = U_h(C_t, H_t)/U_c(C_t, H_t)$ is rents, $\Gamma_{t,t+1} = \beta U_c(C_{t+1}, H_{t+1})/U_c(C_t, H_t)$ is the stochastic discount factor, and μ_t is the Lagrange multiplier on the loan-to-value constraint. In a more general representative framework with the addition of a payment-to-income constraint

and long-term debt, Greenwald (2018) arrives at a nearly identical expression:

$$P_t = \frac{R_t + \mathbb{E}_t \left\{ \Gamma_{t,t+1} P_{t+1} \left[1 - \delta - (1 - \rho_{t+1}) \mathcal{C}_{t+1} \right] \right\}}{1 - \mathcal{C}_t}$$

Relative to the price equation in the simple framework, the main difference is the additional term $\mathcal{C}_t$, which is the collateral premium for housing (to be discussed more in depth momentarily). Together, the variables Γ and $\mathcal{C}$ capture the impact of credit, R gives the effect of "fundamentals" like income and demographics, and $\mathbb{E}_t$ stands in for the role of expectations and beliefs. Note that this equation will be referenced to organize thinking, not because it is necessarily the best model.

Figure 2: Global Real House Prices



Source: Bank of International Settlements (BIS)

4.1 The Role of "Fundamentals"

The notion of fundamentals used here differs from the all-too-common dichotomy that emerges in discussions of whether an ongoing housing boom is sustainable or merely a bubble.

For the purposes of this discussion, fundamentals are factors that have an impact on house prices through changes to rents—whether they be explicitly observed in the rental market or else implied as owner-equivalent rents. This distinction turns out to be important in light of the significant segmentation observed between the owner-occupied and rental markets in some countries, as documented by Halket, Nesheim and Oswald (2017).

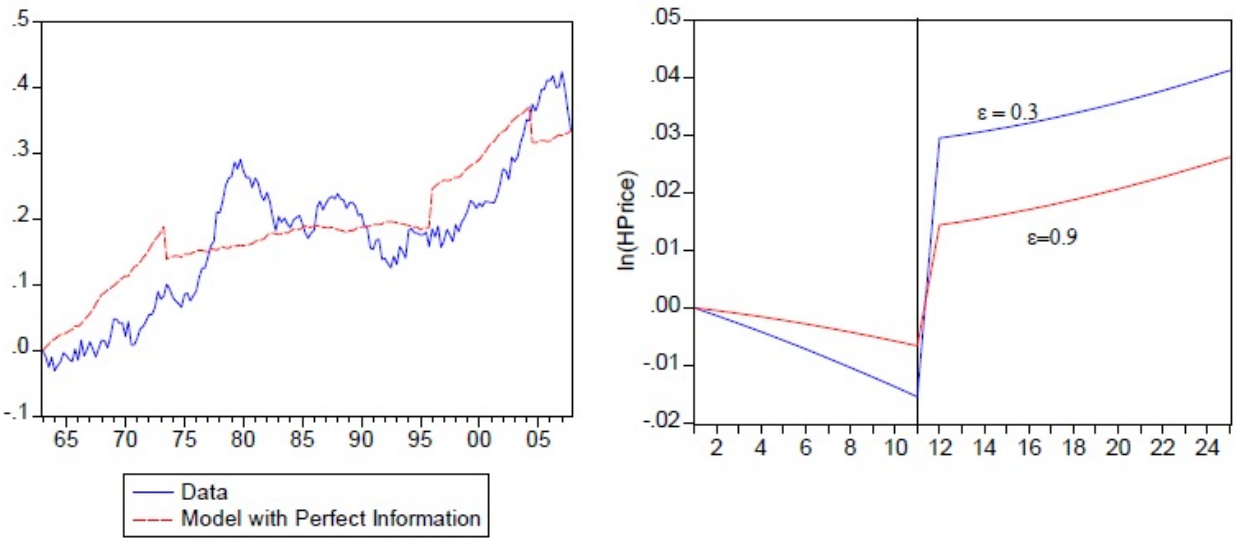
4.1.1 Productivity

Although demand factors can play a significant role in driving short-run house prices with a total housing stock that is more or less fixed, construction costs are pivotal for explaining longer run movements. In the extreme case, constant returns to scale construction using labor and structures as inputs—with no fixed factor like land—implies that house prices exactly follow the path of relative productivity between the goods and construction sectors. Given that land accounted for only 10% of the value of houses from the beginning of the twentieth century through the years immediately following WWII, this assumption is not a bad approximation. In fact, Chambers et al. (2016) use an equilibrium model with tenure choice between renting and owning to analyze the causes of the post-WWII permanent increase in US house prices and conclude that the primary factor was indeed a relative slowdown in construction productivity growth that drove up costs. Similarly, Kahn (2009) generates large house price swings using a two-sector regime-switching model in which construction productivity grows at a constant rate but manufacturing productivity growth fluctuates over time. In that framework, manufacturing productivity booms produce house price booms. Kahn (2009) also estimates a low elasticity of substitution between housing and consumption and stresses its importance in generating large price swings, as seen in 3. Even so, while the model explains a significant fraction of the long run increase in US house prices, it does not adequately replicate the large boom-bust episodes observed in the data.

4.1.2 Income and Wealth

Across countries and over time, there is a clear, positive relationship between housing costs and per-capita income. From the standpoint of theory, rents depend on the marginal rate of substitution between housing and consumption. Because the total stock of housing H_t moves

Figure 3: (Left) US House Prices. (Right) Regime Switch for Different Elasticities.



Source: Figures 9 and 7, Kahn (2009)

quite slowly, positive innovations to consumption—such as those driven by higher income—put upward pressure on rents $R_t = U_h(C_t, \overline{H})/U_c(C_t, \overline{H})$ and, therefore, house prices. For example, using a structural model with a fixed supply of houses, Sommer, Sullivan and Verbrugge (2013) find that the increase in US real wages from 1995 to 2005 translated approximately 1:1 into higher prices and rents. Even over longer horizons, imperfectly elastic construction arising from land supply constraints limits the extent to which the housing stock can expand to accommodate new demand.

Norway presents another compelling example of how rising income and wealth can drive up house prices. After the discovery of massive oil reserves in the North Sea, Norway's crude oil production skyrocketed three-fold from 1980 to 1990 before doubling again by the year 2000. Around the same time, oil prices began an upward trajectory that culminated in a 300% increase from 2000 to 2009. During this twenty year period from 1990 to 2010, Norway's GDP growth greatly outpaced that of neighboring Sweden, and real house prices more than tripled. These statistics do not imply that the entire Norwegian housing boom was driven by higher income, however. In fact, the IMF reports that Norway experienced one of the highest gains in the price-to-income ratio in Europe. Nevertheless, even if magnified by other factors such as cheap credit, fundamentals played an important role in the Norwe-

gian experience over the past two decades. Unfortunately, going forward, the prospects for Norway's housing market look less sanguine. With the fracking-induced drop in oil prices, Norway's GDP growth has stalled, and its currency has depreciated by over 30% against the dollar since 2013. On top of these headwinds, Norway has recently implemented tighter mortgage controls and taken a more restrictive approach to immigration than neighboring Sweden. As a result, house price growth has turned negative over the past year, and policymakers are particularly concerned about the fragility of the housing market in the event that historically low mortgage rates start to rise. Many of these issues—e.g. migration, cheap credit, and macroeconomic fragility—are discussed in the remainder of this article.

4.1.3 Demographics and Migration

Changes in an economy's demographic structure—which can come from a multitude of sources—also generate significant adjustments in the housing market. In the United States, arguably one of the most notable examples was the post-WWII baby boom, which Mankiw and Weil (1989) claim accounts for much of the growth in real house prices during the 1970s. Ironically, they also forecast that "if the historical relation between housing demand and housing prices continues into the future, real housing prices will fall substantially over the next two decades." Of course, they could not have anticipated the profound shifts in the credit market that were about to begin unfolding, but that is a topic for future sections. One distinctive feature of demographic-driven housing booms—as contrasted by those fueled by cheaper credit—is their predictability, potential for sustainability, and the slow speed with which they unfold.

Migration—both internal and external—represents another dimension of demographic change that has important implications for the housing market. In the case of external migration, population flows of foreigners can generate sizable, albeit unpredictable, movements of house prices over short time horizons in the face of relatively inelastic housing supply. Whether the migrants seek to own or rent is only of second order importance, as both forces impact housing demand either directly or indirectly via the behavioral responses of investors. Returning to the comparison between Sweden and Norway, both countries experienced comparable rises in house prices between the early 1990s and 2010, even though Sweden lacked

Norway's oil reserves and GDP growth rate. However, Sweden made up for these shortcomings with higher immigration that, coupled with stringent rental market regulation, may have contributed to higher housing costs.

Although it may seem intuitive at first that higher immigration would drive up house prices, the literature does not speak with one voice on the matter. Some papers, such as Saiz (2007), find that immigration does indeed push up rents and house values in US destination cities. However, using UK data, Hatton and Tani (2005) as well as Sá (2014) both find that immigration has a negative effect on house prices. Whereas the positive studies seem to confirm the view that immigration contributes to higher total demand for housing, these latter two papers highlight how the evolving spatial distribution of the population affects house prices. Specifically, they find that areas experiencing a large influx of immigration witness an exodus of high-wage natives. Saiz and Wachter (2011) find corroborating evidence for this effect of residential sorting, while Guerrieri, Hartley and Hurst (2013) show that its mirror image—gentrification—impacts house price dynamics through a positive externality whereby people want to live next to wealthy neighbors.

This form of residential sorting is absent, however, in cases where foreigners purchase houses but choose not to actually reside in them. In fact, this practice of out-of-town investors purchasing houses has become a significant trend in major urban centers such as Vancouver, Toronto, Sydney, and London—sometimes prompting significant public opposition because of the perception that it makes housing unaffordable. To analyze the impact of these out-of-town buyers, Favilukis, Ludvigson and Van Nieuwerburgh (2017) develop and calibrate a heterogeneous agent spatial equilibrium model. They conclude that the observed increase in out-of-town purchases is responsible for 5% higher house prices in Vancouver but only 1.1% higher prices in New York.

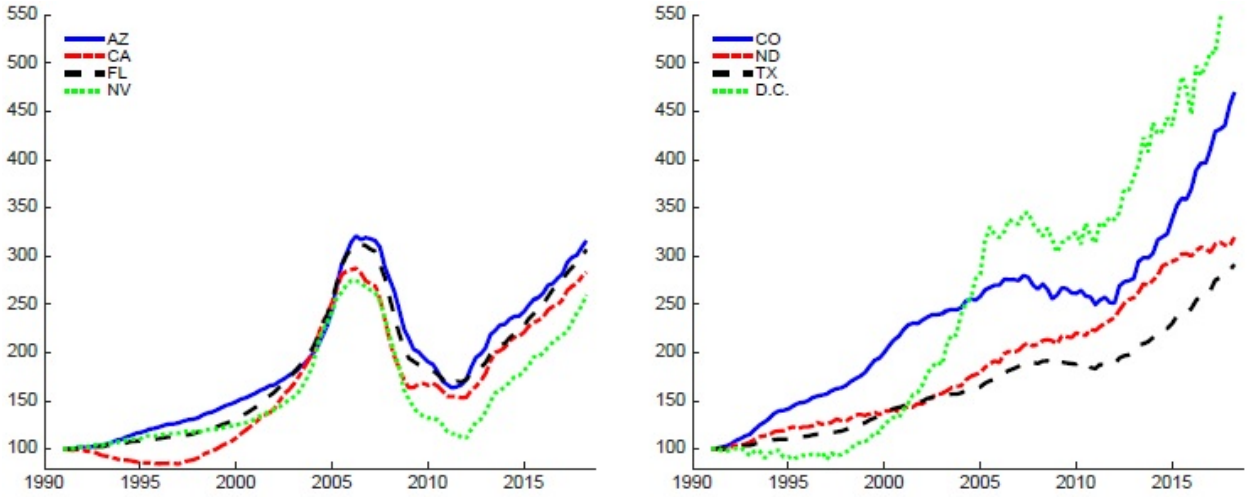
Internal domestic migration can also produce housing booms in prices, quantities, or both. For example, Texas has experienced something of a population boom over the past two decades, though its vast availability of land and pro-development ethos have produced a larger boom in construction than in prices. By contrast, China has undergone a population shift of its own coupled with a surge in house prices. Not even four decades ago, nearly 80% of China's population lived in rural areas. However, structural reforms and evolving global

forces have prompted a shift in China's economy toward urban manufacturing, and much of the population has relocated to where the jobs are. In recent research, Garriga, Hedlund, Tang and Wang (2017a) show that this large shift in the population to crowded urban areas can rationalize much of the rise in house prices.

4.2 Credit, Expectations, and the Housing Crisis Felt Around the Globe

Each of the fundamental forces in the previous section has the ability to generate sustained booms or busts in house prices. However, models that rely only on these fundamentals have been unable to rationalize the historic post-2000 housing market swings experienced by the US and many other western countries. This section discusses what the latest research says about the ability of the other factors—credit and expectations—to generate large boom-bust episodes.

Figure 4: House Prices across States



Source: Federal Housing Finance Agency (FHFA)

While it is tempting to discuss "the" post-2000 US housing boom and crisis—and indeed, its effects were experienced from coast to coast—significant heterogeneity can be seen in the dynamics of house prices within and across markets. For example, the sunbelt states faced a textbook housing cycle with a rapid appreciation of house prices in the early 2000s

followed by a sudden and drastic collapse beginning in late 2006. For many of these states, an often ignored issue is that the bust has been followed by a rapid recovery with prices now approaching their old peaks. However, in Washington, DC and some other states like Colorado, Texas, and North Dakota, the Great Recession marked a mere pause in what is an ongoing housing boom. One cannot avoid noticing the similarities between the first set of volatile housing states and countries like Spain and Ireland as well as the second group of states and countries like Australia, Canada, and New Zealand, where house price appreciation continues unabated. Even though states operate within a relatively uniform national credit market and monetary policy, it is nevertheless unsurprising that the heterogeneous dynamics of prices across states mirror those observed between countries. After all, each state and country faces different economic conditions in terms of demographics, housing supply restrictions, and other factors that are partly responsible for the movements of house prices.

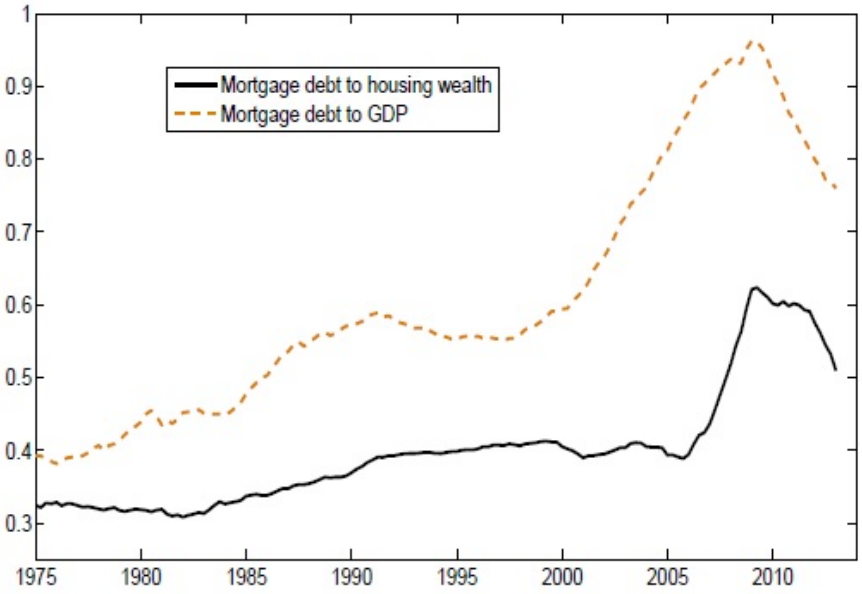
4.2.1 Expansions in Credit Supply: Empirical Evidence

Green and Wachter (2007) report that nominal mortgage debt outstanding grew by 250% between 1997 and 2005. Relative to the size of the economy, this change represented an increase from just under 60% to almost 100% of GDP, as shown in 5. However, as a percentage of housing wealth, mortgage debt remained remarkably stable up until the collapse of house prices beginning in 2006. Thus, the key question is whether the growth in credit was one of the leading causes, or merely a symptom, of the housing boom and subsequent crisis.

The asset pricing equation derived in the previous section specifies two margins of credit that impact house prices: access (i.e. constraints on quantities) and cost (i.e. interest rates). A large body of evidence points to a significant expansion of credit along both margins. First and easiest to measure is the decline in real mortgage rates from around 6% throughout the 1990s to only 4% beginning in the early 2000s. Much of this decline appears to be driven by changes in 10-year treasury rates—perhaps fueled by a global savings glut, as famously hypothesized by former Federal Reserve Chairman Bernanke—though Justiniano, Primiceri and Tambalotti (2017) also identify a divergence beginning in 2003 when mortgage rates started lagging treasury yields.

There was also a significant aggregate expansion along the intensive and extensive mar-

Figure 5: Mortgage Debt.



Source: Figure 7, Davis and Van Nieuwerburgh (2015)

gins of credit access during the boom, though a spirited debate continues regarding the distributional form that it took. In the early years of the crisis, the prevailing narrative attributed both the boom and the bust to excesses in the subprime market. As explained by Green and Wachter (2007), the traditional mortgage underwriting model focused on average cost pricing combined with rationing. If a prospective borrower was deemed not credit worthy, the lender simply issued a loan denial. However, with the widespread adoption of credit scoring during the 1990s, lenders began tapping into a pool of marginal borrowers and offering credit at more expensive terms. In addition, lenders began offering more "exotic" mortgage products, such as loans that featured low initial "teaser" rates that most borrowers expected to refinance after accumulating some equity. Using rich micro-level data, Mian and Sufi (2009) and Mian and Sufi (2011) were at the center of popularizing the argument that these innovations in credit access to risky borrowers fueled the boom and sowed the seeds for the crisis.

More recent research has begun to challenge the empirical foundations of this narrative. For example, Albanesi, De Giorgi and Nosal (2017), using administrative credit panel data, show that credit growth between 2001 and 2007 was actually concentrated in the prime

market. Foote, Lowenstein and Willen (2016) also claim that no such reallocation of credit occurred to risky borrowers, and in fact, wealthy borrowers actually accounted for most new debt in dollar terms. Anenberg, Hizmo, Kung and Molloy (2017) construct a measure of mortgage credit availability that traces out the maximum amount of debt obtainable by borrowers of different characteristics. Using data from 2001 to 2014, they find that the loan frontier expanded for all borrowers during the boom but contracted primarily for borrowers with low credit scores during the bust. Mian and Sufi (2017) push back against this "new narrative" and claim that the growth in household debt from 2000 to 2007 was larger for individuals at the bottom of the credit score distribution, just as Bhutta and Keys (2016) find evidence in support of collateral constraints that bind especially for homeowners with low to middle credit scores. Progress with improved data quality and empirical methods will undoubtedly continue to inform this debate as time goes on.

4.2.2 The Interaction of Loose Credit Constraints and Low Mortgage Rates

A body of structural work has emerged in parallel to assess the contribution of lower mortgage rates and looser credit constraints to the boom, bust, and recovery in house prices. In one respect, economists have long recognized the potential of credit constraints to amplify fluctuations in house prices, as seen in classic papers by Stein (1995) and Ortalo-Magné and Rady (2006). Yet, these earlier papers were a bit stylized and harder to take to the data. More recently, Favilukis et al. (2017) claim that a relaxation of borrowing constraints and a decline in the housing risk premium—not lower interest rates—explain the boom in house prices. Garriga, Manuelli and Peralta-Alva (2018) also show that a decline in rates is not sufficiently potent by itself, but it can explain the boom when interacted with looser borrowing constraints. Justiniano, Primiceri and Tambalotti (2018) make a similar point for an isolated loosening of borrowing constraints, claiming that it would produce a counterfactual rise in mortgage rates due to higher borrowing in a closed economy model. Furthermore, Kaplan, Mitman and Violante (2017) demonstrate that, in a model with perfectly integrated rental and owner-occupied markets, a loosening of down payment constraints cannot by itself reproduce the post-2000 boom in US house prices. Thus, it appears that, for the credit story to work, some combination of lower mortgage rates and looser borrowing constraints must

be operative.

4.2.3 Illiquidity, Long Term Debt, and Mortgage Default

Most of the previously discussed structural models abstract from one of the central topics investigated by the empirical literature: foreclosure-driven credit risk. Depending on its implementation, incorporating mortgage default into macro-housing models is a way to endogenize either credit access or the cost of credit in the case of individual risk pricing. However, substantial computational fortitude is necessary to add this ingredient. In a partial equilibrium setting with exogenous house prices, Corbae and Quintin (2015) use a framework with a rich menu of contract types to quantify the contribution of looser loan-to-value and payment-to-income constraints to the foreclosure crisis. They attribute over 60% of the rise in foreclosures to the increased prevalence of these loans in the later years of the boom.

The singular defining feature of housing crises is, above all, a large drop in house prices. In Corbae and Quintin (2015), this drop is manufactured exogenously, but other quantitative work studies the extent to which disruptions in credit can replicate the 25—30% US national decline in house prices (depending on the measure) between 2006 and 2011. In one paper, Chatterjee and Eyigungor (2015) reverse engineer a financial disruption that, in conjunction with an unexpected supply shock that increases the stock of houses, produces a 19% drop in prices. Garriga and Hedlund (2017) take a different approach by feeding in a combination of credit, labor market, and productivity shocks observed or inferred from the data. They are able to generate a 24% decline in house prices, and several lessons emerge regarding the driving forces behind this decline. First, higher downside risk in the labor market has the biggest single depressing effect on house prices, followed by a tightening in down payment constraints. Second, the model is highly nonlinear: the joint effect of the shocks exceeds the sum of the individual effects. Third, the endogenous response of housing illiquidity acts as a source of amplification and propagation.

This point about illiquidity merits extra discussion. In part prompted by the work of Kaplan and Violante (2014), there has been an increasingly realization over the past few years that the presence of illiquid assets on a household's portfolio—most notably, housing—significantly affects behavior. Currently, the most common way in the literature of modeling

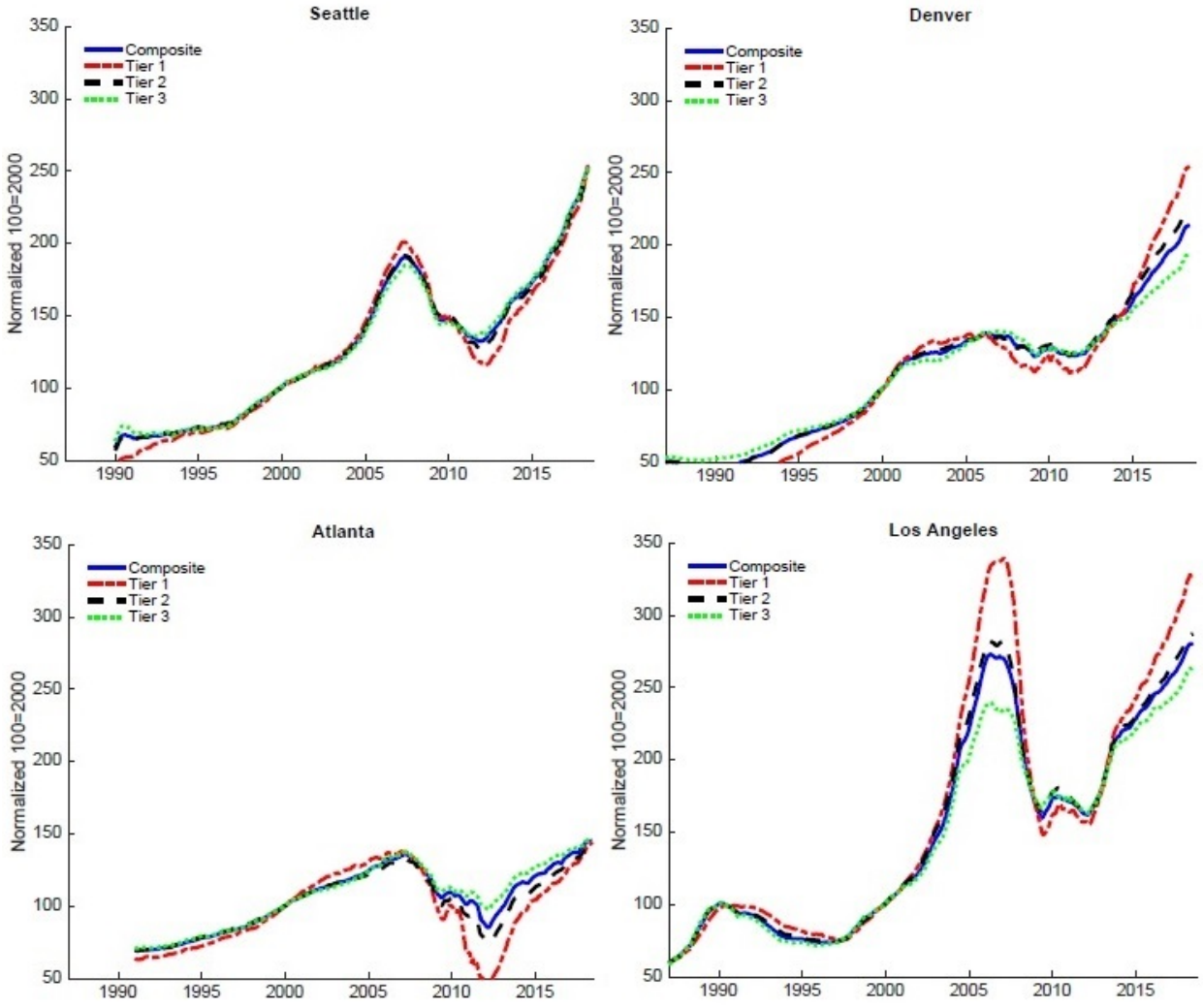
illiquidity in the housing market is through the introduction of transaction costs. However, Garriga and Hedlund (2017) point out that the ease of buying and selling varies tremendously with housing conditions. At the peak of the 2000s boom, houses might sell within days or even instigate bidding wars, which stands in stark contrast to the trough, when houses might sit on the market for a year. Garriga and Hedlund (2017) go on to show that a deterioration in housing liquidity raises default risk which, in turn, causes banks to cut credit. What emerges are liquidity spirals akin to those in Brunnermeier and Pedersen (2009) that amplify the house price decline during the bust by almost 27%.

In other work, Garriga and Hedlund (2018) point out that modeling mortgages accurately as long term debt is also crucial for explaining the dynamics of foreclosures and homeownership. Though useful for conceptual illustration, the loan-to-value constraint from earlier in this section, $M_t \leq \theta P_t H_t$, has stark and counterfactual implications for crisis episodes. In words, this constraint states that the entirety of a borrower's outstanding debt must satisfy a collateral constraint each period. But what happens if house prices fall and borrowers can no longer roll over their debt? This constraint would impose a margin call on borrowers that forces them to either come up with cash or sell. In reality, collateral constraints are only imposed upon origination of a new mortgage and are therefore more aptly called down payment constraints. When house prices fall, nothing happens to homeowners who are able to continue making their scheduled amortization payments.

4.2.4 Credit and Market Segmentation

In the vast majority of quantitative structural models, housing enters the budget constraint as a quantity multiplied by a per-unit price, just like capital. The top row of 6 is largely consistent with this approach. In both Seattle and Denver, house prices across different market tiers followed roughly similar trajectories during the 2000s boom and crisis. However, the bottom row reveals two examples of divergent house price dynamics across market tiers. In Atlanta, prices in every segment of the housing market appeared to rise at similar rates during the housing boom, but the floor really fell out at the bottom end of the housing market during the bust. Los Angeles represents an even starker case of divergence that emerged during both the boom and the crisis.

Figure 6: House Prices across Selected Metro Areas.



Source: Case-Shiller

Ríos-Rull and Sánchez-Marcos (2012) represent one of the earlier attempts at integrating fluctuating relative house prices into a quantitative model by replacing $P_t H_t$ with $P_t(H_t)H_t$ in the household budget constraint and solving for N_H equilibrium prices instead of just 1. More recently, Landvoigt, Piazzesi and Schneider (2015) have pioneered the use of rich micro-level data and an assignment model to explain price dynamics throughout San Diego. They conclude that cheaper credit for poor households was a major driver of prices in the lower tier of the market.

4.2.5 Preference Shocks, Beliefs, and Expectations

An alternative approach to producing shifts in housing demand relies on preference shocks. In one canonical paper, Iacoviello (2005) develops and estimates a two-agent model with preference shocks to housing, but while the model is able to match many cyclical features of the data, it cannot produce large housing booms and relies on one period nominal debt to produce excessively strong collateral effects. In their absence, the preference shocks used to generate higher house prices actually produce a counterfactual, negative co-movement with consumption. Nevertheless, the paper does successfully establish the importance of including housing and nominal mortgage debt in business cycle models.

In the context of an incomplete markets, heterogeneous agent model, Kaplan et al. (2017) also find that preference shocks generate a negative co-movement between house prices and consumption. Instead, they attribute the house price boom primarily to a belief shock about a *future*, yet ultimately unrealized, shift toward higher preferences for housing. While this framework can produce large swings in house prices, the nature of non-materializing preference shocks makes them completely unpredictable.

Broadly speaking, expectations undoubtedly play a critical role for house price behavior. For example, Case and Shiller (2003) find that homebuyers in the year 2003 thought that house prices would appreciate by an astonishing annual 9% over the next decade. According to them, this irrational enthusiasm in expectations concerning future prices was a major factor fueling the housing boom. Consistent with this view, Barlevy and Fisher (2010) argue that the prevalence of interest-only mortgages originated during the boom is evidence of a speculative bubble. Adam, Kuang and Marcet (2012), Glaeser and Nathanson (2015), and

Davis and Quintin (2017) develop models with sluggish expectations. In the case of the first two papers, this feature can produce house price behavior that is delinked from fundamentals, while Davis and Quintin (2017) emphasize the implications for default behavior. Along similar lines, Landvoigt (2017) finds that, contrary to the claims of Case and Shiller (2003), expectations of mean price growth were close to the long run average during the boom. However, large *subjective uncertainty* about house price growth given the option value of default helps to explain the tremendous rise in household debt. Burnside, Eichenbaum and Rebelo (2016) develop a stylized model of heterogeneous expectations and social contagion that generates booms that may or may not be followed by a bust. Lastly, Garriga et al. (2018) show that, even with perfectly rational agents, the slow arrival of information can drastically magnify the size of boom-bust episodes. Importantly, while many papers emphasize the role of beliefs in fueling the housing boom, they have a harder time explaining the bust in light of evidence provided by Cheng, Raina and Xiong (2014) that the agents who were most likely to be informed about real time housing market conditions—managers in securitized finance—neither timed the market nor were cautious in their own home transactions, suggesting that they were unaware of an impending bust. Gerardi, Lehnert, Sherlund and Willen (2008) offer further support for the unanticipated nature of the large price decline.

4.3 The Macroeconomic Consequences of Housing Crises

Clear evidence linking the US housing bust to the severity of the Great Recession is, by all accounts, largely responsible for reinvigorating interest among macroeconomists in the study of housing crises. A growing body of literature finds that large house price declines induce significant cuts to consumption, negative labor market spillovers, and can stunt the recovery after a recession. This section discusses the latest evidence and analysis of these macroeconomic effects.

4.3.1 Consumption and Balance Sheet Effects

Numerous papers have highlighted the role of household balance sheets in transmitting housing market disruptions to consumption and employment. One prominent example is Mian

and Sufi (2011), who use credit bureau data to identify a home equity-based borrowing channel whereby both new *and existing* homeowners extract equity from their houses when prices rise. Importantly, they find that households used this equity during the boom to increase consumption rather than pay down other high-interest debts or purchase investment properties, though Zhou (2018) has recently pushed back with evidence indicating that a large share of the borrowed funds were used for housing investment. Bhutta and Keys (2016) confirm the view that these borrowed funds were used either for consumption or illiquid investment rather than debt repayment based on the fact that equity extraction was associated with higher subsequent default risk, with Cooper (2013) providing further evidence against significant balance sheet repairs efforts by households.

A similar mechanism operates in reverse during housing busts. Empirically, Mian and Sufi (2014) show that employment contracted more strongly from 2007—2009 in counties that were more exposed to declines in house prices, and Mian, Rao and Sufi (2013) find a similar negative effect on consumption at the zip code level. Garriga and Hedlund (2017) show that, in order to match the empirical facts, structural models should not abstract from portfolio composition. In particular, net worth is not a sufficient statistic for the response of consumption to changes in wealth—gross portfolio positions matter. Heavily indebted homeowners with more of their wealth in the form of housing experience larger declines in consumption than households with similar net worth but who are less exposed to the housing market. Garriga and Hedlund (2018) go further and point out the asymmetric response of consumption to house price changes in booms and busts, which they attribute in part to long term debt and the option values of defaulting and refinancing.

4.3.2 Foreclosure Externalities

Other legal and institutional features of the mortgage market also shape the macroeconomic response to large housing market declines. To begin with, several lessons emerge from a large body of work that emphasizes the importance of foreclosure laws. For example, Ghent and Kudlyak (2011) examine the impact of recourse laws—which allow banks to pursue deficiency judgments from borrowers for outstanding mortgage debt not paid off by the foreclosure sale—on the propensity to default. They find that recourse lowers borrowers'

sensitivity to negative equity, thereby mitigating the strategic motive to default, which Geraradi, Herkenhoff, Ohanian and Willen (2018) claim plays a role in nearly 40% of mortgage defaults. However, Hatchondo, Martinez and Sanchez (2015) point out that the relationship between recourse stringency and foreclosure activity is non-monotonic. With stricter foreclosure laws, borrowers undoubtedly have a lower individual propensity to default for a given level of debt, but banks respond by expanding the supply of credit, which may increase the amount of debt in the economy. Empirically, although Hurst, Keys, Seru and Vavra (2016) find substantial mortgage market redistribution across regions that could mute the impact of state-specific laws, Li and Oswald (2017) show that legislation passed in Nevada in 2009 that abolished deficiency judgments led to a contraction in credit. In terms of macroeconomic impact, Hedlund (2016) finds that recourse laws induce greater caution among buyers when purchasing and financing houses, which reduces the volatility of house prices.

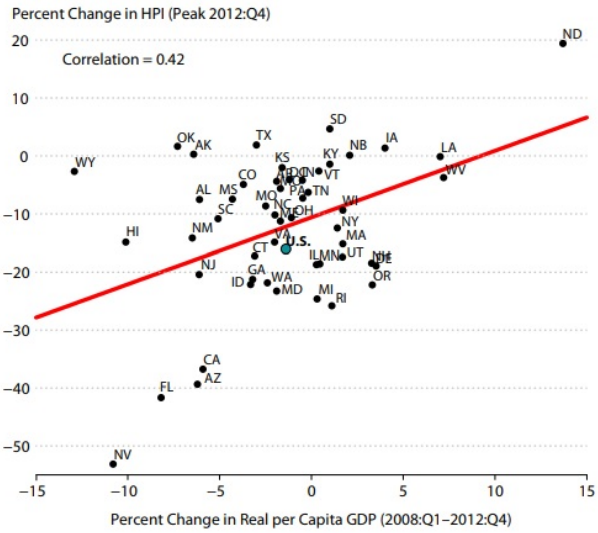
Mian, Sufi and Trebbi (2015) identify strong macroeconomic effects from another significant source of state-level in foreclosure laws: the presence or absence of a judicial requirement that requires lenders to seek court permission to initiate foreclosure proceedings. They provide evidence for a discrete jump in foreclosures upon crossing the border into a state without a judicial requirement, and this elevated foreclosure activity led to a large decline in house prices and consumption between 2007 and 2009. However, these states also subsequently experienced a faster rebound during the recovery, which lends credence to the analysis in Guren and McQuade (2018) that demonstrates how foreclosure delays may be counterproductive even in the presence of the damaging foreclosure externalities that both they as well as Anenberg and Kung (2014) find.

4.3.3 Output and Production Linkages

Many of the previous papers have emphasized the transmission from housing to the macroeconomy through consumer spending, either as the main variable of interest or as a stand-in for "aggregate demand" that drives other components of GDP. However, there is growing evidence that housing crises also exert a macroeconomic impact by disrupting production chains and altering labor market flows. For example, Boldrin, Garriga, Peralta-Alva and Sanchez (2016) address the ability of production linkages to induce a rippling effect through

the rest of the economy from a decline in residential investment. They estimate that, although the drop in construction employment during the crisis only accounted *directly* for a modest fraction of the decline in total employment, a "production multiplier" arising from the input-output structure of the economy greatly magnified the impact. Quantitatively, they conclude that a $1 decline in demand in the construction sector generates a $2.10 decline in gross output which, in the context of the Great Recession, means that the drop in housing output was responsible for up to 44% of the decline in total employment and 56% of the decline in output. The consequences of the construction collapse are particularly evident in states which experienced larger price declines, as seen in 7.

Figure 7: State-Level Housing Spillovers.



Source: St. Louis Fed Economic Synopses, 2013, No. 11

4.3.4 Labor Markets and Mobility

Turning attention to the labor market, Herkenhoff and Ohanian (2018) show how foreclosure delays act as an implicit line of credit that leads to longer unemployment spells by altering job search behavior. Using micro data, they show that these delays depressed employment during the Great Recession by up to 1.3 percentage points in states like Florida and New Jersey, which seems to confirm the assertion by Guren and McQuade (2018) that foreclosure delays can be economically detrimental. With a further focus on the labor market, Sterk

(2015) presents both theoretical and empirical support for the idea that the evaporation of home equity during a crisis induces workers to turn down job offers that require them to move, either because of an inability to sell their previous house or afford a down payment in the new location.

The empirical evidence is mixed, however, with Demyanyk, Hryshko, Luengo-Prado and Sorensen (2017) providing a contrary view. They interpret empirical evidence from merged individual-level credit reports and loan-level mortgage data through the lens of a structural model and conclude that negative equity during the crisis was not a significant barrier to mobility. However, Brown and Matsa (2016) do find evidence for a negative mobility response in areas with depressed housing markets, especially when the legal environment features recourse mortgages. van Veldhuizen, Vogt and Voogt (2018) use administrative panel data of nearly the entire population of Dutch homeowners to arrive at similar findings abroad. Together, these last two papers indicate that foreclosure laws may play a critical role in shaping the response of worker job search behavior to deteriorating housing market conditions.

4.4 Policy Implications

For policymakers, the practical question that inevitably comes to mind after understanding the causes and consequences of housing crises is, "What can we do about it?" The range of experiences across states and countries over the last decade has proven fruitful for researchers as they assess the impacts of policies that have already been implemented and contemplate possible actions for the future. In reality, the work in this area could fill an entire article on its own, but this section briefly discusses some of the emergency interventions from the Great Recession as well as the ongoing academic and policy debates surrounding how to prevent a repeat of the last crisis.

4.4.1 Crisis Interventions

Policymakers across all levels of the US government engaged in a full court press during the last housing crisis trying to find measures to stem the bleeding and accelerate the recovery. At the federal level, Congress intervened with the creation of the Home Affordable Modification

Program (HAMP) and Home Affordable Refinance Program (HARP), which were targeted programs aimed at preventing distressed or underwater borrowers from going into foreclosure. The principal distinction was that HAMP modified the existing mortgage contract of a borrower—for example, by extending the loan term, reducing the interest rate, or cutting the monthly payment—whereas HARP streamlined and loosened underwriting requirements for borrowers with negative equity to allow them to take out a new loan at prevailing market rates. California also instituted its own series of "Keep Your Home California" initiatives, including a principal reduction program.

A stream of recent papers has evaluated the consequences of these programs. On the empirical front, Chomsisengphet and Pennington-Cross (2007) exploit regional variation in the intensity of HAMP implementation and find evidence that the program had a salutary effect on foreclosures, house prices, and durable spending. However, the program only reached one third of its intended audience of highly indebted households. One of the central policy questions surrounding these programs is whether principal reductions or interest rate relief are more potent forms of "stimulus." The lessons that emerge from the structural analyses in Hedlund (2018) and Kaplan et al. (2017) is that principal reductions can significantly reduce foreclosures but are not effective by themselves at boosting house prices or consumption. Recent work by Ganong and Noel (2018) provides empirical support for this finding. In particular, they use variation in mortgage modifications to separate the wealth effect from the income effect of debt reduction. Their empirical design reveals that principal reductions that leave liquidity unchanged—that is, they do not relax budget constraints—have no effect on consumption. By contrast, interventions that provide liquidity relief without changing balance sheets, such as loan maturity extensions, have large effects.

In addition to these measures targeted at distressed borrowers, the federal government instituted a $20 billion First-Time Homebuyer Credit (FTHC) between 2008 and 2010 to stimulate home buying and, ideally, house prices. At the time, one worry that emerged was that any beneficial effects would immediately reverse upon conclusion of the policy. Berger, Turner and Zwick (2018) analyze the program with this concern in mind but arrive at far different conclusions. Using administrative tax records combined with transaction deeds data, they find that the policy spurred sales and homeownership, these effects did not

reverse after the program ended, and the main benefit of the policy was to accelerate the process of reallocation of existing houses from low-value sellers to high-value buyers rather than provide direct stimulus to new construction.

Last but certainly not least, the Federal Reserve aggressively loosened monetary policy during and extending beyond the crisis. Besides the traditional move of lowering short term rates, the Federal Reserve engaged in unconventional monetary policy, the capstone of which—quantitative easing—aimed to reduce long term rates. This policy coincided with mortgage rates reaching historic lows, which Engen, Laubach and Reifschneider (2015), Krishnamurthy and Vissing-Jorgensen (2011), and Joyce, Miles, Scott and Vayanos (2012) claim was a causal response to the policy, not mere correlation. Di Maggio, Kermani, Keys, Piskorski, Ramcharan, Seru and Yao (2017) provide indirect evidence of sorts for the macroeconomic impacts of quantitative easing by showing that areas with a higher prevalence of adjustable rate mortgages—where homeowners would automatically benefit from lower rates without needing to go through a refinance process—saw a relative decline in foreclosures and rise in house prices, car purchases, and employment following interest rate declines. According to Garriga and Hedlund (2017), the stimulative effective of quantitative easing on house prices comes primarily through its positive general equilibrium effect on house prices, while Garriga and Hedlund (2018) emphasize the importance of mortgage contract type. In particular, with adjustable rate mortgages, quantitative easing boosts consumption throughout the entire recovery. However, homeowners with fixed rate mortgages must refinance to receive the lower rates, during which process they usually extract equity that subsequently slows consumption growth because of debt overhang. The importance of mortgage design to the monetary transmission mechanism has also been emphasized in papers such as Garriga, Kydland and Sustek (2017b) and Hedlund, Karahan, Mitman and Ozkan (2017).

4.4.2 Macroprudential Policy

In the early years of the economic recovery, the still-weak conditions in the housing market afforded a degree of patience to discussions in the United States surrounding the effective design of macroprudential policies to prevent a repeat crisis. However, with prices now in full rebound mode, the prospect of another boom-bust episode no longer seems as far off. In

other countries like Canada, Norway, and New Zealand where house prices have been on even more of a tear the past several years, worries about the potential of an impending housing bust and the resilience of the macroeconomy in such an event are even more pressing. In fact, these particular countries have already taken preemptive measures to cool their housing markets, often by targeting foreign buyers who rightly or wrongly receive a disproportionate share of the blame for overheating house prices.

While many of these policy discussions have centered on banking sector reforms, too big to fail, and stress testing, regulation of household borrowing has also garnered significant attention. Arguably, the two most prevalent examples of such macroprudential regulations are loan-to-value limits and debt-to-income limits for new mortgages applied at the origination stage. Many papers have studied the implications of loan-to-value limits, and the consensus view appears to be that they successfully reduce foreclosures but have ambiguous welfare effects. Recently, others have begun studying debt-to-income constraints and weighing their efficacy against traditional down payment constraints. While Greenwald (2018) claims that payment-to-income caps are a more effective tool for limiting boom-bust cycles, alternative frameworks have delivered different results, and a consensus has not yet emerged.

Conceptually, Garriga and Hedlund (2018) explain that any macroprudential policy that limits borrowing has two opposing effects on macroeconomic fragility, defined as the sensitivity of economic aggregates to a given exogenous shock. On the one hand, such borrowing restrictions limit the accumulation of household debt and minimize the number of households in the part of the state space that is most vulnerable to defaults and severe consumption drops in the event of a shock. On the other hand, households use credit markets to insure themselves against shocks, so any restrictions limit their ability to smooth consumption. Lastly, some recent papers, such as Guren, Krishnamurthy and McQuade (2018) and Greenwald, Landvoigt and Van Nieuwerburgh (2018) look at whether more fundamental changes to the structure of mortgage contracts can improve macroeconomic stability. In both cases, promising avenues for mortgage reform emerge, but not without their own implementation challenges.

5 Conclusions

As the largest source of wealth for most people, housing has always played an outsized role in economic life. However, the pace of financial innovation, credit market liberalization, and globalization over the past few decades has increased the chance that local housing downturns—which, contrary to any narrative that attempts to paint housing as a sure bet, are not a new phenomenon—turn into more severe crises that cause lasting macroeconomic damage. This article has provided a guided tour for the leading explanations behind the causes and consequences of housing crises with an attempt to blend reduced-form empirical evidence with structural analysis. Going forward, there are still many fruitful areas for researchers to explore. For example, economists still do not have a satisfactory model that can quantitatively account for all of the stylized facts of house prices documented earlier in this article, though significant progress has certainly been made over the past decade. In addition, the increased availability of micro-data presents new opportunities to test and refine these models. Lastly, continued work is merited to investigate the effectiveness of different policy approaches in creating an environment that is conducive to economic opportunity—which for many people, includes homeownership—built on a foundation of economic resilience rather than fragility.

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