I am a macroeconomist working on monetary economics and the aggregate implications of heterogeneity. My research shows that heterogeneity is a crucial determinant of “aggregate demand”: it can help us understand what drives recessions, how monetary policy and fiscal policy work, why consumer bankruptcy policy can have aggregate effects, or how phenomena such as rising income inequality or population aging are affecting the macroeconomy. This perspective substantially broadens the standard macro approach to these questions, which is based on models with a representative agent.

General equilibrium models with lots of heterogeneity can sometimes feel like black boxes. I develop new ways of taking these models to the data that shed light on core model mechanisms, help discriminate between various modeling choices, and point towards new directions for model design. I have notably used the “sufficient statistic approach” to advance the development of the recent Heterogeneous-Agent New Keynesian (“HANK”) literature.

High and heterogeneous MPCs: implications for modeling and policy. A key empirical moment that disqualifies the representative-agent model is the Marginal Propensity to Consume (MPC)—it is high and heterogeneous in the micro data, versus low and uniform in the representative agent model. An important part of my work has been to flesh out the macroeconomic implications of the level and heterogeneity in MPCs that we observe empirically.

Monetary policy. In “Monetary Policy and the Redistribution Channel” [2] (published in the American Economic Review), I establish the importance of MPCs for the transmission mechanism of monetary policy. I show that standard representative-agent models miss three key channels of monetary policy transmission: an earnings heterogeneity channel from unequal income gains, a Fisher channel from unexpected inflation, and an interest rate exposure channel from real interest rate changes. I develop a sufficient statistic approach to evaluating the magnitudes of these three new channels, and show that all three are likely to contribute to the transmission of monetary policy. Hence, redistribution isn’t only a side effect of monetary policy: it is important to understand how it affects aggregate economic activity—equivalent, for instance, to adding an extra 0.1 to 0.4 points to the aggregate elasticity of intertemporal substitution. My framework clarifies who gains and who loses when monetary policy changes—a point that policy discussions often get wrong—and provides a measurement device to inform the redistributive consequences of policy actions.

The findings in [2] helped spur the development of the Heterogeneous-Agent New Keynesian literature. Models in this literature have the benefit of being consistent with “micro moments”—such as MPCs and the distributions of income and wealth we observe in the data—but have so far been inconsistent with the “macro moments” that the earlier monetary policy literature focused on, such as the empirical impulse response to monetary policy shocks studied by Christiano, Eichenbaum, Evans and others. In work in progress with Matt Rognlie and Ludwig Straub [8], we show that it is possible to reconcile these two approaches by introducing sluggishness in the adjustment of households’ expectations of aggregate variables. Our estimated model—the first such model that is at once consistent with micro and macro moments—implies a large role for investment in the transmission mechanism of monetary policy. The reason is that, in our model, monetary policy stimulates investment, which raises incomes and—because MPCs are high—feeds into consumption. An implication of our paper is that factors affecting investment are much more crucial for monetary policy than previously thought. Our model also generates a natural comovement between consumption and investment over the business cycle, which has long been a puzzle for macroeconomists.
Fiscal policy. MPCs feature prominently in the traditional textbook analysis of fiscal policy, which is based on the IS-LM framework. In “the Intertemporal Keynesian Cross” [4] (with Rognlie and Straub, R&R at the Journal of Political Economy), we show that a modern version of the Keynesian cross is also present in heterogeneous-agent models with nominal rigidities. But, to really understand the aggregate effects of government spending and transfer policy, one must go beyond MPCs, and instead consider a new set of moments we call iMPCs, for “intertemporal Marginal Propensities to Consume”—the impulse response of consumption to transitory income changes at different dates. We show that these moments are a powerful model discrimination device. The empirical estimates of iMPCs we provide favor a certain class of HANK models with two assets over the other classes of models used to study fiscal policy to date: representative-agent models, saver-spender models and models with one asset. Our two-asset model implies that deficit-financed fiscal policy is much more powerful at stimulating economic activity than previously thought. While the empirical literature had acknowledged the potential importance of deficits, our paper is the first to explicitly flesh out this theoretical implication of models that match iMPCs.

A benefit of HANK models is that they can be made consistent with both MPCs and empirical estimates of fiscal multipliers. The first generation of models in this literature extended the textbook representative-agent framework by assuming sticky prices but flexible wages. In [3] (with Bence Bardóczy and Rognlie), we show that these models miss an important third dimension of the micro data: Marginal Propensities to Earn, or MPEs. In the data, MPEs are much lower than MPCs. Standard specifications of preferences are inconsistent with this fact. Shutting down wealth effects on labor supply does not help, because it introduces too much consumption-labor complementarity, in turn raising fiscal multipliers above empirical estimates. Our solution to this “trilemma” is to introduce frictions in the labor market, such as sticky wages. I put this modeling device to use in [4], [6], [8] and [10].

Income redistribution. What are the aggregate effects of redistribution, such as that induced by rising inequality in labor income? I tackle this question in “Inequality and Aggregate Demand” [6] (with Rognlie). We show that, in a large class of models, these aggregate effects are given by the product of a general equilibrium multiplier and a partial equilibrium sufficient statistic: the covariance between MPCs and the direction of redistribution. We find that in practice, and contrary to conventional wisdom, this covariance tends to be small, and therefore the aggregate effects of income-based redistribution cannot be too large. Our theorem connecting partial and general equilibrium outcomes are the foundation for the general equilibrium sufficient statistic methodology that we further develop in [4] and [7].

Solution methods. An impediment to research in the heterogeneous-agent literature has been the difficulty of solving models on the computer, owing to the very large state spaces that these models involve. In [7] (with Bardóczy, Rognlie and Straub), we introduce a new solution method that linearizes with respect to aggregate variables, exploits certainty equivalence, and represents equilibrium as a linear system in the sequence space. Our method is both general and fast; we show how to apply it to test for determinacy and compute impulse responses at hundreds of times the speed achieved by conventional methods. This methodological advance opens the door to likelihood-based model estimation, which had so far been out of reach for the literature, and is key to enabling [8]. We maintain an online code repository, funded by an NSF grant, that contains a detailed guide to our methods, as well as many examples where we apply them.

Macroeconomic implications of household and government default. A standard narrative of the recent Great Recession is that impaired household balance sheets prevented a fast recovery by dragging down consumer spending. An implication of this view is that debt forgiveness could have helped the economy bounce back faster.
In “Macroeconomic Effects of Debt Relief: Consumer Bankruptcy Protections in the Great Recession” [5] (with Will Dobbie and Paul Goldsmith-Pinkham, R&R at the American Economic Review), we test this hypothesis by exploiting the heterogeneous amount of debt relief that took place during the recession, driven by plausibly exogenous variation in the leniency of state bankruptcy laws. We show that more lenient states had better employment performance. We then develop a heterogeneous-agent model in which borrowers have higher MPCs than savers, and use the model to recover the aggregate effect of debt forgiveness during the Great Recession, which we find to have been large. Our paper introduces a general framework to connect well-identified regional regressions to aggregate economic counterfactuals, showing exactly what general equilibrium effects are differenced out by empirical strategies such as ours, and illustrates how to use the model to examine the determinants of the sign and magnitude of these general equilibrium spillovers.

The model we use in [5] assumes away potential adverse effects on credit supply from changes in consumer bankruptcy laws. A full normative analysis of bankruptcy policy requires taking these effects into account. A well-established class of models in the consumer bankruptcy literature, building on the Eaton-Gersovitz framework, has been used for thinking about the tradeoff between credit access and idiosyncratic insurance. In ongoing work with Kurt Mitman [10], we add nominal rigidities to this class of models. This allows us to study optimal bankruptcy policy in the presence of the types of aggregate demand effects that I document in [5].

The Eaton-Gersovitz model is also the leading framework to study government default. In [1] (with Rognlie, published in the Journal of Monetary Economics), we ask whether these models feature multiple equilibria. There is a common policy view that sovereign debt markets are prone to such multiple equilibria—the idea is that a market panic could inflate bond prices, deteriorate the sustainability of government debt and precipitate a default event, thereby justifying investor fears. Our paper establishes for the first time that, by contrast, Eaton-Gersovitz models do not feature multiple equilibria. Our proof shows that the multiple equilibria logic is not as simple as it sounds, and it also points towards the types of modifications of the framework that are necessary to deliver multiplicity.

The long run. The importance of heterogeneity for macroeconomics carries over to long-run issues. Two major macroeconomic trends of the past decades have been the aging of the world population and the global rise of income inequality. In “Demographics, Wealth and Interest Rates in the 21st Century” [9] (with Hannes Malmberg, Frédéric Martenet, and Rognlie), we consider the aggregate implications of the first phenomenon. We show that, in many overlapping generations models, a simple statistic—which rolls the forecasted change in the age distribution of the population over a fixed age profile of net asset demand—is useful to predict the effect of population aging on aggregate wealth accumulation and equilibrium interest rates. We collect and harmonize individual wealth and income data for 16 countries and show that, absent a fall in global safe rates, the wealth-GDP ratio will increase by around 100 p.p. on average over the next 80 years—equivalent to the increase these countries have observed in the past 50 years. Our results confirm the hypothesis that population aging can have substantial macro effects, in another application of a sufficient statistic methodology on micro data to infer macro outcomes. In [6], Rognlie and I use a similar methodology to tackle the long-run effects of the rise of income inequality.

Teaching. I have taught three classes at Stanford: a first-year graduate macro class on business cycles (econ 211/212), a second-year graduate international finance class (econ 269), and a second-year graduate macro class on monetary economics (econ 234). I am also involved in organizing the third-year seminar for graduate students (econ 300), as well as the macro workshop.
Published papers


Under revision


Working papers

6. “Inequality and Aggregate Demand” (with Matthew Rognlie), NBER Working Paper 24280, February 2018

Work in progress

10. “Consumer Bankruptcy as Aggregate Demand Management” (with Kurt Mitman).