The Great Recession: Lessons from Microeconomic Data

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Crises and sharp economic downturns, while undesirable, provide economists with a unique opportunity to test and hone economic theory. Indeed, some of the most influential advancements in economic thought, including Milton Friedman's monetarist tradition, John Maynard Keynes' fiscal theory, and Irving Fisher's debt-deflation hypothesis, emerged from analysis of the Great Depression.

The current economic malaise, which we refer to as "The Great Recession," provides another watershed moment to reevaluate our core economic beliefs. However in contrast to our peers in previous crises, we are fortunate to have access to large-scale microeconomic data sets and advancements in computational capacity. These advantages allow for a more rigorous analysis of the current recession and therefore a more informed understanding of its origins, propagation, and consequences.

Our purpose is to highlight how a micro-level analysis of the Great Recession provides us with important clues to understand the origins of the crisis, the link between credit and asset prices, the feedback effect from asset prices to the real economy, and the role of household leverage in explaining the downturn. We hope that our discussion also serves as an example of the usefulness of incorporating microeconomic data and techniques in answering traditional macroeconomic questions.

I. What Were the Origins of the Credit Cycle: Credit Demand or Credit Supply?

Financial crises are almost always preceded by a sharp rise in leverage or debt-based financing. There are two competing explanations for this observation. The first explanation borrows from the real business cycle tradition and associates credit expansion to positive

productivity or technology shocks. Under this paradigm, the subsequent crisis represents an "unlucky" event when realized shocks are not as positive as anticipated. If such a view were correct, there is no role for public policy: credit booms result from productivity-driven shifts in the *demand* for credit and should therefore be left alone. The influence of this paradigm on policymakers during the credit expansion from 2002 to 2006 is evident from Alan Greenspan's references to "productivity improvements" as a rationale for the higher debt burdens.[1]

However, an alternative explanation for credit booms is based on shifts in the *supply* of credit. Such shifts may be driven by a series of factors, but financial innovation (such as securitization) is often a core component. Charles P. Kindleberger, in his masterful account of financial crises originally published in 1978, asserts that "in many cases the expansion of credit resulted from the development of substitutes for what previously had been the traditional monies."[2]

From a policy perspective, it is important to understand whether a rise in leverage is driven by demand-side productivity shocks or supply-side financial factors. A supply-driven rise in leverage may not be innocuous. For example, if leverage growth is driven by risk-shifting supply-side incentives such as regulatory arbitrage or expectations of government bailouts, then there may be a role for intervention to realign incentives.

How does one separate supply from demand in understanding the origins of the expansion of household leverage from 2002 to 2006? In Mian and Sufi (2009a), we argue that the use of microeconomic data in the form of zip code level data on household borrowing can isolate channels much more effectively than traditional aggregate data sets. We show that contrary to the predictions of a productivity-based credit expansion hypothesis, zip codes that

see the largest increase in home purchase mortgage originations from 2002 to 2005 experienced relative *declines* in income.

In fact, the evidence is even more extreme. We isolate the sample to zip codes that experienced negative income growth in nominal terms from 2002 to 2005, and compare these zip codes to others in the same county with positive income growth. From 2002 to 2005, the negative income growth zip codes witnessed a growth in mortgage originations that was almost twice as large as the positive income growth zip codes! More broadly, we show that the correlation between mortgage growth and income growth is *negative* from 2002 to 2005 while the correlation is positive in all other periods since 1990. A productivity-driven credit demand hypothesis for the mortgage credit boom is soundly rejected in the data.

On the other hand, a supply-based explanation for mortgage credit expansion, where subprime credit is financed through the rapidly developing securitization market, is robustly supported in the data. The fraction of home purchase mortgages that were securitized by non-GSE institutions rose from 3% to almost 20% from 2002 to 2005, before collapsing completely by 2008.[3] We show that non-GSE securitization primarily targeted zip codes that had a large share of subprime borrowers. In these zip codes, mortgage denial rates dropped dramatically and debt to income ratios skyrocketed.

Not surprisingly, the mortgage default crisis started and remains most pronounced in high subprime share zip codes, which correspond to the top quartile based on the fraction of borrowers in the zip code with a credit score less than 660 as of 2000.[4] The top left panel of Figure 1 shows the dramatic relative expansion and collapse of mortgage lending to subprime zip codes, and the top middle panel shows a similar expansion and collapse in securitization for

these zip codes. The top right panel plots mortgage default rates in subprime zip codes, which reached almost 20% by 2008.

II. Does the Supply of Credit Influence Asset Prices?

The traditional approach in asset pricing prices assets by discounting future cash flows. The availability of credit plays no role in the determination of asset prices. However, this view is increasingly challenged as being too narrow. For example, John Geanakoplos has initiated a promising line of inquiry on the premise that "variations in leverage cause fluctuations in asset prices" (Geanakoplos (2009)). In other words, financial innovation or general shifts in the supply of credit can have a direct impact on asset prices, creating a potentially important feedback mechanism (see also Franklin Allen and Douglas Gale (2000)).

Is there evidence that the growth in real estate prices during the recent boom was partly driven by shifts in credit supply? Mian and Sufi (2009a) exploit local variation in credit growth and housing supply elasticity to address this question. The bottom left panel of Figure 1 shows that house price growth was significantly stronger in subprime zip codes relative to prime zip codes until 2006, before collapsing completely by the end of 2008. Since credit growth was also significantly stronger in subprime zip codes during 2002 to 2005, the graph is suggestive of a credit-induced house price boom.

However, how do we know that the causality does not run in the opposite direction? Perhaps the higher credit growth in subprime neighborhoods was itself driven by the expectation of higher house prices in these neighborhoods. To test for such reverse causality concerns, we split the sample by housing supply elasticity. In particular, we focus only on cities where housing supply is extremely elastic—that is, where new housing can be constructed

quickly at relatively low marginal cost. Theoretically, house price appreciation in these cities should not exceed nominal inflation in construction costs because land is effectively free.

We show that this was indeed true during the subprime lending frenzy. Moreover, in these elastic housing supply MSAs, there was no differential house price growth in subprime neighborhoods despite these neighborhoods seeing strong credit growth relative to prime neighborhoods. If subprime credit growth were driven by expectations of higher house price appreciation in subprime neighborhoods, we should *not* have seen higher subprime credit growth in elastic cities that experienced no house price appreciation. The housing supply elasticity comparison suggests that the direction of causality is more likely to flow from credit expansion to higher house prices.[5] Indeed, Mian and Sufi (2009a) show that the within-county zip code level correlation between house prices and income growth was *negative* from 2002 to 2005, while it was positive in all other time periods. It appears far more likely that a single cause—a shift in supply of credit—was responsible for the boom in leverage and house prices.

This point is especially important for policy-makers and regulators. After arguing that house price growth during the housing boom "largely reflect[s] strong economic fundamentals," Ben Bernanke now recognizes that "the availability of these alternative mortgage products proved to be quite important and, as many have recognized, is likely a key explanation of the housing bubble".[6] One of the key lessons from our research is that the use of microeconomic data can lead to real time analysis to tease out the underlying causes of macroeconomic patterns. The negative correlation between income growth and house price growth at the zip code level could have been detected as early as 2005 using microeconomic data.

III. Do House Prices Have an Accelerator Effect?

The growth in mortgage credit and house prices obviously impacts the real economy through the construction sector. However, such real effects could be relatively small unless there is an "accelerator" or feedback effect from the rise in asset prices to the real economy. Several macro models based on collateral and financial frictions postulate such feedback effects (e.g., Ben Bernanke and Mark Gertler (1989), Nobuhiro Kiyotaki and John Moore (1997)).

Historically, accelerator effects are largely perceived to work through the effect of collateral value on firm investment. However, we believe that in years preceding the Great Recession, the major accelerator effect was driven by the impact of rising home equity on household spending. It is generally difficult to isolate the impact of higher house prices on household expenditure. The usual worry is that unobserved common shocks, such as permanent income shocks, may co-determine house price, household consumption, and borrowing dynamics.

We show in Mian and Sufi (2009b) that microeconomic data helps to overcome this worry. Our analysis uses an instrumental variables approach and a large panel of individual-level data on household borrowing to isolate the causal effect of house price growth on household borrowing and consumption. We find that existing homeowners borrowed 25 to 30 cents against the rising value of their home equity from 2002 to 2006. A significant fraction of the overall rise in household debt can therefore be attributed to home equity-based borrowing. Moreover, the borrowings were not used to purchase new properties or to pay down expensive credit card balances, implying that they were likely used for real outlays such as home improvement and consumption.

We also examine heterogeneity across different groups and find that the home equity-based borrowing channel is much stronger among households with low credit scores and high

credit card utilization rates. Homeowners that appear credit constrained are the most aggressive in their home equity extraction response to house price growth. Older households respond *less* aggressively to unexpected house price growth, contradicting most standard life cycle theories of consumer behavior. The magnitude of borrowing against home equity growth suggests that it had a first order effect on the economy. House price-driven home equity extraction accounts for $1.5 trillion of the increase in household debt, or 2.8% of GDP per year from 2002 to 2006.

While our findings are consistent with collateral-based accelerator models, they also point to some shortcomings requiring further exploration. For example, collateral effects and financial frictions are typically associated with the *production* sector as opposed to the *household* sector. Our findings suggest that household borrowing for consumption may be far more sensitive to collateral values than firm investment. Similarly, the high sensitivity of household borrowing and defaults to collateral value raises the question of whether non-standard preferences, such as the hyperbolic discounting model of David Laibson (1997), more accurately capture consumer behavior.

IV. The Household Leverage-Driven Recession

An expansion in the supply of credit coupled with the feedback effect of borrowing against rising house values by existing homeowners created an unprecedented growth in U.S. household leverage between 2002 and 2006. We show in Mian and Sufi (2010) that the cross-sectional variation in leverage growth across U.S. counties is an early and powerful predictor of the severity of the recession of 2007 to 2009.

The predictive effect of household leverage on macroeconomic outcomes is large enough that it can explain the entire rise in mortgage defaults, the fall in house prices, and the fall in durable consumption measured by auto sales. We use county-level information on auto

sales and building permits to show that durable consumption declined earlier and more sharply in counties that experienced a large increase in household leverage before the recession. In the most highly levered counties, auto sales and new residential building began declining as early as 2006, a full year before the beginning of the recession. In fact, counties with low household leverage completely escaped the drop in durable consumption until the fourth quarter of 2008 (see bottom-middle panel in Figure 1).[7]

Household leverage could have affected durable consumption and residential investment through two channels. First, highly levered households may have refused to purchase goods that required additional debt burdens given higher probabilities of default. Second, frictions in credit markets may have lead to a decline in the supply of credit, making it difficult for consumers to purchase durable goods. In support of this latter channel, we find that credit card lenders sharply curtailed credit availability from the fourth quarter of 2008 to the third quarter of 2009, and that this differentially affected counties that relied more on credit card borrowing.

Our results support an earlier strand of literature that highlights the importance of household leverage in driving and amplifying recessions (e.g. Irving Fisher (1933) and Frederic Mishkin (1978) on the Great Depression). Mervyn King (1994) and Reuven Glick and Kevin Lansing (2009) also find a very strong relation between the increase in household leverage and the severity of the subsequent recession across developed countries. Similarly, Edward Leamer (2009) points out that eight of the last ten recessions were preceded by substantial problems in housing and consumer durables. Yet household finance does not play a major role in most models of macroeconomic fluctuations.

V. In Search of Fundamental Causes

Our central argument is that an outward shift in the supply of credit from 2002 to 2006 was a primary driver of the macroeconomic cycle of 2002 to 2009. An obvious question then is: what drove this outward shift? There are many potential answers to this question, but we choose to highlight two. The first is the international financial literature on global savings imbalances (Maurice Obstfeld and Kenneth Rogoff (2009)). Indeed, in terms of aggregate flows, the accumulated current account deficit almost perfectly matches the rise in household leverage that we argue was at the root of the economic downturn.

Second, subsidies for mortgage credit in the form of government homeownership initiatives, implicit government guarantees and expected bailouts is likely to have played an important role in artificially lowering the cost of credit. In research with Francesco Trebbi, we find that campaign contributions from the mortgage industry increased significantly in favor of U.S. Representatives from high subprime congressional districts starting in 2000. These campaign contributions were in turn increasingly informative in predicting congressional voting behavior (Mian, Sufi and Trebbi (2009b)). Moreover, in the aftermath of the crisis, representatives with high constituent defaults and high campaign contributions from the financial industry were significantly more likely to vote in favor of various bailout initiatives (Mian, Sufi and Trebbi (2009a)).

These results highlight the dangers that political capture by special interest and populist forces pose. If the prevailing political structure cannot credibly commit to imposing losses on market participants engaged in risky behavior, leverage-driven crises are likely to be a recurrent feature of our economy. The bottom right panel of Figure 1 shows why this issue is especially pressing: In 2008, the Federal Housing Finance Administration aggressively stepped into the housing market by insuring mortgages in collapsing subprime neighborhoods.

Conclusion: The Role of Microeconomic Analysis in Macroeconomic Policy

The widespread availability of microeconomic data has greatly enhanced our ability to understand the fundamental driving forces behind macroeconomic fluctuations and credit cycles. Our research has employed microeconomic data in order to understand the link between household finance and the real economy. However, a similar case can be made for other channels of interest, such as the link between bank liquidity and the real economy.[8]

The broader point to emphasize is that micro-level data is now widely available for key variables of interest such as bank loans, house prices, consumer borrowing, spending, and defaults. These data are updated at quarterly frequency or higher, making them highly useful for policy work. We hope that the above illustration of our work using microeconomic data leads to a greater use of such data both in academic and policy circles.

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[1] For example, see Federal Reserve Chairman Alan Greenspan's testimony to the U.S. Congress on June 9th, 2005.

[2] See chapter 4 of Charles P. Kindleberger and Robert Aliber (2005).

[3] These facts come from HMDA data. Mortgages sold by the originator to non-bank financial institutions and for the purpose of private securitization are included. See Mian and Sufi (2009a) for more details.

[4] All of the data used in Figure 1 are explained in detail in Mian and Sufi (2009a). The quartile splits are weighted by population so that the bottom and top quartiles contain the same number of households.

[5] In elastic cities, higher credit extension should level to more quantity of housing. This is also true in data.

[6] See January 3rd, 2010 speech at the American Economic Association Meeting on "Monetary Policy and the Housing Bubble" and October 20th, 2005 Congressional Testimony on "The Economic Outlook."

[7] This figure is based on county level data, where we split the U.S. counties based on the change in the household debt to income ratio in the county from 2002 to 2006. See Mian and Sufi (2010) for more details.

[8] See Khwaja and Mian (2008) for an illustration. Similarly, Jimenez et al (2010) use credit registry data in Spain to isolate the credit channel consequences of the rise in securitization in Spain.

Figure 1
Household Credit Cycle and the Macroeconomy

Subprime and prime categories correspond to the top and bottom quartiles based on the fraction of borrowers in the zip code with a credit score less than 660 as of 2000. Quartiles are population weighted so that both subprime and prime zip codes contain the same number of individuals. For the bottom middle panel, we use county-level data on auto sales. High (low) leverage growth counties are counties in the top (bottom) decile of the distribution of the change in the debt to income ratio from 2002 to 2006.