

**ANDREAS SCHAAB**  
<https://andreasschaab.com>  
schaab.aj@gmail.com

## HARVARD UNIVERSITY

Placement Director: Amanda Pallais	APALLAIS@FAS.HARVARD.EDU	617-495-2151
Placement Director: Nathan Hendren	NHENDREN@FAS.HARVARD.EDU	617-496-3588
Assistant Director: Brenda Piquet	BPIQUET@FAS.HARVARD.EDU	617-495-8927

### **Contact Information**

199 N Harvard St  
Allston, MA 02134  
(857) 999-5243

### **Personal Information**

Date of birth: September 21, 1991  
Citizenship: Germany

### **Undergraduate Studies**

2011 - 2015      A.B. in Economics with secondary in History, Harvard College (magna cum laude)

### **Graduate Studies**

Harvard University, 2015 to present  
Ph.D. Candidate in Business Economics  
Thesis Title: Essays in Macroeconomics and Finance  
Expected Completion Date: May 2021

#### **References:**\*

Professor Xavier Gabaix  
Harvard University  
xgabaix@fas.harvard.edu

Professor Matteo Maggiori  
Stanford GSB  
maggiori@stanford.edu

Professor Ludwig Straub  
Harvard University  
ludwigstraub@fas.harvard.edu

### **Teaching and Research Fields**

Macroeconomics and Finance

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\* Emmanuel Farhi was my main advisor before he passed away in July, 2020.

### **Teaching Experience**

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|--------------|---|
| Spring, 2019 | Intermediate Macroeconomics (Advanced), Harvard University, teaching fellow for Professors Paul Willen and Gabriel Chodorow-Reich |
| Summer, 2013 | Macroeconomics and Growth, Harvard Summit for Young Leaders in China, Shanghai  |
| Summer, 2012 | Monetary Policy in Times of Financial Crisis, Harvard Summit for Young Leaders in China, Beijing                                  |

### **Research Experience**

Research assistant for Emmanuel Farhi (2015 – 2017). Research assistant for Olivier Blanchard at the IMF (summers of 2013 and 2014). Research assistant at the Bundesbank (summer of 2012).

### **Awards and Honors**

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| 2020 | Best Job Market Paper in Finance Theory award (with co-author Chris Clayton) |
| 2013 | National champion of the U.S. College Fed Challenge                          |
| 2011 | National champion of the U.S. College Fed Challenge                          |
| 2011 | Second place in German Debating Senior League                                |

### **Working Papers**

#### **Micro and Macro Uncertainty (Job Market Paper)**

Uncertainty rises sharply during economic downturns at both the micro and macro level. Leveraging a new solution method, I study the interaction between micro and macro uncertainty in a globally solved Heterogeneous Agent New Keynesian (HANK) model with aggregate risk, counter-cyclical unemployment risk, and a zero lower bound (ZLB) constraint on monetary policy. The interaction with micro uncertainty emerges as the dominant transmission channel of macro uncertainty. The overall effect of uncertainty on economic activity is substantially amplified. My model also generates endogenous spikes in uncertainty during bad times as the economy is pushed towards the ZLB. In general equilibrium, a feedback loop emerges that gives rise to an “Uncertainty Multiplier”: A contraction in economic activity spurs endogenous uncertainty about the future, which depresses aggregate demand further. The model matches the skewness and kurtosis exhibited by macro uncertainty in the data even in the absence of exogenous second-moment shocks. The interplay between micro and macro uncertainty has ramifications for the nature of zero lower bound spells, the welfare cost of business cycles, and the effectiveness of stabilization policy.

### **Multinational Banks and Financial Stability** (with Christopher Clayton)

Winner of the *Best Job Market Paper in Finance Theory* award

We study the scope for international cooperation in macroprudential policies. Multinational banks contribute to and are affected by fire sales in countries they operate in. National governments setting quantity regulations non-cooperatively fail to achieve the globally efficient outcome, under-regulating domestic banks and over-regulating foreign banks, necessitating international cooperation. Surprisingly, non-cooperative national governments using Pigouvian taxation can achieve the global optimum. Intuitively, this occurs because applying taxes, rather than quantity regulations, leads governments to internalize the business value of foreign banks through the tax revenue collected. Our theory not only provides a unified framework to think about international bank regulations, but also yields concrete insights with the potential to improve on the current policy stance.

### **Bail-Ins, Optimal Regulation, and Crisis Resolution** (with Christopher Clayton)

We provide a framework to study bail-in regimes for banks. In the presence of a monitoring problem, the optimal bank capital structure combines standard debt, which liquidates the bank and provides strong monitoring incentives, and bail-in debt, which recapitalizes the bank but provides weaker incentives. A bail-in regime, which increases use of bail-in debt, is the optimal regulatory policy when liquidation is socially costly due to fire sales or bailouts. Bail-ins fully replace bailouts. Bail-ins can generate self-fulfilling crises in long-term debt markets, leading to bank runs. Debt guarantees and an expanded notion of lender of last resort prevent these crises, and should complement bail-ins in the crisis resolution toolkit.

### **Heterogeneous Price Rigidities and Monetary Policy** (with Christopher Clayton and Xavier Jaravel)

This paper investigates the implications of heterogeneous price rigidities across sectors for the distributional and aggregate effects of monetary policy. First, we identify and characterize analytically a new set of earnings and expenditure channels of monetary policy that emerge in the presence of sectoral heterogeneity. Second, we establish empirically that (i) prices are more rigid in sectors selling to college-educated households, (ii) prices are more rigid in sectors employing college-educated households, and (iii) sectors that employ college-educated households also sell more to these households. These new facts suggest that monetary policy stabilizes sectors that matter relatively more for college-educated households, due to an expenditure channel (from (i)), an earnings channel (from (ii)), and their amplification by feedback loops (from (iii)). Finally, we develop a multi-sector incomplete-markets Heterogeneous Agent New Keynesian model, in which households of different education levels work and consume in different sectors. We quantify the aggregate and distributional effects from heterogeneous price rigidities using this model. In the baseline calibration, we find that the consumption of college-educated households is 30 to 50% more sensitive to monetary policy shocks than that of non-college households, while the aggregate real effect of monetary policy is 5 to 10% weaker than with homogeneous price rigidities.

### **Shadow Banks and Optimal Regulation** (with Christopher Clayton)

This paper develops a new framework to study regulatory policy in the presence of unregulated financial institutions (“shadow banks”). Using sufficient statistics, we show that optimal regulation in the presence of shadow banks is scaled by a “regulatory arbitrage multiplier”. This multiplier only depends on aggregate shadow banking activity. Our framework provides guidance on how to regulate currently unregulated financial institutions and sectors. To first order, the marginal welfare gain of regulating a shadow bank is large when a notion of its intermediary activity substitution effects across its activities is large. We further characterize optimal activity-based regulation whereby the planner regulates a particular activity across all shadow banks, e.g. a tax on debt. To first order, gains from activity regulation are large when average substitution effects across intermediaries are large for the regulated activity.

## **Adaptive Sparse Grid Methods for Differential Equations in Economics (with Allen Zhang)**

We develop a library for solving (partial) differential equations on adaptive sparse grids (ASG). Building on Brumm and Scheidegger (2017), our main contribution is to develop an infrastructure that is tailored to differential equations in continuous time. We show how to extend important aspects in the solution of differential equations, such as the treatment of boundary conditions and the discretization of differential operators, to highly irregular sparse grids.

### **Work in Progress**

#### **Financial Crises, Recapitalizations and Aggregate Demand**

This paper introduces financial constraints and risk premia to the burgeoning Heterogeneous Agent New Keynesian paradigm. I extend the global solution method proposed in my job market paper to a macro-finance model with heterogeneous households. My main analytical result is to derive a system of differential equations that characterizes the model's main asset prices, despite the complexity of rich cross-sectional heterogeneity. I show numerically that the model generates endogenous spikes in macroeconomic uncertainty during downturns which can drive counter-cyclical risk premia. Unlike in the representative-household benchmark, financial shocks are, in large part, transmitted through and amplified by aggregate demand channels. As a result, household debt relief, or a bailout for Main Street, becomes a potent policy instrument with effects complementary to those of bank recapitalizations.

#### **A Theory of Dynamic Inflation Targets (with Christopher Clayton)**

Should central banks' inflation targets remain set in stone? We study a dynamic mechanism design problem between a government (principal) and a central bank (agent). The central bank sets inflation but suffers from a time consistency problem. The central bank also learns about persistent economic shocks affecting optimal inflation, and so influences beliefs of the government and of firms that use that information in price setting (Phillips curve). A "dynamic inflation target" implements the constrained efficient inflation level: the central bank reports its target one period in advance, with a linear incentive scheme for deviations from the target. This mechanism is optimal when the social costs of the incentive scheme are negligible relative to the inflation-output trade-off.

#### **Policy Transmission in Disaggregated Economies**

What can we say about the aggregate transmission channels of policy interventions in disaggregated economies with rich cross-sectional heterogeneity? When markets are complete, we know that the aggregation of consumer spending and firm investment is governed by the distribution of a small set of estimable micro moments. Leveraging novel results on price theory in incomplete markets, I show that this insight survives in more general incomplete markets economies. On the firm side, I introduce the *marginal propensity to invest* (MPI) as a novel sufficient statistic and show that its joint distribution with households' MPCs becomes a key determinant of demand aggregation.

#### **Slutsky Decompositions when Markets are Incomplete**

This paper revisits the classical results of price theory in an incomplete markets setting. I allow for a general asset market structure and show that every sequential incomplete markets economy admits a *timeless representation* where decisions are made ex ante behind a veil of ignorance, not unlike the Arrow-Debreu model. While traditional price theory leverages the lifetime budget constraint to arrive at a dual problem, I instead propose a two-stage representation: A first-stage consumption problem takes income as given and

therefore admits the usual dual problem state-by-state. In a second-stage financing problem, agents take as given indirect utility from the first stage and allocate resources across states. My main result is a set of incomplete market Slutsky equations for commodity and asset price effects.

### **Older Work**

Ferguson, N., Schaab, A., Schularick, M. "Central Bank Balance Sheets: Expansion and Reduction Since 1900." ECB Forum on Central Banking 2014, Conference Proceedings.