

The Macroeconomic Risk Chair organized a workshop on December 15, 2022, entitled: “**Housing and the Economy**”. Four specialists on the subject shared their presentations: Pedro Gete (IE University), Carlos Garriga (Federal Reserve Bank of St. Louis), Wenli Li (Federal Reserve Bank of Philadelphia) and Sonia Gilbukh (CUNY Baruch College).

Furthermore, on April 20, 2023, the chair awarded **the 2022 Junior Research Prize** to **Ian Dew-Becker** (Northwestern University) for his paper entitled “Tail Risk in Production Networks”.

This newsletter includes an interview of Ian Dew-Becker, an abstract of his awarded research paper and a brief description of the research presented at the workshop. [+](#)



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Macroeconomic risk

2022 Junior Research Prize: Ian Dew-Becker

On April 20, 2023, the Junior Research Prize 2022 was awarded to **Ian Dew-Becker** (Northwestern University) for his work entitled “Tail Risk in Production Networks” during a conference organised online. We had the opportunity to interview him about his award winning paper and his research path.

Tail Risk in Production Networks

Ian Dew-Becker (Northwestern University), **Tail Risk in Production Networks**.
Macroeconomic Risk Chair Working Paper n°2023-10, July 2023. [+](#)

Recent worldwide supply chain disruptions highlighted how sector-specific shocks may propagate to the whole economy. However, all sectors are not alike, and some sectors matter substantially to assess the exposure of an economy to negative large shocks. What determines a sector’s systemic importance? Is sales share a good indicator? Or is it rather the amount of downstream linkages? To what extent does the production structure of the economy affect the economy’s exposure to large shocks?

To answer those questions, Ian Dew-Becker develops a model of nonlinear production network with tail risks (*Figure 1*). **The model gives an asymptotic approximation of GDP to grasp its first-order behavior when large shocks occur.** Shocks’ propagation works through the structure of production and depends on how substitutable an input is. As such, the amount of linkages between sectors (interconnectedness hereafter) is key to transmission of large shocks, not how strong links between sectors are, nor the size of sectors. Interconnectedness increases tail risk under complementarity

**Shocks’
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as it makes it harder to substitute away from a specific input. In contrast, interconnectedness under substitutability decreases tail risk as it makes it easier to substitute away from a specific input. Therefore, more inputs in production can imply more or less fragile supply chain as it can diversify options for production but also create a new need for production. In other words, an increase in interconnectedness can diversify the economy, making it less sensitive to small shocks, while at the same time increasing the probability of an extreme negative realization of GDP. **A measure of a sector’s systemic risk becomes its fraction of GDP that is downstream and cannot substitute away.**

The discovery of a new input can both increase output and the economy’s exposure to large shocks. Indeed, if the new input is used in many other sectors’ production and no proper substitutes exist, a large shock to that new input will propagate more easily. Hence, tail centralities, i.e. how large shocks to some

sectors affect GDP, increase when the economy is more connected. It is possible for the economy to diversify while tail risk stays large, simply because in this economy a large negative shock to any single sector has the power to significantly impact GDP. Tail centrality is thus independent of diversification.

Empirically, top sectors in terms of tail centrality in the U.S. are all universal inputs. The first is electricity, which explains why it has appeared frequently as an example. The second most important sector for tail centrality is trucking services. Indeed, all of final production involves trucking. The third is legal services. Again, this is simply because every sector purchases legal services. Similarly, credit intermediation also appears as one of the top sectors in terms of tail centrality. Interestingly, sectors with the largest tail centralities have the greatest potential to cause large cross-country income differences.

To summarize, this paper identifies:
1/ the structure of the production network
2/ the substitution away from inputs in production as being factors to determine global systemically important sectors. As such, it helps formalizing intuitions behind what policy makers perceive as essential sectors and quantifying the effects of policies such as shutdowns.

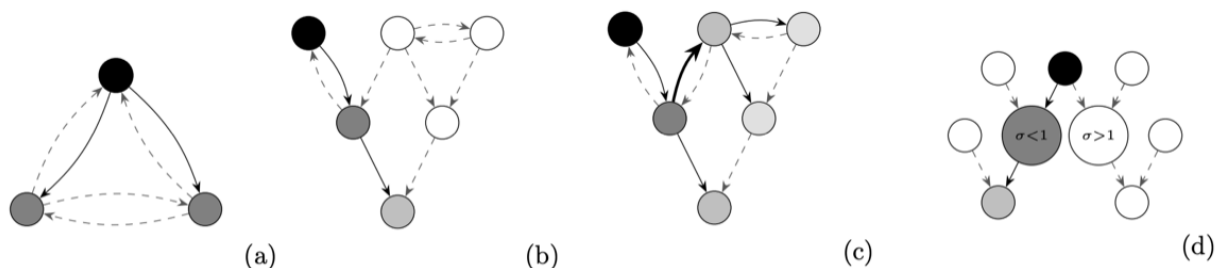


Figure 1: Network examples

Notes: The nodes represent sectors and arrows flows of goods. The black and gray nodes and black arrows represent a hypothetical tail network following a shock to the solid black sector (with the shading becoming lighter with distance). All sectors use their own output as an input. For panels (a)-(c), all elasticities are assumed to be less than 1. For panel (d), the two center nodes have elasticities as noted, and the others again have $\sigma < 1$. White nodes are asymptotically unaffected by the shock.

Interview: Ian Dew-Becker

ABOUT THE AWARDED PAPER:

Can you tell us more about the genesis of this paper? In particular, how did you come up with the idea of the paper?

I was working with some colleagues trying to understand the behavior of production networks when there can be nonlinear responses to shocks. I was looking at simulations of a simple model and noticed that they had a surprising property where when the shocks were large, the responses became much simpler. It turned out that it wasn't too difficult to work out the responses mathematically. The core theorem came out of some simulations and math work in a couple hours in a coffee shop the day after Christmas. The remainder of the time spent on the paper was about tracing out its implications for risk.

You've told us during the presentation that you just revised the paper for *Econometrica*. In which direction did the paper go? More generally, how has the paper evolved over time?

Over time the paper has evolved to focus a bit more on just the properties of the tail approximation and its implications for the systemic risk of different sectors. It is now conditionally accepted at *Econometrica*, and the main request from the referees remains to be to give more explanation of the main result. Earlier versions of the paper had much more analysis of the probability distribution of GDP, using methods from extreme value theory (which are also common in the insurance literature, actually). Those results may eventually end up in a different paper.

Your paper underlines the importance of the structure of the production network - in particular, linkages across industries and the very existence (or not) of inputs' substitutes. But industries' interlinkages change over time. Could you use your framework to also analyze the impact of policies on the network structure itself? Or to inform us about the evolution of tail risk along a transition such as switching from brown to green sectors?

Absolutely, that's one of the directions that I'd like to take the work. The paper as it stands makes the point that the structure of the network, in terms of the importance of different linkages, is endogenous. It also

gives some comparative statics for the result of changes in linkages. An interesting question, though, is what endogenous link formation would look like and how it would affect tail risk. Maybe there are externalities, for example. A transition from brown to green sectors would also certainly have implications in this setting, for example if the number of green suppliers is small initially.

As you mentioned during the presentation, before a shock hit the semiconductor industry, policy makers were not aware of its systemic importance. Can your framework help policy makers to identify sectors at risk when large shocks hit the economy? If yes, what kind of policies would be relevant to deal with those systemically important sectors? Could we think of tools based on what has been done in micro and macro prudential policy?

Thinking ahead about what makes a sector risky is absolutely one of the core contributions of the paper. One of the lessons of the analysis is that trouble arises especially when goods have no substitutes. So it highlights the importance of diversifying supply chains, for example. It also says that once a shock happens, what is important is encouraging flexibility in the economy to switch to a different set of suppliers or inputs.

ABOUT THE REST OF YOUR RESEARCH: Your research lies at the intersection of finance and economics. How does your knowledge of finance affect how you do research in economics? What can economists learn from research in finance in terms of methods and/or data?

Finance is at the end of the day just a sub-field of economics, using really all the same methods. Finance has developed some useful tools for interpreting asset prices, especially for thinking about what they tell us about

expectations. Those results have been used in economics more broadly, but probably not as much as they could be. Some of my other work has used asset prices to measure, for example, skewness and volatility in the economy, which can help test macro models.

In your recent research, you have developed a new measure of cross-sectional uncertainty. How does this measure complement other existing measures such as the VIX, for instance? Could you explain the main differences between your cross-sectional measure and the VIX? How could both be used together to inform the banking sector, institutions and academia about how to forecast changes in macroeconomic variables?

The VIX is a measure of uncertainty about the level of the aggregate stock market.

The paper makes the point that the structure of the network, in terms of the importance of different linkages, is endogenous.





For example, the VIX might be driven by uncertainty about macroeconomic policy, macro shocks, trade shocks, etc. On the other hand, in other situations what we are interested in understanding is uncertainty at the micro level. That is, there might be high volatility in shocks that reallocate demand across firms or sectors (e.g. new technologies, or the shift from brown to green production), or that reallocate income and wealth across households.

What I've worked on with Stefano Giglio is in measuring cross-sectional uncertainty. That's useful because many models are driven by cross-sectional uncertainty, so we give a measure that can be used for calibrating or estimating those models.

ABOUT YOUR CAREER:

What were you working at the early stages of your career? Has it changed over time? If yes, why?

Throughout my career my work has stayed right on the boundary between macro and finance. I've worked on a number of different topics over time, but in general always near that border. I've wor-

ked on a few different topics – risk across frequencies, uncertainty, and networks – and they are still all things that I think about actively.

What is your research program in the coming years? Is there any topic you think the profession should give more interest to?

I expect to continue trying to understand nonlinearity in production networks. I also have some new work trying to understand the sources of risk premia in options markets. While past work, including my own, has shown that volatility is an important driver, it appears that may no longer be the case.

Going forward, I think nonlinearity, extreme events, and regime shifts could all be much better understood. We have many linear models or varying degrees

of sophistication, but one always worries about their out-of-sample power, especially for extreme states of the world. Nonlinearity, as in this paper, is one way of thinking about changes in relationships. But, more generally, we've seen a lot of things change about the world in the

past few decades, and the economy appears to be behaving differently, so we will need to have methods that can accommodate those changes.

What advice(s) would you give to our PhD students enrolled at PSE?

Your biggest choice is what to work on.

Whatever the topic is, there is probably something to be said. When thinking about a topic, it should be something that you're intrinsically interested in, since you'll spend years of your life on it, but it also needs to be something with an active community working on it.

The economy appears to be behaving differently, so we will need to have methods that can accommodate those changes.



Ian Dew-Becker earned his BA in Economics and Mathematical Methods in the Social Sciences at the Northwestern University, and his AM and PhD in Economics from the Harvard University. He is now an associate professor of finance at the Northwestern University, and affiliate at the NBER. His research covers both theoretical and empirical asset pricing and macroeconomics, focusing most recently on uncertainty, skewness, and tail risk in the economy.

Homeownership Dynamics and Housing Investors: The Crowding-out Channel

This presentation was the opening talk of the “Housing and the economy” workshop organized on December 15, 2022.

Pedro Gete (IE University), Athena Tsouderou (University of Miami) and Franco Zecchetto (ITAM), **Homeownership Dynamics and Housing Investors: the Crowding-out Channel**, Working Paper.

After the Great Financial Crisis (GFC), homeownership experienced a large decline in the United States. This trend was mainly **driven by a fall of home-ownership of young individuals aged between 25 and 44**. Meanwhile, there has been **an increase in investors’ share of total housing**. This rise appears to be driven by small investors whose purchases experienced a growth rate of more than +90% from 2006 to 2015. This fact may be explained by cheap access to housing after the GFC and higher rental yield that triggered portfolio changes. To what extent some investors - mostly older individuals - crowd out access to home-ownership for young individuals? What should policy makers do about it, if anything?

To answer those questions, P. Gete, A. Tsouderou and F. Zecchetto develop **an overlapping generation model in which agents can buy different types of assets, including real estate**. Households can either buy a house to live in it or to invest. Housing is an asset that is characterized

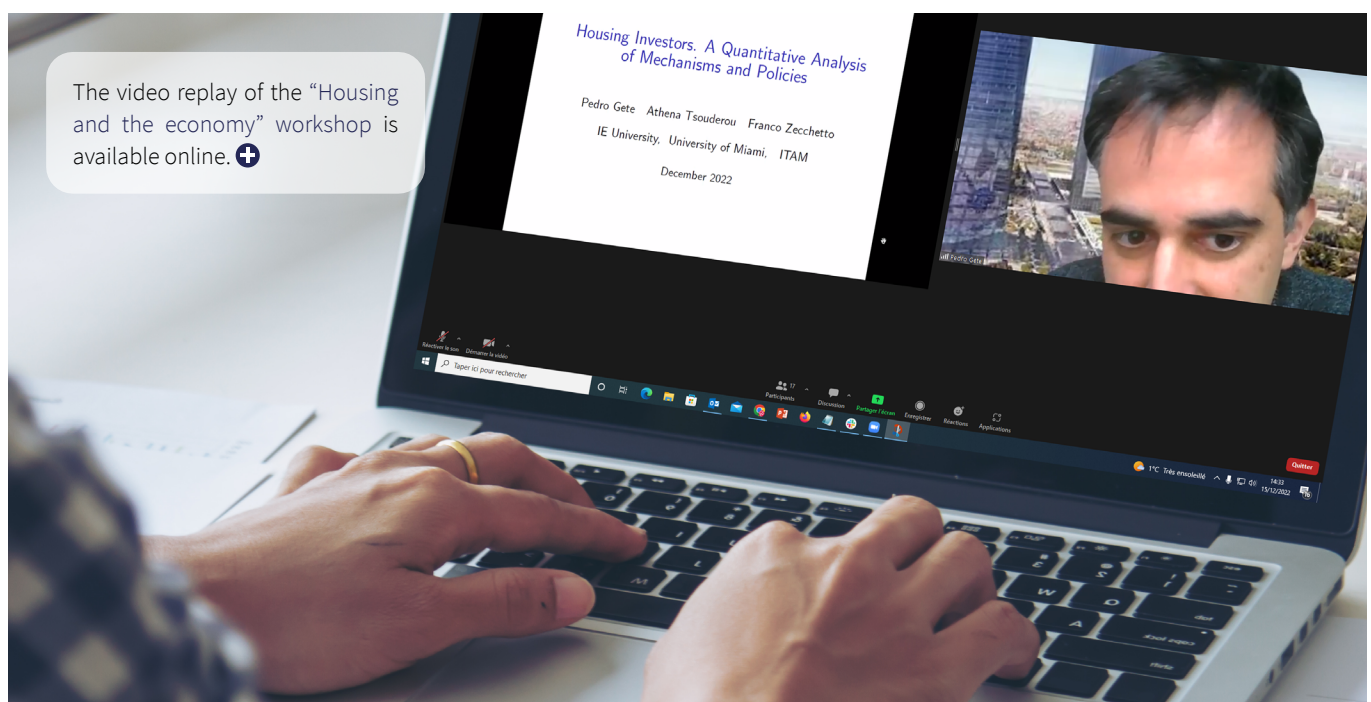
by being illiquid, that depreciates and gives the households a rental return. Households are also heterogeneous in their income and face labor income risks. Young households tend to be more financially constrained than older individuals who invest in housing through their savings. After a shock like the GFC, investors’ demand limits price fluctuations. However, their existence aggravates fluctuations in housing quantities. In other words, **the GFC made it attractive for individuals with savings to become small real estate investors**, which limits prices fluctuations as the demand for housing does not drop too much. However, **it also reduced the quantities of houses available for home-ownership** for other more financially constrained households.

In line with the model, data analysis shows that wealthy elders appear to become more and more small real estate investors in several countries (US, Spain, United Kingdom) as young homeownership declines. The value of invest-

ment properties for people aged between 65 and 74 and 75 and 95 increased by more than +200% over the period 1989-2019, while it only increased by around +38% or individuals aged between 45 and 54 in the US. In Spain, home-ownership of young individuals fell by almost 30 percentage points (pp) from 2005 to 2017, while the share of households with more than one property increased by around 31 pp for individuals aged between 70 and 79 and by roughly 25 pp for individuals aged between 60 and 69 over the same period.

Finally, the paper shows that policies aimed at discouraging real estate investors, such as rent control or through taxation, have asymmetric effects across individuals. Such policies have **large negative effects on low and middle income individuals older than 50, while only increasing marginally access to home ownership for young people**. After the implementation of rent controls, those individuals stop participating in the housing market. By contrast, individuals with high income, which invest a lot in housing, are not impacted by rental controls or higher tax on rental yield. Individuals with middle and high gross wealth tend to be negatively impacted by a rise in rental tax.

Policies aimed at discouraging real estate investors, such as rent control or through taxation, have asymmetric effects across individuals.



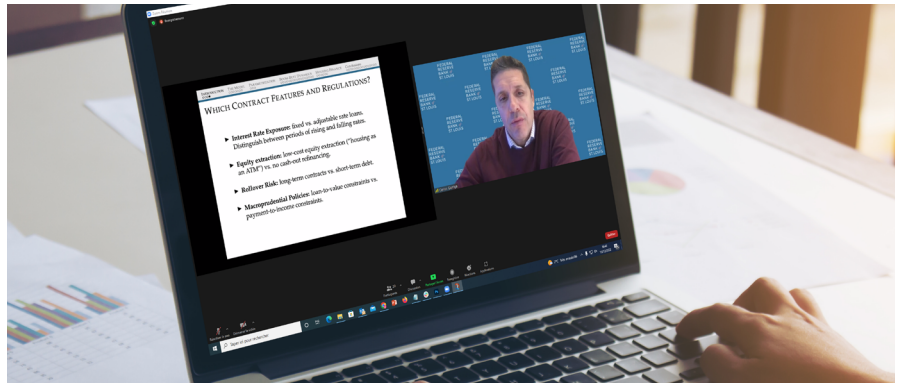
Housing Finance, Boom-bust Episodes and Macroeconomic Fragility

This presentation is part of the “Housing and the economy” workshop organized on December 15, 2022.

Carlos Garriga (Federal Reserve Bank of St. Louis) and Aaron Hedlund (Purdue University), **Housing Finance, Boom-bust Episodes and Macroeconomic Fragility**, Working Paper, December 2022. [+](#)

Advanced economies experience episodes of boom and bust of house prices. Credit expansion appears to coincide with episodes of prices boom. Indeed, low borrowing costs along with low return on safe assets redirect individuals in the housing market. Therefore, housing finance is a potential intuitive driver of house prices boom-bust episodes. It encompasses borrowing costs through mortgage rates but also institutional features that determines house purchases. Through its impact on the house prices cycle, housing finance also affects macroeconomic fragility. Hence, the role of housing finance has implications for regulation and macro prudential policies.

In order to understand the role played by housing finance, C. Garriga and A. Hedlund develop a **model with incomplete markets that takes into account mortgage contract features**, and where the housing market displays search frictions. The latter induces housing illiquidity through a trade-off between the price of the house and the delay it takes to sell it: the lower the price, the faster the house is sold. Households can also default on their long-term mortgage loan. Banks therefore price default risk in their new mortgage contracts, which leads to credit illiquidity. Debt overhang



materializes when highly leveraged home-owners are obliged to set high prices to pay off their debt, thereby resulting in long selling delays. Finally, the intensive margin in the housing market plays an important role in the model.

Credit condition, like lower interest rates, affects home-owners by changing their refinancing options.

Debt overhang materializes when highly leveraged home-owners are obliged to set high prices to pay off their debt.

Lower borrowing costs are key to generate boom in housing prices. A boom episode in housing prices, as the one preceding the GFC in the US, is generated in the model by a

combination of higher total factor productivity (TFP) and lower interest rates. Households perceive the boom to be permanent. The boom episode is characterised by a liquid housing market, low foreclosure rate and an increase in the

home-ownership rate. Credit boom also generates a shift towards larger houses. A bust is modeled as a series of unexpected temporary negative shocks on down payment, income risk and TFP. **When a negative shock occurs, illiquidity in the housing market increases.** Housing prices fall sharply as some owners try to sell as quick as possible to avoid defaulting. Foreclosure rate sharply increases while the home-ownership rate steadily decreases.

When shutting down the option for owners to refinance, the house price boom is 40% smaller in the model. This is explained by two channels. First, the value of house as an ATM decreases. Second, as consumption and housing are complementary, smaller consumption booms lead to lower demand in housing. Regarding interest rate exposure, **homeowners face higher debt servicing costs under adjusted-rate mortgages (ARM) than fixed-rate mortgages.** This translates into higher defaulting rate and a more substantial decrease in consumption. The later is very sensitive to change in interest rate for highly leveraged households under ARM. Finally, **loan-to-value (LTV) and payment-to-income (PTI) policies both reduce debt.** However, while LTV reduces macroeconomic exposure to risks, PTI actually increases exposure by limiting insurance during bust.

Overall, mortgage structure have strong distributional implications as they affect transmission of credit condition to borrowers. Macroprudential policies have an impact on macroeconomic risk as they alter debt distribution and the ability of households to insure against shocks.



Consumer Bankruptcy, Mortgage Default and Labor Supply

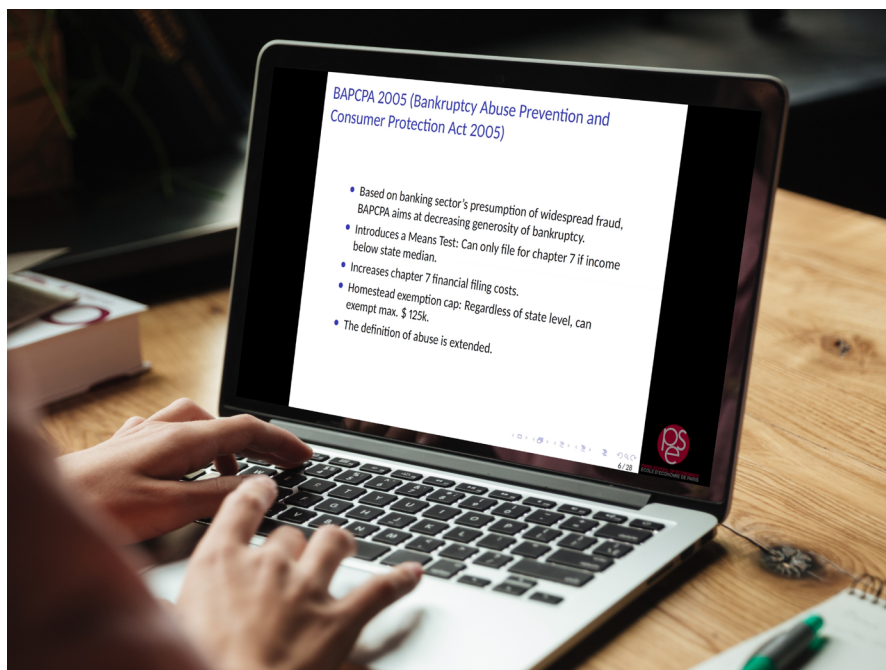
This presentation is part of the “Housing and the economy” workshop organized on December 15, 2022.

Wenli Li (Federal Reserve Bank of Philadelphia), Costas Meghir (Yale University) and Florian Oswald (Sciences Po), **Consumer Bankruptcy, Mortgage Default and Labor Supply**, NBER Working Paper, March 2022. 

Consumers face many shocks over their life-cycle, from unemployment to health shocks or sudden falls in housing prices. **The United States provide insurance against such shocks through laws on bankruptcy default (Chapter 7) and mortgage default (Chapter 13). The very existence of these laws affects consumers’ decisions and aggregate credit supply by creating moral hazard.** How consumers form decisions in the presence of bankruptcy and mortgage default laws appears therefore crucial to understand both households’ savings and labor supply. The interaction of consumer bankruptcy and mortgage default is also central to shed light on distributional consequences of policy reforms of bankruptcy regimes.

In this paper, W. Li, C. Meghir and F. Oswald document that U.S. consumers’ bankruptcy rates and mortgage defaults are affected in similar ways by consumers’ characteristics, institutional features and house prices. Both bankruptcy rates and mortgage default are negatively correlated with house prices. As house prices fall, both consumers’ bankruptcy rates and mortgage defaults increase. The less educated the individuals, the higher the consumers’ bankruptcy rates and mortgage defaults. The empirical analysis also highlights that moral hazard induced by the laws decreases credit supply. Laws provide insurance for consumers and lead to an increase in demand for credit. However, lenders react by increasing their interest rates and reducing their credit supply.

The authors then develop an overlapping generation model that captures consumers’ choices in the presence of consumers’ bankruptcy, mortgage default and different types of idiosyncratic shocks. In the model, households can either be renters or home-owners.



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Households are also heterogeneous *ex-ante* in education in order to capture how education level affects filling for Chapter 7 or Chapter 13. Households incur a cost of filling for Chapter 7 or Chapter 13 that is formalized through financial markets exclusion: punished households won’t be able to borrow for a specific time period. This formalizes the interaction between bankruptcy and mortgage default for some individuals in the model.

In the model, most individuals ending up bankruptcy filling experienced a bad income shock. Households’ asset position deteriorates before bankruptcy filling. However, consumption level remains stable thanks to the possibility to fill for Chapter 7 or Chapter 13. Chapter 7 individuals’ labor supply increases steadily before the decision to fill for Chapter 7 as they try to avoid the filling. At the time of bankruptcy filling, wage is so low that individuals decrease substantially their labor supply. The labor recovers then slowly as wage recovers.

Low income individuals will be more likely to fill under Chapter 7. For a given level of debt, a high education owner of age 26 could fill for Chapter 7, sell or stay in her house depending on her income. As debt increases, the range of income at which the individual fills for Chapter 7 increases.

The model shows that policies that aim at reducing moral hazard by limiting bankruptcy filling have asymmetric effects on *ex-ante* heterogeneous individuals. High educated households benefit from Chapter 7 filling removal as they fill for Chapter 7 much less and find it more beneficial to fill for Chapter 13. High educated households suffer when Chapter 13 is removed. Since high educated households are more likely to be homeowners and have assets, Chapter 13 protect them better. Results are the opposite for low educated individuals. Furthermore, both high and low educated individuals suffer from a reform that limits bankruptcy filling.

Overall, consumers’ bankruptcy and mortgage default laws lead to moral hazard and inefficient credit supply. **However, reforms that aim at reducing the moral hazard problem have large distributional effects across heterogeneous consumers.**

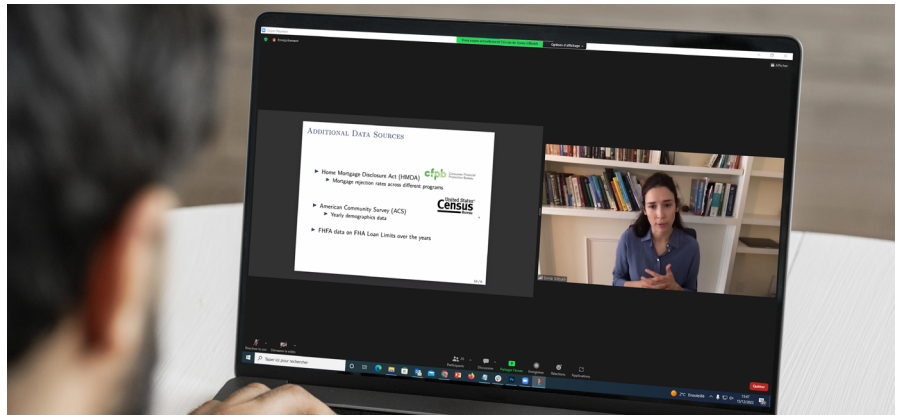
Unintended Consequences of FHA/VA Government Programs

This presentation is part of the “Housing and the economy” workshop organized on December 15, 2022.

Brent Ambrose (The Pennsylvania State University), Jim Conklin (University of Georgia), Sonia Gilbukh (CUNY Baruch College) and Luis Lopez (University of Illinois Chicago), **Unintended Consequences of FHA/VA Government Programs**, Working Paper.

The Federal Housing Administration (FHA) program is the biggest federal program in the United States whose aim is to help low-income households to access home-ownership. As it provides insurance for their mortgages, it comes with eligibility criteria for both potential FHA borrowers and sellers. The objective behind those criteria is to protect FHA borrowers from risky investment and to avoid fraudulent use of the program. However, this comes at the cost of limiting the stock of properties available to FHA borrowers. Too restrictive criteria on properties also give sellers incentives not to sell to FHA borrowers, decreasing further the stock of available houses through FHA. **To what extent do sellers exclude FHA borrowers from their pool of potential buyers to specifically avoid dealing with the criteria? How much does the housing cycle affect sellers' behavior?**

In their paper, B. Ambrose, J. Conklin, S. Gilbukh and L. Lopez use a unique dataset on sellers' preferences to address the questions. The data is built on Multiple Listing Services (MLS) that are online platforms used by real estate agents to advertise houses for clients and account for around 86% of sellers. Financing types are divided by the authors in three categories: cash only, cash or conventional financing and cash, conventional, veterans or FHA financing. Prior to the housing crisis, only half of the sellers were willing to accept a bid coming from veterans assistance or FHA. However, after 2010, the share of cash or conventional financing in sellers' preferences decreased a



lot, from around 50% to around 20% in 2014.

Longer closing delay for FHA borrowers could explain FHA borrowers' exclusion.

Average time between the “in-contract” date and the close date is around 21 days for cash financing, 33 days for conventional financing and 38 days for FHA financing. Higher mortgage rejection could also explain exclusion of FHA borrowers. In 2020, average mortgage rejection rate was around 13% for FHA borrowers, while it was around 7.5% for conventional borrowers in Harris county (Texas). A decrease in bargaining power for the seller close to the loan cut-off implied by the program could ex-

plain FHA borrowers' exclusion. Indeed, as the price of the property gets closer to the loan limit, sellers' preferences exclude more and more FHA borrowers. Finally, real estate agents and location ap-

pear to matter a lot in explaining whether sellers will exclude FHA borrowers or not.

Too restrictive criteria on properties also give sellers incentives not to sell to FHA borrowers, decreasing further the stock of available houses through FHA.

Overall, FHA borrowers appear to be excluded from a large part of the housing market. Sellers seem more reluctant to sell their house to FHA borrowers when other sources of financing are available or when the price of their property is near the FHA loan cut off. Real

estate agents seem to play a substantial role in sellers' decision to exclude FHA borrowers or not.





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Publication:

July 2023

Layout:

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