The Credit-Driven Household Demand Channel

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A Striking Empirical Regularity

The great recession of 2008 left behind a striking empirical regularity that you can see in the left panel of Figure 1. States within the U.S. that had a larger increase in household leverage between 2002 and 2007, ended up experiencing a much more severe recession between 2007 and 2010 as measured by the increase in unemployment. Remarkably, we find exactly the same relationship across countries. In particular, countries that had a larger increase in household leverage between 2002 and 2007, experienced a much more severe recession between 2007 and 2010 (right panel of Figure 1).

One might complain here that I am conditioning on a recession in figure 1 and as such it is not that surprising that leverage, conditional on a recession, hurts. However, as I will discuss, this empirical regularity is not an artifact of cherry picking data, but is the result of a systematic force that I am going to refer to as the credit-driven household demand channel.

The credit driven household demand channel has three stages. It starts with an expansion in the supply of credit, i.e. for some reason, financial markets are willing to lend more to the same loan applicant. This increase in credit supply fuels a boom that drives an outward shift in household aggregate demand. However, the expanding credit boom also sows the seeds of its own destruction and ultimately results in a macroeconomic slowdown.

I will present a wide range of empirical findings, both from the U.S. and around the world and covering the last half century, that hopefully will convince the reader of the prominence of credit-driven household demand channel. I will first present international evidence from business

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cycles worldwide, including a new out-of-sample test of previous findings. I will then present results from a natural experiment within the U.S. during the 1980s when states started deregulating their banking systems. And finally i will discuss U.S. evidence from the Great Recession episode. The last part of my remarks will be devoted to discussing the theoretical and policy implications of these empirical findings.

International Evidence

I start with stuctural VAR evidence on credit shocks and their impact on business cycles worldwide from Mian et al. (2017b). We use data from 30 mostly advanced countries over the last half century and run VAR using log real GDP, and the two components of private credit to GDP, household credit to GDP and non-financial firm credit to GDP. Two points are worth noting. First, the response of GDP to a household credit shock is a muted boom followed by a strong and persistent slowdown that i have emphasized with an arrow (left panel of figure 2). Second, there is a clear asymmetry in the response of GDP to household credit shock versus a shock to non-financial firm credit. The latter does not produce the strong cyclical response (right panel of figure 2). This is the first indication that a household credit-driven demand channel is important for understanding business cycles.

Table 1 pools together evidence from Mian et al. (2017b,a) and highlights some noteworthy elements of this credit-induced business cycle. First, household credit growth, but not non-financial firm credit growth, is *contemporaneously* associated with "consumption booms, an increase in the consumption to GDP ratio and a deterioration in the trade balance with the consumption share of import goods rising significantly (columns 1 through 3).

This is suggestive of a household credit-driven local demand boom. As discussed in Mian et al. (2017a), we can explicitly test for whether credit pushes local aggregate demand by testing if it disproportionately expands non-tradable relative to tradable sector - both in terms of the relatize size of the non-tradable sector and also in terms of relative price of non-tradable to tradable sector. This hypothesis is confirmed by columns 4 and 5. There is expansion in non-tradable sector to tradable sector employment (column 4) and increase in non-tradable to tradable sector prices (column 5) when household credit expands. No such relationship holds for non-financial firm credit that is more likely to operate on the supply-side of the economy. Column 6 summarizes the key

result I already highlighted in the VAR plot: growth in household credit predicts subsequent GDP slowdown, whereas non-financial firm debt does not. Notice again the asymmetry between the effects of household credit and non-financial firm credit throughout table 1.

The results in table 1 are based on a paper we wrote in 2015 and published in the QJE in 2017. Since then, and just this month in fact, IMF has released a new global debt database that covers an additional 105 countries with a breakdown of private credit into household credit and non-financial firm credit. So we have done a literal out of sample test for the Nobel symposium in column 7 of the core finding of Mian et al. (2017b). The results are essentially identical. As an example of a recent country that experienced a credit-driven household demand channel boom-bust, interested readers may look at the case of Brazil.

Figure 3 shows the non-parametric relationship between change in household debt to GDP between year (t-4) and (t-1) and change in real GDP between t and (t+3). The non-parametric relationship in the original 30-country sample of Mian et al. (2017b) is shown in blue, while the new out-of-sample relationship is shown in red. The figure once again illustrates how similar the out of sample result is. Figure 3 is also a more generalized version of the striking empirical regularity that I highlighted in figure 1 for the Great Recession.

Another noteworthy feature of figure 3 is that the relationship is non-linear: reduction in household debt to GDP does not predict an increase in GDP growth. This non-linearity is consistent with macroeconomic theory where frictions such as ZLB or downward wage rigidity only bind in one direction.

Evidence From A Natural Experiment During the 1980's

I will next present evidence from a natural experiment that produces a well-known plausibly exogenous variation in credit supply expansion across U.S. states during the 1980s: the staggered wave of banking deregulation across states. The left panel of figure 4 shows the first stage from Mian et al. (2017a). States that deregulated earlier - for reasons unrelated to expected GDP trend - experience a much larger expansion in bank credit. The increase in bank credit also resulted in a much larger increase in household credit in early deregulating states. The right panel shows that the credit supply expansion results in a, now familiar, boom-bust cycle. Early deregulating states that see a faster expansion in credit, also experience a sharper decline in unemployment, but only

to be followed by a stronger subsequent recession.

Figure 5 shows that the credit-induced boom during the 1980s was driven by an expansion in household demand. States more exposed to deregulation experienced a stronger expansion in non-tradable employment, but no relative expansion in tradable employment, between 1982 and 1989. Similarly, the price of non-tradable goods increased in states that were more exposed to banking deregulation, but no such relationship exists for tradable sector prices (Figure 6). The combined increase in non-tradable to tradable sector employment and non-tradable to tradable sector prices suggests an expansion in local household demand driven by the increase in credit supply.

Figure 7 should look very familiar to the audience by now. It has the same empirical regularity that we saw for the Great Recession in figure 1. States with a larger expansion in household leverage from 1982 to 1989 experience a much more severe subsequent recession. Moreover, this time the source of credit expansion is plausibly exogenous as it is driven by the staggered wave of banking deregulation across U.S. states.

U.S. Evidence From The 2000's

Evidence from the U.S. Great Recession episode is also quite supportive of the credit-driven household demand channel. A number of authors have argued, some using very detail micro-empirical evidence, that there was a large expansion in the supply of credit in the U.S.[1]. At the macro level the expansion in credit supply can be seen from the fact that credit spreads in the U.S. declined significantly prior to 2007, even as the quantity of all types of risky credit expanded aggressively.

The expansion in credit again lead to an increase in household demand. This has been shown by Di Maggio and Kermani (2017) who report that the non-tradable sector expanded relative to tradable sector during the credit boom. However, ultimately rising household credit creates a predictable collapse as we saw before. The severity of the household credit-driven collapse is driven by Irving Fisher's famous "debt deflation hypothesis". There is an initial fall in demand, that leads to a fall in employment and ignites a large fire-sale of houses. This feeds back to further reduction in demand, thus amplifying the initial negative shock

[1]See e.g. Adelino et al. (2014); Demyanyk and Van Hemert (2011); Favara and Imbs (2015); Justiniano et al. (2015, 2017); Keys et al. (2010); Levitin and Wachter (2012); Mian and Sufi (2009, 2017)

Figure 8 from Mian et al. (2013) shows the fall in spending, or local demand, against the fall in household net worth at the county level between 2006 and 2009. Counties where households had levered up more experienced a larger decline in net worth both because of the direct leverage effect and because house prices fell more in these areas due to foreclosure fire sales. Counties experiencing a larger reduction in household net worth experience a sharp contraction in local aggregate demand.

Figure 9 from Mian and Sufi (2014b) shows that the fall in local demand directly translates into a loss in local employment. There is a stronger decline in non-tradable employment between 2007 and 2009 in counties with a stronger decline in household net worth. The focus on nontradable employment is useful here since by definition nontradable employment must rely on local demand for revenue. As such this strong positive relationship between change in nontradable employment and change in household net worth reflects the direct impact and a 'macro spillover' of the drop in local demand on employment.

It is interesting to contrast this result with a similar analysis using tradable employment. Unlike for nontradable employment, there is no relationship between the local change in tradable employment and household net worth. This makes sense since tradable employment does not depend exclusively on local demand for generating sales. The asymmetry in result between nontradable and tradable employment further strengthens the interpretation that it is indeed local demand shocks that are causing the change in local employment. Moreover the tradable employment is also being affected by the demand shocks it is just that since those shocks are aggregate in nature – they shift tradable employment downwards for all counties proportionately. A number of papers have confirmed these effects in other contexts and using alternative empirical strategies[2].

Macro Theory Implications Of The Credit-Driven Household Demand Channel

I have discussed a broad range of empirical evidence that describes the importance of the credit driven household demand channel in practice, not only in the most recent 2008 global recession, but even prior to that. I am next going to discuss the theoretical and policy implications of this evidence.

A natural theoretical implication of empirical evidence on the importance of household credit

[2]See e.g. Andersen et al. (2014); Bahadir and Gumus (2016); Bunn and Rostom (2015); Drehmann et al. (2017); Giroud and Mueller (2017); Glick and Lansing (2010); IMF (2012, 2017); Di Maggio and Kermani (2017); Martin and Philippon (2014); Mian and Sufi (2010); Mian et al. (2017a,b); Verner and Gyongyosi (2017)

for macro aggregates is that heterogeneity matters, and in particular heterogeneity in the behavior of borrower versus creditor households. For example, as right panel of figure 10 from Mian et al. (2013) shows, marginal propensity to spend in response to a dollar decline in housing wealth is much stronger for levered households than unlevered households. Similarly, the left panel of figure 10 from Mian and Sufi (2011) shows that during the boom phase, marginal propensity to borrow for a dollar increase in home value was much stronger for low credit score individuals than high credit score individuals. It is thus no longer sufficient to model aggregate dynamics using a representative household economy. The empirical evidence suggests that macro aggregates fundamentally depend on the covariance of shocks with the underlying household heterogeneity. Thus if a negative shock falls disproportionately on levered households that have the highest marginal propensity to respond then the net effect on the overall economy would be much stronger.

A number of recent papers in macroeconomic theory have emphasized such heterogeneity and how it interacts with macro frictions such as zero lower bound constraint or downward nominal wage rigidity [3]. The work has also highlighted the presence of an aggregate demand externality, or a pecuniary externality such that ex ante individual households will tend to over borrow from a macro perspective. Individuals fail to fully internalize the negative future macroeconomic consequences of their collective borrowing decisions leading to over-borrowing that may require macro-prudential interventions.

The newer class of models rationalize why expansion in credit supply for the household sector leads to a boom bust pattern. However, there is one potential problem. These models are based on rational expectation and common belief assumptions. Thus the models suggest that market participants should also predict the slowdown that follows a household credit boom. However when we look at the data, there is no evidence that the market or households correctly predict a subsequent slowdown during the boom. Infact, as figure 11 from Mian et al. (2017b) shows there is evidence to the contrary. Growth in household credit predicts GDP forecasting errors by the IMF and other professional forecastors. Models with heterogeneous beliefs or behavioral biases can help address this issue, suggesting that these forces are also important to fully understand the relationship between credit expansion and business cycles[4].

[3] See e.g. Eggertsson and Krugman (2012); Farhi and Werning (2015); Guerrieri and Lorenzoni (2017); Huo and Ríos-Rull (2016); Korinek and Simsek (2016); Lorenzoni (2008); Schmitt-Grohé and Uribe (2016)

[4] see e.g. Baron and Xiong (2016); Bordalo et al. (2017); Burnside et al. (2017); Geanakoplos (2010); Gennaioli et al.

So far I have focused on the credit driven household demand channel at the business cycle frequency. However there is also a longer-term "super cycle in the background, driven by a persistent expansion in credit as shown by the work of Jordà et al. (2016). Moreover, the super cycle is largely driven by the growth in household credit, and has been accompanied by a strong decline in long-term real interest rate. The latter fact suggests that the long term trends are driven by an expansion in credit supply forces.

What might be the drivers of the increase in credit supply? And what are its longer term economic consequences? The rise in global credit coincides with the rise in global inequality, particularly the top 1% versus the rest, and the appearance of a global savings glut. Since top incomes save at a very high rate, channeling these savings into the financial sector is naturally going to increase credit which can only be sustained at continually declining interest rates[5]. Indeed we find in ongoing work, see figure 12, that the rise in household credit is concentrated in the bottom 99% and not the 1%, while income gains since 1980's have largely gone to the top 1%. How long can this process continue without leading to liquidity trap-like situations and lower growth is an important open question facing us today.

Policy Implications Of The Credit-Driven Household Demand Channel

The credit driven household demand channel has important implications for public policy. I will particularly focus on implications for crisis response, monetary policy and macro prudential policy.

Policy response to the 2008 crisis centered on interventions to promote provision of market liquidity and public support for bank capital injections. However, a recession that is the result of the credit-driven household demand channel requires that attention should be paid to repair and restructure household balance sheets as well.

Our main criticism of the administration's response to the 2008 crisis is that not sufficient attention was paid to restructure loans for under-water and distressed homeowners. Similarly, efforts should have been made to reduce the more than four million foreclosed homes that ended up worsening the downturn considerably Mian et al. (2015).

(2012); Kindleberger (1978); Kindelberger and Aliber (2005); Krishnamurthy and Muir (2016); López-Salido et al. (2017); Mian and Sufi (2018a); Minsky (2008); Nathanson and Zwick (2017)

[5]see e.g. Favilukis et al. (2012); Jordà et al. (2016); Kumhof et al. (2015)

Looking forward, there is a need to design better regulatory and financial framework that promotes risk-sharing between creditors and debtors. We discuss this with relation to state-contingent contracting in Mian and Sufi (2014a). As we discuss, moving in this direction requires institutional changes, such as eliminating the favorable treatment of debt and re-designing bank capital regulation.

The credit driven household demand channel is also one of the most powerful channels through which monetary policy impacts the real economy. In normal times, expansionary monetary policy lowers rates and increases house prices, enabling high MPC constrained households to boost spending, thus raising aggregate demand. A tightening cycle can work in reverse, making monetary policy impotent as high MPC households fail to respond to monetary easing due to hightened risk-aversion and borrowing constraints. For example, Di Maggio et al. (2017) show that lower interest rates post-2008 were not passed-through to many constrained households who were unable to refinance, thus putting a real drag on aggregate demand[6]. The failure of traditional monetary policy tools to find traction in boosting aggregate demand means that alternative approaches need to be considered.

Finally, a natural policy implication of credit-driven household demand channel is that ex-ante macro-prudential policies that constrain household credit growth are useful. A number of countries, most notably the U.K., have gone in this direction since 2008, putting limits on household credit growth based on a combination of loan to value and debt to income constraints.

[6]For broader evidence on household demand channel constraining the efficacy of monetary policy, see Agarwal et al. (2017, 2018); Aladangady (2014); Baker (2018); Cloyne et al. (2017); Ganong and Noel (2017a,b); Jordà et al. (2014); Liu et al. (2018); Mian and Sufi (2018b, Forthcoming)

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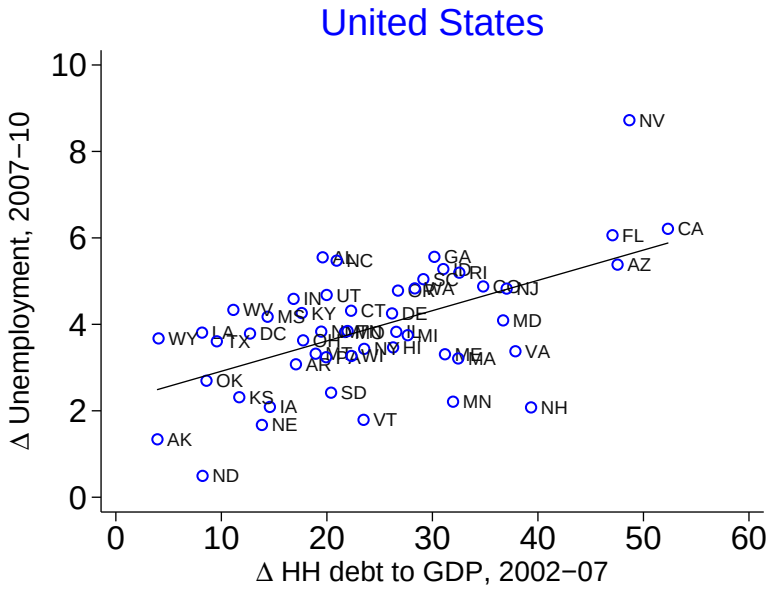
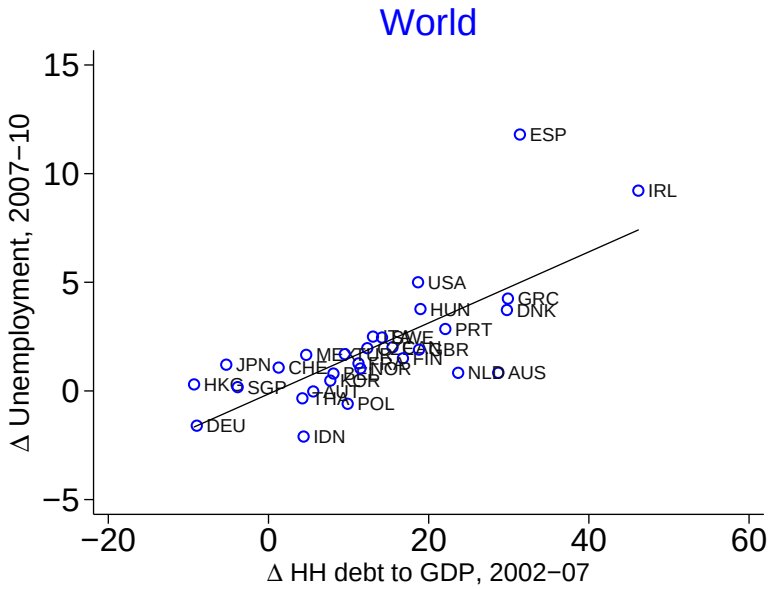
Figure 1: Introduction

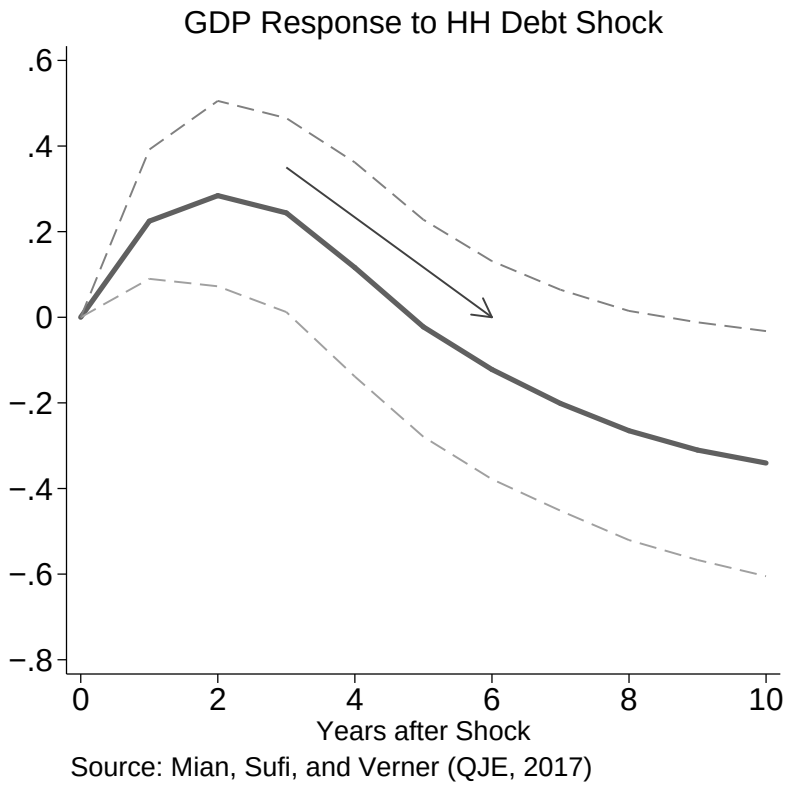


Source: Mian and Sufi (IMF, 2010).



Source: Mian, Sufi, and Verner (QJE, 2017).

Figure 2: Effect of credit shock on GDP



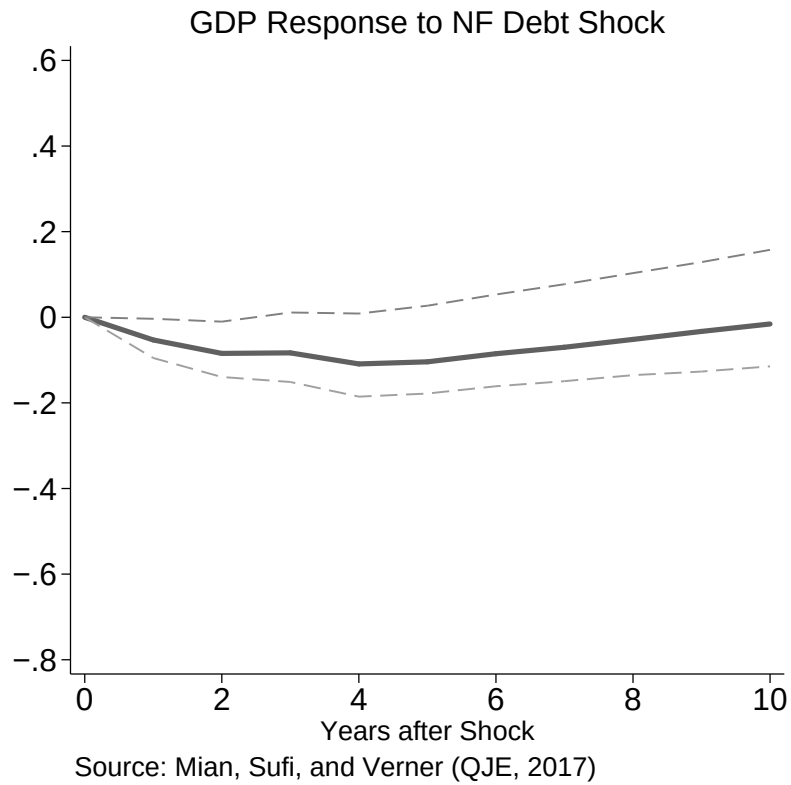
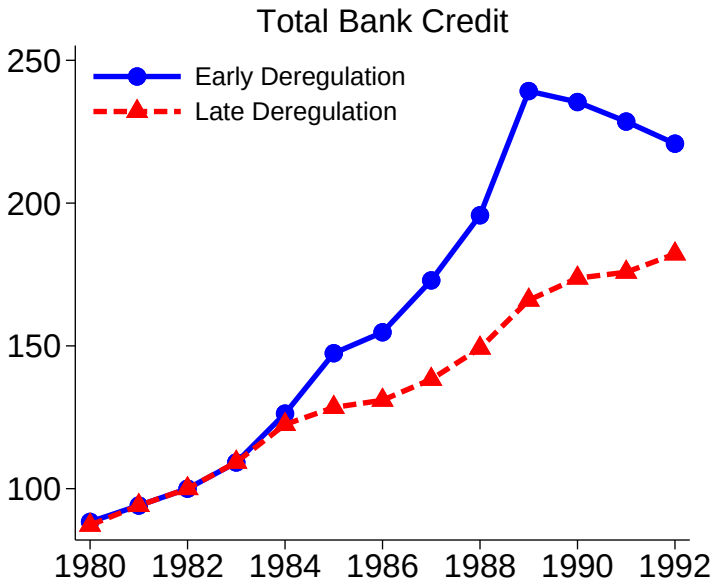


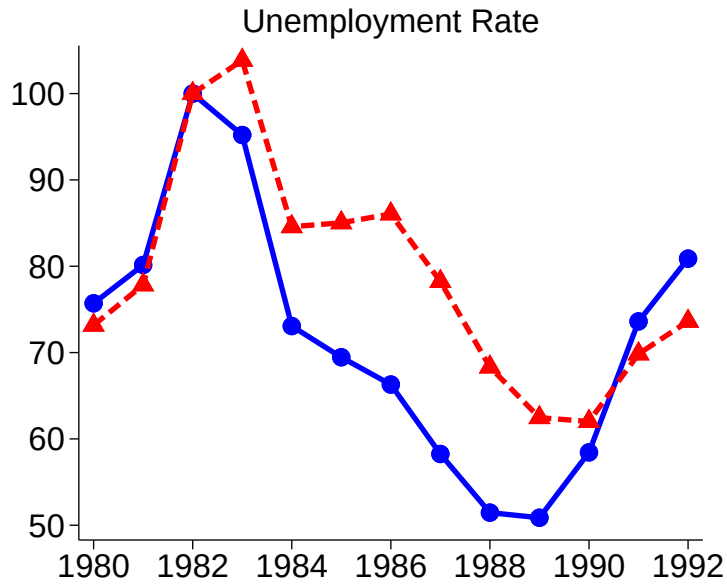
Figure 3: Increase in household debt to GDP predicts GDP slowdown

Source: Mian, Sufi, and Verner (QJE, 2017).

Figure 4: Deregulation Experiment in the 1980s

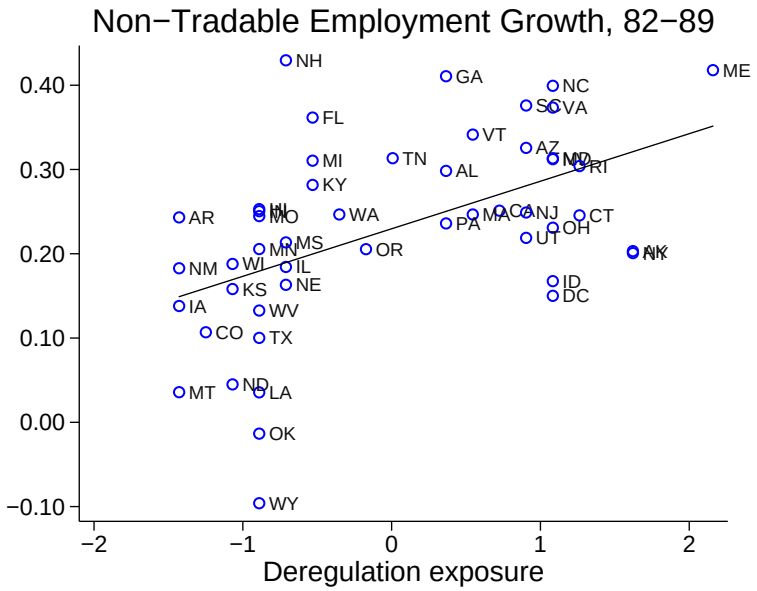


Source: Mian, Sufi, and Verner (WP, 2018).

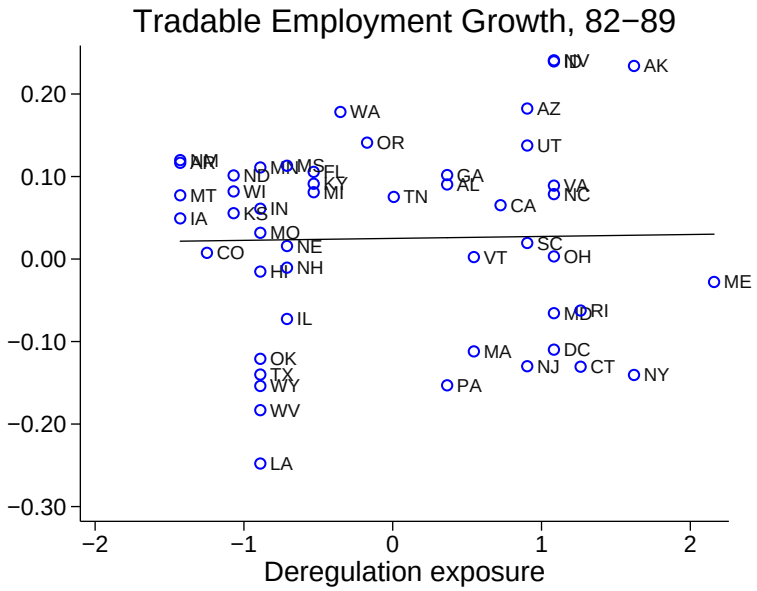


Source: Mian, Sufi, and Verner (WP, 2018).

Figure 5: Non-tradable vs Tradable Employment in the 1980s

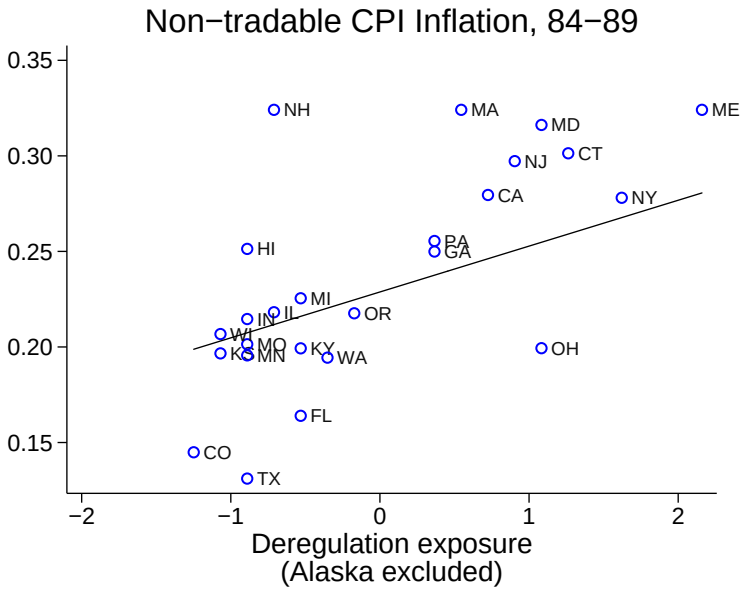


Source: Mian, Sufi, and Verner (WP, 2018).

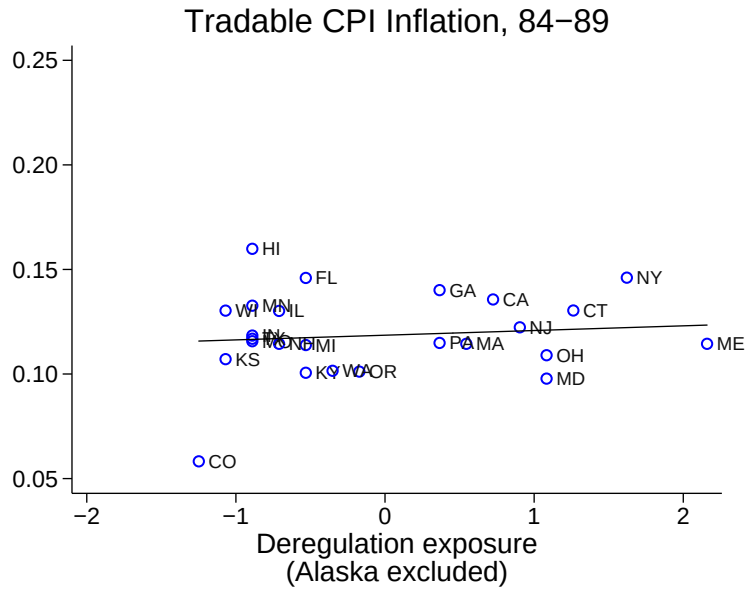


Source: Mian, Sufi, and Verner (WP, 2018).

Figure 6: Non-Tradable vs. Tradable Price in the 1980s

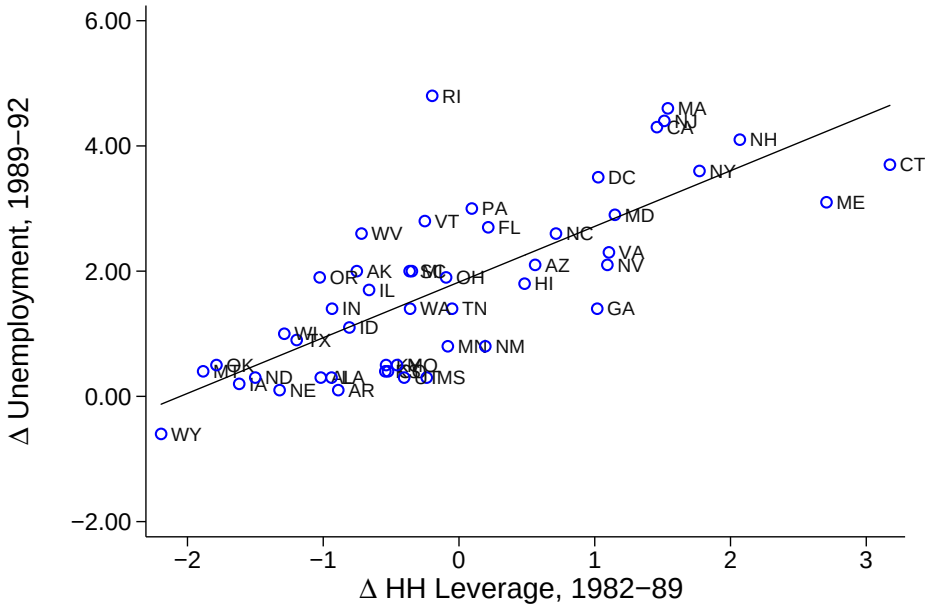


Source: Mian, Sufi, and Verner (WP, 2018).



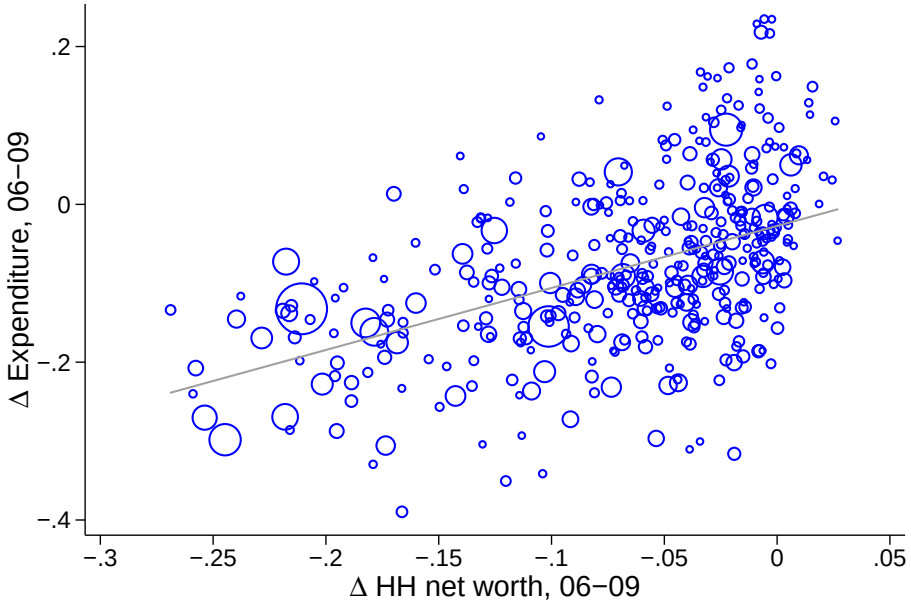
Source: Mian, Sufi, and Verner (WP, 2018).

Figure 7: Increase in household leverage predicts 1990/91 recession



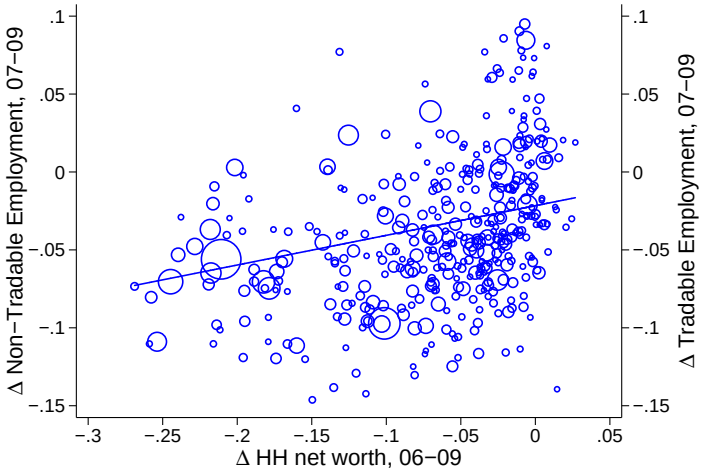
Source: Mian, Sufi, and Verner (WP, 2018).

Figure 8: Fall in demand during the great recession

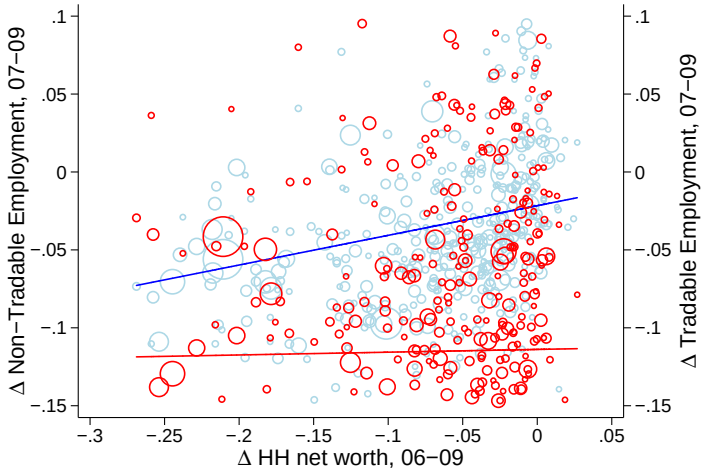


Source: Mian, Rao, and Sufi (QJE, 2013).

Figure 9: Local employment falls due to lack of demand



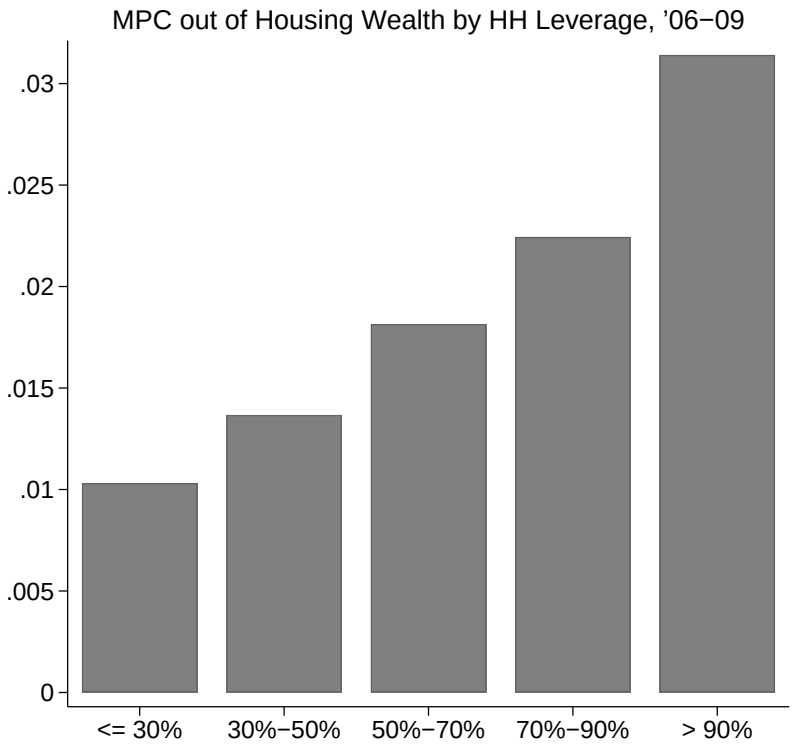
Source: Mian and Sufi (ECMA, 2014).



Source: Mian and Sufi (ECMA, 2014).

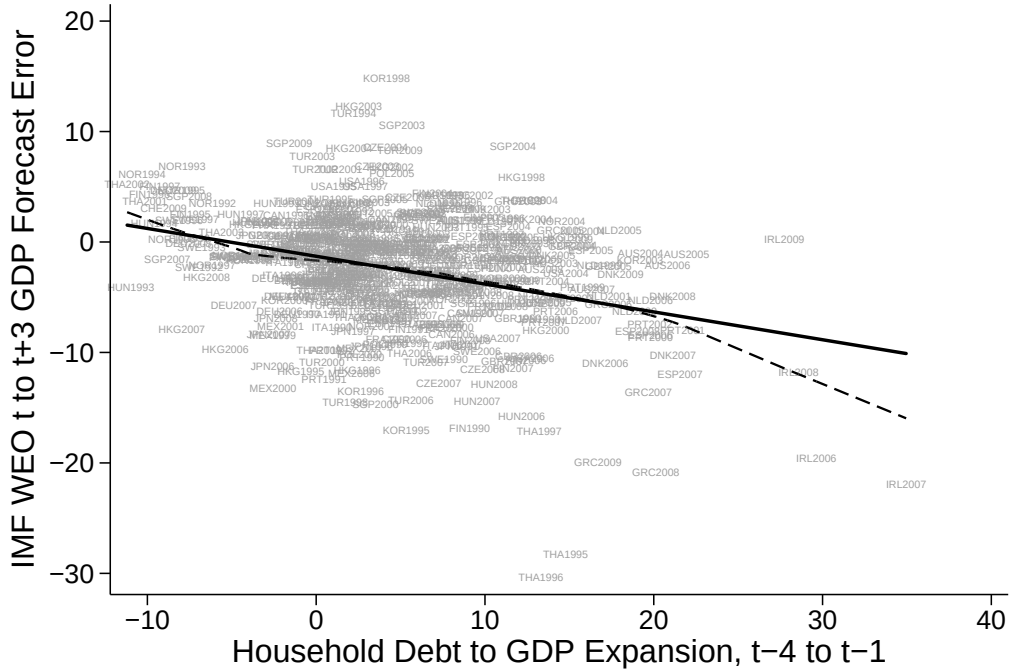
Figure 10: Heterogeneity in marginal propensity to borrow and marginal propensity to consume

Source: Mian and Sufi (AER, 2011).



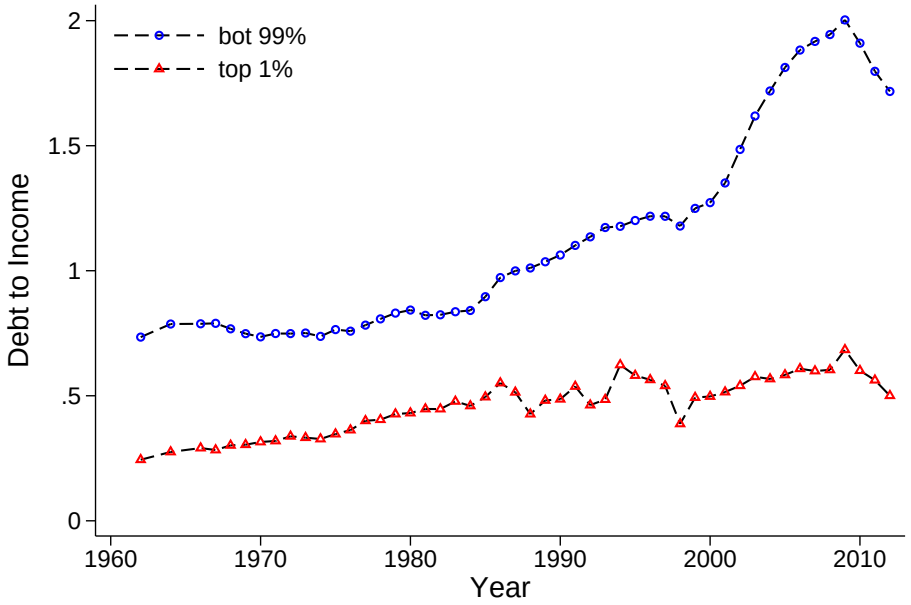
Source: Mian, Rao, and Sufi (QJE, 2013).

Figure 11: Rising household leverage predicts forecasting errors



Source: Mian, Sufi, and Verner (QJE, 2017)

Figure 12: Rising leverage concentrated in the bottom 99%



Source: Mian and Sufi (WP, 2018).

Table 1: International Evidence

	MSV2017 30 Countries, 1962-2012						IMF2018
	(1) $\Delta_3 \frac{C_{it}}{Y_{it}}$	(2) $\Delta_3 \frac{NX_{it}}{Y_{it}}$	(3) $\Delta_3 s_{it}^{MC}$	(4) $\Delta_3 \ln\left(\frac{L_{it}^{NT}}{L_{it}^{T}}\right)$	(5) $\Delta_3 \ln\left(\frac{P_{it}^{NT}}{P_{it}^{T}}\right)$	(6) $\Delta_3 y_{i,t+4}$	(7) $\Delta_3 y_{i,t+4}$
$\Delta_3 d_{it}^{HH}$	0.058*	-0.15**	0.055*	0.36**	0.38**	-0.34**	-0.37*
	(0.024)	(0.051)	(0.025)	(0.056)	(0.097)	(0.089)	(0.17)
$\Delta_3 d_{it}^{F}$	0.038**	-0.00036	-0.012	0.0085	-0.065	-0.032	-0.019**
	(0.012)	(0.031)	(0.021)	(0.064)	(0.059)	(0.038)	(0.0072)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓
R^2	0.087	0.062	0.012	0.17	0.067	0.11	0.056
Observations	816	832	858	639	670	840	964

Standard errors in parentheses

Source: Mian, Sufi, and Verner (QJE, 2017).

$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$