

## Shocks, Frictions, and Inequality in US Business Cycles

CFM-DP2020-03

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How important are business cycles for inequality dynamics and do inequality dynamics help us in identifying the drivers of business cycles? To answer these questions, this column estimates a heterogeneous-agent New-Keynesian (HANK) model on both macro and micro data. The results suggest that adding data on wealth and income inequality does not materially change the estimated shocks and frictions driving the US business cycle. The estimated business cycle shocks, however, do a good job in explaining the evolution of US wealth and income inequality from the 1950s to today. In terms of systematic policy, we find sovereign debt policy to be an important driver of wealth inequality.

### **Model and Estimation**

A new generation of monetary business cycle models that features heterogeneous agents and incomplete markets (known as HANK models) allows us to study inequality through the lens of a business cycle model. In particular, we use a technique that has become standard at least since Smets and Wouters' (2007) seminal paper, extending this technique to the analysis of HANK models: We estimate an incomplete markets model by a full information Bayesian likelihood approach using the state-space representation of the model. We use this approach to answer two questions: First, do data on inequality change the estimated shocks and frictions driving the US business cycle? Second, how important are business cycle shocks for the evolution of US inequality?

Specifically, we estimate an extension of the New-Keynesian incomplete markets model of Bayer et al (2019). We add features such as capacity utilization, a frictional labor market with sticky wages, and progressive taxation, as well as the usual plethora of shocks that drive business cycle fluctuations in estimated New-Keynesian models: aggregate and investment-specific productivity shocks, wage- and price-markup shocks, monetary- and fiscal-policy shocks, risk premium shocks, and, as two additional incomplete-market-specific ones, shocks to the progressivity of taxes and shocks to idiosyncratic productivity risk.

To infer the importance of inequality for the business cycle, we estimate the HANK model with and without data on inequality. We first estimate the model on aggregate data as in Smets and Wouters (2007), covering the time period from 1954 to 2015. We then re-estimate the model with two additional observables for the shares of wealth and income held by the top 10% of households in each dimension, which are taken from the World Inequality Database.

### **US Business Cycles and Inequality**

First, we find that the addition of distributional data does not change what we infer about the aggregate shocks and frictions driving the US business cycle. Second and in line with the first result, business cycle shocks explain a substantial fraction of movements in inequality because they generate very persistent movements in wealth and income inequality. And these movements are consistent with the U-shaped evolution of US inequality over 1954-2015. In the HANK model, even transitory shocks have very persistent effects on inequality, because wealth is a slowly moving variable that accumulates past shocks and thus business cycle shocks persistently redistribute across households with different portfolios.

The historical decomposition of US inequality reveals that changing markups are the main contributors to the rise of wealth and income inequality from the 1980s to today. Yet, fiscal policies also play their role both by providing liquid assets for self-insurance through government deficits and by changing the incentives to self-insure through progressive taxation. Both move liquidity premia and thus affect the savings incentives of the rich and the poor differentially. Quantitatively, we find deficits to be less important than changes in progressive taxation. For consumption and income inequality, fluctuations in income risk play a significant role and this role goes beyond increasing the dispersion of income once the higher risk is realized. Wealth poor, and thus badly insured, households react to an increase in uncertainty by cutting consumption particularly strongly, while for well-insured households, which are already consumption rich, behavior changes little. Consequently, these shocks account for 20% of the cyclical variations in consumption inequality. They also account for 20% of aggregate consumption fluctuations in US recessions.

### **The Importance of Policy Rules for US Inequality**

Given the estimated shocks, we assess the importance of policy rules in shaping inequality over the business cycle. We find that, broadly speaking, output stabilization is key to reducing fluctuations in inequality.

A more hawkish monetary policy, i.e., a stronger reaction to inflation, would have increased inequality in the 1970s and today. Both periods - through the lens of our model - are characterized by high markups such that hawkish policy leads to output losses and increases inequality. We also consider a dovish policy where we double the monetary policy response to output fluctuations. This leads in general to more stable markups and output at the expense of higher inflation volatility; see also Gornemann et al (2016).

We find that the recovery after the Great Recession would have been faster, had US fiscal policy allowed for even larger and more persistent deficits; see Figure 2. An important channel for this faster recovery is that such policy would have depressed the liquidity premium, the return difference between illiquid and liquid assets, by driving up the nominal and real rates of the latter. A by-product of this is that wealth inequality would have increased less. Poor households hold more of their wealth in liquid form, such they would have been affected particularly strongly from such policy, providing them greater incentives to accumulate wealth.

In terms of the composition of a fiscal stimulus, we find that putting a larger emphasis on tax cuts instead of spending hikes renders fiscal policy more effective at stabilizing output and consumption inequality in general (keeping the deficit response of the government to recessions constant). However, such more aggressive tax policy does increase the liquidity premium in downturns. Therefore, it would have been no viable option during the Great Recession, as it had made the effective lower bound on interest rates more binding. In other words, cutting back taxes and spending in lockstep is only a viable fiscal policy response to a recession, if monetary policy has room to accommodate this policy.