I am a quantitative macroeconomist studying the implications that firm and household heterogeneity have on business cycle dynamics. I specialize in writing non-linear models that are micro-founded and calibrated to real-world data, where aggregate outcomes are functions of the distributions of firms and households.

Firm Debt Relief in Financial Downturn (Job Market Paper)

In my job market paper, "Firm Debt Relief in Financial Downturn" I develop a heterogeneous agent dynamic stochastic general equilibrium model of financial frictions that is calibrated to accurately fit the skewed unconditional size distribution of firms in the United States, as well as match key financial moments in the data. I then use the model as a quantitative laboratory to study a variety of debt relief policies that vary in terms of which subsection of firms are eligible for relief during a financial downturn.

I model financial market frictions by assuming collateralized borrowing. Investment among firms with insufficient collateral is limited by their inability to borrow, leading to a misallocation of capital. A shock to firms' access to credit exacerbates the misallocation as growing firms have a stronger reliance on external financing. This shock generates a recession with features similar to that of the 2008 Financial Crisis: an initial rise in consumption, a steep fall in investment, and a slow initial fall in output. Debt relief, where a government pays a fraction of firms' outstanding financial obligations, assists firms in overcoming their collateral constraints, potentially mitigating the effects of a financial crisis. In essence, debt relief transfers liabilities from firms to the government, requiring governments to borrow and subsequently raise taxes. This underscores the importance of effectively targeting the relief; the benefits of a stronger recovery must outweigh the costs of future taxation.

Financial frictions interact with firm-level productivity, a stochastic process drawn from a Pareto distribution. While the slowed growth seen in young and small firms can also be reproduced in models using the more common log-normal distribution (Khan & Thomas, 2013), this model delivers something further: large firms are inefficiently smaller than they should be. Productive firms must borrow more to grow to their efficient size on the long right tail of the size distribution, making them more susceptible to a financial crisis than under the more commonly assumed Gaussian shock processes. Thus, debt relief policy not only has potential benefits for small and young firms, but larger and older firms as well.

Policy that targets firms with the highest level of excess return to capital investment improves aggregates the most, reducing the drop in output from a 2.27 percent decrease from steady state to 1.67 percent, an improvement of over 26 percent. Understanding that excess return may not be a readily observable target for policymakers, I consider firm size and age as alternative targets. My model is well equipped to analyze these policies as it not only matches the unconditional size distribution of firms, but also reproduces the age-size distribution of young firms seen in the United States. Using these model generated distributions, I divide firms into small, medium, and large size bins, which correspond to employment share bins in the BDS data, as well as a separate grouping for young and old firms (with 5 years being the threshold for young firms). Despite many policies in the United States targeting small firms (Paycheck Protection Program, Small Business Administration loans), I find that policy that targets medium size firms outperforms those that target small, large, and young firms in dampening the severity of a financial crisis. Medium size

firms have higher growth potential than small firms, while also being more hindered in their growth by financing constraints than large firms, so relief can be usefully spread across this group.

Misallocation, Sticky Prices, and Monetary Transmission (with Aubhik Khan)
In future work with Aubhik Khan, we begin to explore the role of credit market frictions hindering firms' ability to finance investment on the transmission of monetary policy. In contrast to Ottonello and Winberry (2020) our approach involves a setting that reproduces the size and age-size distribution of firms.

Building on the canonical sticky price model, we introduce a nontrivial distribution of upstream firms that vary over their persistent productivity, capital and debt. They produce a homogeneous commodity that is used as an input for downstream price-setting firms. These downstream firms face nominal rigidities when setting prices, which leads to the New Keynesian Phillips Curve. Financial frictions limit upstream firms' access to external financing; highly productive firms that have not yet built up enough retained earnings must borrow to afford efficient investment. Given decreasing returns to scale in capital and labor at the individual firm, the resulting misallocation of capital reduces aggregate total factor productivity.

During a financial crisis, changes in monetary policy that effect the real interest rate can partly offset the cost of firms' loans. This helps small and young firms, which are more likely to be financially constrained, and improves the allocation of capital, as well as boosting aggregate TFP. Fitting the size distribution of firms allows us to offer an empirically consistent estimate of the extent to which financial frictions amplify the effectiveness of monetary policy in the United States. Moreover, the nonlinear solution of our model allows us to evaluate the effectiveness of unconventional monetary policy operating through firms' balance sheets.

Stabilization vs Inequality: A Trade-off to Debt Relief?
Building off my job market paper, I study a potential tradeoff to debt relief policy: mitigating recession at the cost of increased wealth inequality. Debt relief policies have the potential to benefit all households by reducing the length and severity of financially driven recessions, while also increasing firm value. However, this is where the potential to exacerbate household wealth inequality originates. In partial equilibrium, increasing firm value increases the value of their shares, which are typically owned in greater concentration by wealthy households. In general equilibrium, expanding the budget set of wealthy households by increasing the value of the shares they own causes a positive wealth effect, increasing their consumption. Decreasing marginal utility of consumption from a small percent of the population responsible for a disproportionate share of total consumption puts upward pressure on the equilibrium wage. This decreases factor demand which partially offsets the stabilizing effects of fiscal policy.

Moving forward, my research agenda will focus on real business cycle models that emphasize the effects firm and household heterogeneity have on aggregate dynamics. These effects are essential to understand how the incidence of shocks varies over firm and household characteristics, and how they shape policy recommendations.