Research Proposal: **'Credit Growth and the Financial Crisis: A New Narrative.'**

The evolution of household borrowing and default has been at the forefront of discussion in academic and policy circles since the Great Recession. A broadly accepted narrative about the 2007-09 financial crisis, based on the findings in Mian and Sufi (2009) and Mian and Sufi (2015), suggests that most of the growth in credit during the 2001-2006 boom, and defaults during the 2007-2009 crisis, were concentrated in the subprime segment. The expansion of subprime credit is then viewed as a leading cause for the crisis, having lead to a rise in insolvencies and foreclosures, which caused a contraction of credit supply and a decline in house prices that also affected otherwise solvent households (see Mian and Sufi (2011), Mian and Sufi (2010), Mian, Sufi, and Trebbi (2011) and Mian, Rao, and Sufi (2013)).

In this project, joint with Stefania Albanesi, Giacomo DeGiorgi and Matthew Ploenzke, we study the evolution of household borrowing and delinquency between 1999 and 2013, leading up and following the Great Recession. Our analysis is based on the Federal Reserve Bank of New York Consumer Credit Panel/Equifax data, which gives a complete picture of the liability side of individual balance sheets for 1% representative sample of the US population. We examine the evolution of borrowing and defaults for a variety of debt categories, as well as evaluate the role of housing collateral in driving the decline in household borrowing post-2008.

Evolution of debt and delinquency. To identify individuals of varying creditworthiness, we assign individuals in each quarter to a credit score quartile based on their 8 quarter lagged credit score. This avoids joint endogeneity of the credit score and borrowing and delinquency behavior, but ensures that the ranking reflects a relatively contemporaneous measure of creditworthiness to capture the market perception of the ability of the individual to repay debt at the time of borrowing. We find that credit growth between 2001 and 2007 grew by 110% and 90% in the top two credit quartiles, while only by about 50% in the bottom quartile This challenges the large role of subprime credit growth in the run-up to the crisis.

These findings are at odds with the ones in Mian and Sufi (2009) and Mian and Sufi (2015), which identify subprime individuals based on their credit score in 1996 and 1997, respectively. Using 1999 to allocate individuals to credit score quartiles, we reproduce these results. Specifically, we find that the aggregate debt balances in the 1st credit score quartile according to that measure grow by 160% between 2001 and 2007, compared to less than 100% for all other quartiles. However, we find that results based on the 1999 ranking are mostly driven by life cycle demand for borrowing, and life cycle evolution of credit scores. The reason is that in the data, credit score is highly correlated with age and hence the lowest credit score quartile consists of predominantly young individuals.

In order to quantify the effects of age, we compute the counterfactual credit growth for each 1999 credit score bin, assigning to each individual of a given age group *in 1999* the behavior of that age group in subsequent quarters. As a result, we get a time series for credit growth assuming that the age composition of the 1999 credit bins remains constant, hence removing life cycle effects. Controlling for aging of the individuals sorted according to the 1999 ranking covers from 50% to 100% of the discrepancy between the results based on the 8 quarter lagged ranking and the 1999 ranking, significantly lowering the contribution of quartile 1 of credit score distribution and raising the contribution of quartile 4 of the credit score distribution.

The arguments sketched above for aggregate debt also hold separately for auto, credit card and mortgage debt. We also find that the rise in defaults during the financial crisis is concentrated in the middle and upper quartiles of the credit score distribution. While low credit score individuals have on average higher default rates than individuals with higher credit scores, during the financial crisis the fraction of defaults attributable to the lowest quartile of the credit score distribution drops from 40% to

30% for severe delinquencies, and from 70% to 35% for foreclosures.

The most related paper to the above results is Adelino, Schoar, and Severino (2015) who show that for mortgages, most of the growth in balances during the boom and the new defaults during the financial crisis are concentrated in the middle of the income distribution. Our analysis confirms those findings, but also expands the analysis in substantial ways. First, we analyze the boom-bust cycle for all debt categories. Second, we are the first to point out that the prior studies mis-assign credit growth to sub-prime because of age effects. Third, we analyze the rise in all types of delinquencies based on recent credit scores, and document the contribution of credit bins to these delinquencies.

Housing Collateral Channel. The results above challenge the role of sub-prime housing boom in the subsequent credit bust and rise in delinquency. Motivated by that, we further explore their broader implications, focusing particularly on the role of the housing equity collateral channel, which is seen as a key driver for the onset and propagation of the financial crisis. There is a large literature on the role of collateral constraints, through housing equity, in the financial crisis (Guerrieri and Lorenzoni (2011), Kehoe, Midrigan, and Pastorino (2014), Hurst and Stafford (2004), Mian and Sufi (2014), Iacoviello (2004)). According to this view, the value of housing collateral, by affecting household's ability to borrow, is a key determinant of consumption and its response to fluctuations in income. We evaluate this mechanism by evaluating the role of home equity based borrowing between 2001 and 2013.

We show that while real estate debt (mostly mortgages) was a main driver in the credit boom (up to 2008), it played a much smaller role in the financial crisis and the credit contraction. We find that, from 2008 to 2011, non-real estate debt contracted by 17%, while real estate debt by only 9%. Moreover, the aggregate debt of non-homeowners contracted by 16%, while the homeowners' aggregate debt contracted by less than 6% in the same period. These findings challenge the view that the decline in housing values were a key contributor to the contraction in household debt during and in the aftermath of the 2007-09 financial crisis. They also suggest that another mechanism was at play in driving the large contraction in borrowing. Uncovering this mechanism is the subject of our planned future work.

Future and Ongoing Work. In terms of the evolution of debt and delinquency, we are planning to expand our analysis in several directions: (i) add the analysis of individual characteristics and past behavior of individuals ranked by their future 4 or 8 quarter credit growth, with and without controlling for age. This will allow us to attack directly the question about who were the high credit growth individuals, (ii) add the analysis of individuals around a new insolvency or new delinquency episode, in order to study their run-up to falling into financial distress, and also how their characteristics change over time (iii) add a regression analysis of future credit and delinquency as a function of present credit score, controlling for age characteristics and location. This would allow us to always use credit score at origination in order to rank individuals. (iv) add a ZIP code level analysis using within ZIP code measures of inequality in order to quantify the bias of using ZIP code level measures of credit score and income in drawing conclusions about the marginal borrower.

We are also planning to add analysis at the geographical (ZIP code) level in order to shed more light on the housing collateral channel. The goal of this part is to study the interaction between housing values, short-term borrowing and consumption. Since in our data, we observe homeownership and debt by type, this work can provide more evidence on the specific mechanism behind individual responses, relative to Mian, Rao, and Sufi (2013) who link ZIP-level house prices and credit use.

1 Budget and Justification

Budget Requested Total: $16200

1.1 Detailed Budget Breakdown

1. Travel to the Society for Economic Dynamics in Toulouse: $2600
   (a) Airfare $2000
   (b) Hotel: $600
2. Visit at the Einaudi Institute for Economics and Finance in Rome during 1 month in Summer of 2016: $5800
   (a) Housing: $4000
   (b) Airfare: $1500
   (c) Incidentals: $300
   (d) Justification: EIEF's staff includes some of the leading researchers in household finance. Interacting with them and the summer visitors on this project would be very beneficial.
3. Visiting co-author Giacomo DeGiorgi at the NY Fed: $800
   (a) Two trips: train plus hotel ($200+$200 each visit)
4. Visiting co-author Stefania Albanesi at Ohio State University: $2000
   (a) Two trips: airfare plus hotel ($800+$200 each visit)
5. Conference presentations: $5000
   (a) CESifo conference on Macroeconomics and Survey Data in Munich: $2000 based on previous year's participation cost
   (b) Asian Meeting of the Econometric Society in Kyoto: airfare plus hotel $3000

Curriculum Vitae

Fall 2015

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Citizenship

Poland, U. S. Permanent Resident

Fields of Concentration

International Finance, Household Finance, Macroeconomics

Education

Degree	*Field*	*Institution*	*Year*
Ph.D.	Economics	University of Minnesota	2008
M.Sc.	Quantitative Methods and Information Systems	Warsaw School of Economics	2002

Appointments

2015-now	Assistant Professor, Boston College
Spring 2015	Visiting Professor, Ohio State University
2008-2015	Assistant Professor, Columbia University
2011-2012	Kennen Fellow, Princeton University, International Economics Section
2005-2008	Research Analyst, University of Minnesota and Federal Reserve Bank of Minneapolis

Honors and Awards

2008-2015	Seed Research Grant, Columbia University
2007-2015	Minnesota Supercomputing Institute, Principal User, project 'Competing for Customers: A Search Model of the Market for Unsecured Credit'
2007-2008	Graduate School Doctoral Dissertation Fellowship, University of Minnesota
2005	Institute for Computational Economics, University of Chicago/Argonne National Laboratory
2004	Distinguished Teaching Assistant, Department of Economics, University of Minnesota
2002-2003	Graduate School Fellowship, University of Minnesota

Teaching Experience

2008-2014 *Instructor,* Topics in Economic Analysis (Ph.D.), Senior Macroeconomics Seminar (Undergraduate), Mathematical Methods for Economists (Ph.D.), Columbia University

2004-2005 *Instructor*, Intermediate Microeconomics, University of Minnesota

Summer 2004 *Instructor,* Principles of Microeconomics, University of Minnesota

2003-2004 *Teaching Assistant*, Principles of Microeconomics, University of Minnesota

2000-2002 *Teaching Assistant*, Intermediate Microeconomics, Warsaw School of Economics

Papers

'Understanding International Prices: Customers as Capital', joint with Lukasz A. Drozd, *American Economic Review,* February 2012

'Competing for Customers: A Search Model of the Market for Unsecured Credit', joint with Lukasz A. Drozd

'Long-Run Price Elasticity of Trade and the Trade-Comovement Puzzle', joint with Lukasz A. Drozd

'The Nontradable Goods' Real Exchange Rate Puzzle', joint with Lukasz A. Drozd, *NBER ISOM 2009*

'Pricing to Market in Business Cycle Models', joint with Lukasz A. Drozd

'Uncertainty as Commitment', joint with Guillermo Ordoñez

'Investor Sophistication and Capital Income Inequality', joint with Marcin Kacperczyk and Luminita Stevens

'Insolvency after the 2005 Bankruptcy Reform', joint with Stefania Albanesi

'Segmentation of Information and Unsecured Credit', joint with Manolis Galenianos

Seminars and Conference Participation

2006 Midwest Macroeconomics Meetings, Washington University, St Louis, University of Minnesota

2007 Allied Social Science Association, Chicago; Midwest Economics Association, Minneapolis; Midwest Theory and Trade Meeting, University of Minnesota

2008 Columbia University, Federal Reserve Bank of Richmond, Federal Reserve Bank of Saint Louis, Federal Reserve Board, Georgetown University, UCLA, UCSD, University of Pennsylvania, University of Rochester, Stanford University, The Wharton School, Federal Reserve Bank of Philadelphia, Federal Reserve Bank of New York, New York University, Society for Economic Dynamics, NBER International Finance and Macroeconomics

2009 University of Chicago, Purdue University, University of Wisconsin-Madison, UCLA, Columbia University, University of Pennsylvania, Search & Matching Workshop

2010 Society for Economic Dynamics, Duke Macroeconomics Jamboree, Yale University, University of Western Ontario

2011 Arizona State University, Princeton University, Penn State University

2012 Boston College, Columbia University, Federal Reserve Bank of Chicago, Federal Reserve Bank of St. Louis, LAEF – UC Santa Barbara, National Bank of Poland, Society for Economic Dynamics – Cyprus, Toulouse School of Economics, The Wharton School

2013 Federal Reserve Bank of Chicago, University of Maryland, National Bank of Poland, Society for Economic Dynamics – Seoul, Columbia University

2014 New York University, University of Western Ontario, NBER Asset Pricing Meeting, NBER Summer Institute, Arizona State University, National Bank of Poland, Federal Reserve Bank of Philadelphia, Carnegie Mellon University – LAEF Conference, Wharton Liquidity and Financial Crises Conference, Columbia University, Boston College, Federal Reserve Bank of Minneapolis

2015 NBER Summer Institute, Society for Economic Dynamics – Warsaw, ESSFM – Gerzensee, National Bank of Poland, Emory University, Boston University, CESifo Conference on Macroeconomics and Survey Data

Professional Service

Referee: American Economic Review, Review of Economic Studies, American Economic Journal: Macroeconomics, Journal of Economic Theory, Journal of International Economics, International Economic Review, BE Journal of Macroeconomics, Journal of Monetary Economics, Journal of Money, Credit and Banking, Review of Economic Dynamics

Conference Organization: Committee - Society for Economic Dynamics in Ghent (2011), Limassol (2012), Seoul (2013), Warsaw (2015), Program Committee - Fourth Wharton Conference on Liquidity and Financial Crises, Program Committee – Midwest Finance Association 2016 Annual Meeting.