

I am an applied macroeconomist. The focus of my research is examining positive and normative aspects of deep recessions. Specifically, my work examines (1) how economies behave at the zero lower bound on nominal interest rates, (2) what policies are effective in deep recessions, and (3) what is the optimal inflation rate? In this work I combine a variety of approaches, including statistical analysis of micro and macro data, theoretical modeling, and computational methods. My research has been published or accepted in the *Journal of Political Economy*, the *American Economic Review*, the *Review of Economic Studies*, the *Journal of Money Credit and Banking*, and the *Brookings Papers on Economic Activity*. Most of these papers were published or accepted after I joined the University of California, San Diego, in Fall 2013.

## 1 How do economies behave at the zero lower bound?

In some of the deepest recessions in history — the Great Depression, the Great Recession, and the Japanese lost decade(s) — monetary policy was constrained by the zero lower bound on nominal interest rates. Since such events are rare, there existed little empirical evidence on how the zero lower bound affects economic outcomes. A first set of my papers provides such empirical evidence ([11], [2], [8]).

This work is motivated by the standard new Keynesian model, which predicts that economies behave very differently at the zero lower bound than they do in normal times: completely wasteful government spending or forward-guidance are very stimulative, capital destruction or oil supply shocks are expansionary, and reducing pricing frictions exacerbates a recession. In this model aggregate demand is determined by intertemporal substitution. Lower expected real interest rates encourage consumers to pull forward consumption and vice-versa. Capital destruction, higher real oil prices, or higher government spending raise marginal costs, which raises expected inflation. In normal times the central bank raises nominal interest rates more than one-for-one with inflation, raising expected real interest rates, and inducing consumers to postpone consumption. But if the central bank does not respond, for example because it is constrained by the zero lower bound, then expected real interest rates decline causing an increase in consumption and output.

My work suggests skepticism that these unusual predictions of the new Keynesian model apply in practice. In “**Are Negative Supply Shocks Expansionary at the Zero Lower Bound?**” (*JPE* accepted, [11]) I look for events that raise current

and future marginal costs, I check whether expected inflation rises as predicted and nominal interest rates do not, and I look for the predicted output rise.

I study the Great East Japan earthquake and global oil supply shocks in Japan when nominal interest rates are zero. I verify that these shocks raise expected inflation and lower expected real interest rates. However, I find that both shocks reduce output, contrary to theory. Indeed, I find that oil supply shocks are even more contractionary at the zero lower bound than in normal times. Specifications of the new Keynesian model that match these data also overturn the other unusual predictions of the model for the zero lower bound, such as large fiscal multipliers. These findings suggest that policy makers should be cautious in expecting large positive outcomes at the zero lower bound through the intertemporal substitution channel emphasized by new Keynesian models.

In **“Supply-Side Policies in the Depression: Evidence from France”** (*JMCB*, [2]) Jeremie Cohen-Setton, Joshua Hausman, and I perform a similar test in a different environment: France in the Great Depression. Elected in May 1936 and led by Léon Blum, the Popular Front government in France enacted a suite of supply-side policies: private sector wages were raised by 7-15 percent. Workers were granted 2 weeks of vacation without loss of pay. And perhaps most importantly, the work week was reduced from 48 to 40 hours, also without loss of pay. The size of these shocks, as well as their temporal isolation from demand-side policies, make France from 1936 to 1938 a useful setting for understanding the effects of supply-side policies in depressed economies.

Using aggregate data, we show that price increases and output declines coincided with the implementation of supply-side restrictions. We then exploit variation in the implementation date of the 40-hour law across industries to show that it lowered output and raised prices. Finally, we ask whether a standard new Keynesian model calibrated to match the cross-sectional data could still match the aggregate facts. We find that it predicts an implausible doubling of output. This paper, like my work more recent data, suggests that the new Keynesian model is a poor guide to the effects of supply-side policies in depressed economies.

In **“Fiscal Multipliers at the Zero Lower Bound: International Theory and Evidence”** ([8]) I examine to what extent fiscal stimulus crowds out net exports. A conventional view is that higher government spending crowds out net exports through a real exchange rate appreciation. By contrast, I show that a stan-

standard open economy new Keynesian model predicts that fiscal policy crowds in net exports at the zero lower bound, such that the fiscal multiplier is larger than in a closed economy. Intuitively, higher inflation from government spending reduces expected real interest rates, which depreciates the real exchange rate under uncovered interest rate parity (UIP). However, in the data I estimate that inflation surprises still cause an appreciation of the real exchange rate at the zero lower bound, contrary to the standard model's prediction. A new Keynesian with frictional UIP, calibrated to match these data, predicts that the open economy fiscal multiplier at the zero lower bound is smaller than the closed economy fiscal multiplier. This suggests that the conventional view still applies in practice.

Some existing work claims that standard new Keynesian models do not make unusual predictions when the zero lower bound is caused by a persistent shock to confidence: fiscal multipliers are small and negative supply shocks are contractionary. I examine and argue against these claims in the context of fiscal multipliers in two papers, “**State-dependence of the Zero Lower Bound Government Spending Multiplier**” ([9]) and “**Zero Lower Bound Government Spending Multipliers and Equilibrium Selection**” ([10]). But the results apply broadly to supply and demand shocks in these models.

In [9], I show that the size of the fiscal multiplier at constant, zero nominal interest rates is independent of what causes the zero lower bound. Existing work has found the opposite result because it simultaneously changed the persistence of the fiscal shock as well as the persistence of the zero lower bound. But it is the former change, not the latter, that changes the size of the fiscal multiplier.

In [10], I then examine why the persistence of the fiscal shock is such an important determinant of the fiscal multiplier at the zero lower bound. In particular, I examine why a small increase in the persistence can switch the multiplier from large positive to small or negative. I show that this discontinuity occurs because the solution method implicitly switches to a different type of equilibrium. When a consistent equilibrium selection criterion is used, then there is no such discontinuity, and the standard new Keynesian model predicts large and positive multipliers at constant, zero nominal interest rates.

## 2 What policies are effective in deep recessions?

Another strand of my work provides empirical evidence on various policies aimed at improving outcomes in deep recessions.

In “**Recovery from the Great Depression: The Farm Channel in Spring 1933**” (*AER* accepted, [7]), Joshua Hausman, Paul Rhode, and I examine how the U.S. economy recovered from the Great Depression. From its low point in March 1933, industrial production increased by 57% over the next four months. We argue that an important driver of this extraordinary recovery was the effect of devaluation on farm prices, incomes, and consumption (the “farm channel”).

We show that crop prices rose rapidly in spring 1933, and that this increase was in part caused by devaluation. Using state and county-level data, we show that auto sales and income grew much more in farm areas of the country, particularly in those areas most burdened by farm mortgage debt. Finally, we gauge the aggregate effects of the farm channel through the lens of a heterogeneous agent model disciplined by our cross-sectional estimates. For plausible assumptions about farmers’ relative marginal propensity to consume, the incidence of higher farm prices, and the aggregate multiplier, this redistribution to farmers accounted for 20-60% of spring 1933 growth. This farm channel thus provides an example of how the distributional consequences of macroeconomic policies can have large aggregate effects.

In “**Abenomics: Preliminary Analysis and Outlook**” (*BPEA*, [5]) and “**Overcoming the Lost Decades? Abenomics after Three Years**” (*BPEA*, [6]), Joshua Hausman and I evaluate the unconventional monetary policies that are part of Abenomics. We show that these policies had modest positive effects on output and inflation, and likely passed a cost-benefit test. We highlight two puzzles that account for why performance was not better: The response of net exports to the weak yen was small, and there is little evidence that expansionary monetary policy had large effects on consumption. Our findings in [7] suggest that the distributional incidence of Abenomics may be important to explain why Abenomics may have been less successful at raising output and inflation than originally hoped for.

In “**Financial Dampening**” (*R&R JMCB*, [12]), Mu-Jeung Yang and I examine a different mechanism by which monetary policy may be less effective at raising output in times of financial distress. In our model of bank capital structure and risk management, loan retrenchment combined with loan liquidation costs reduces the

pass-through from monetary policy rate changes to loan supply (the “Bank Lending Channel”), which attenuates the effectiveness of monetary policy.

We test the prediction of the model on bank-level micro data. To isolate credit supply from credit demand shocks, we employ a spatial IV strategy, which we validate in our model. Specifically, we instrument local loan growth with loan growth at banks of the same bank holding company operating in a different geographic area. We estimate that retrenching banks increase loan supply substantially less in response to exogenous monetary policy rate reductions. We also show that areas more exposed to retrenching banks experience slower employment growth, suggesting that borrowers cannot easily substitute to expanding banks. Financial dampening thus provides a rationale for slow recoveries from financial crisis, and it suggests that central banks may want to cut interest rates more aggressively in times of financial distress.

Some economists have questioned the extent to which demand-side policy can be effective in deep recessions if frictions prevent unemployed workers from reallocating to industries with high labor demand. In “**Secular Labor Reallocation and Business Cycles**” (*R&R JPE*, [1]) Gabriel Chodorow-Reich and I provide new evidence on the extent to which the need for reallocating labor contributes to the depth and persistence of recessions.

We propose a novel method to estimate how secular labor reallocation affects local labor markets and implement it using confidential administrative employment data. Specifically, we compare employment outcomes in local areas more exposed to national reallocation trends, while controlling for locally predicted growth implied by these trends. Our estimates imply that the consequences of reallocation depend on the phase of the business cycle. More reallocation implies higher unemployment when the reallocation coincides with a recession, but roughly neutral effects when it occurs coincident with an expansion.

We show that a multi-area, multi-sector search-and-matching model featuring realistic frictions to sectoral mobility and downward wage rigidity can rationalize this result. In expansions, the wage constraint does not bind and relative wages adjust, causing little change in unemployment. In recessions, the downward wage constraint binds in contracting sectors causing large increases in unemployment. Overall, our results suggest that labor reallocation is an important determinant of the depths of recessions, but this does not imply that it is invariant to demand-side policies.

### 3 The optimal rate of inflation

Many prominent macroeconomists have argued that the Federal Reserve should adopt a higher inflation target to reduce the likelihood of hitting the zero lower bound in the future. Despite the importance of quantifying the optimal inflation rate for policymakers, modern monetary models of the business cycle, namely the new Keynesian framework, have been strikingly ill-suited to address this question because of their near exclusive reliance on the assumption of zero steady-state inflation, particularly in welfare analysis.

In “**The Optimal Inflation Rate in New Keynesian Models: Should Central Banks Raise Their Inflation Targets in Light of the Zero Lower Bound?**” (*ReStud*, [3]) Olivier Coibion, Yuriy Gorodnichenko, and I explicitly incorporate positive steady-state inflation into new Keynesian models with an endogenously binding zero lower bound constraint. While hitting the zero lower bound is very costly in the model, our baseline finding is that the optimal rate of inflation is low, typically less than 2% a year, even when we allow for features that lower the costs or raise the benefits of positive steady-state inflation.

The key intuition for the result is that the benefits of higher inflation only accrue at the zero lower bound. As such the unconditional cost of the zero lower bound is typically small, so that even modest costs of trend inflation, which must be borne every period, will imply an optimal inflation rate below 2%. This explains why our results are robust to a variety of settings and suggests that our results are not particular to the new Keynesian model. We conclude that raising the inflation target is likely too blunt an instrument to efficiently reduce the severe costs of zero bound episodes.

In “**Infrequent but Long-Lived Zero-Bound Episodes and the Optimal Rate of Inflation**” (*Annual Review*, [4]) we reaffirm these findings when we calibrate the model to also match the fact that zero lower bound episodes are rare but long-lived.

## 4 Work in progress

In ongoing work with Joshua Hausman and Paul Rhode, we examine the importance of the farm channel for the beginning of the Great Depression. Even before the first banking panic, the Great Depression would still have been more severe than that in any postwar recession, suggesting a role for non-bank based propagation mechanism. Our preliminary findings suggest that the farm channel operated in similar ways at the beginning of the Depression as in [7]. We show that real farm prices declined due to the international Great Depression. Using cross-state data we find that domestic demand from declines particularly rapidly in areas producing traded crops. We are currently collecting and analyzing cross-county data to check if the decline in demand is larger on areas with higher farm mortgage debt, which is what we found in the recovery.

Alisdair McKay and I show that standard models of durables that are consistent with lumpy adjustment imply an interest rate elasticity of durable expenditure about 20 times larger than what we estimate in the data. We then show how to modify these models to bring them closer in line with the data. Our results suggest that monetary policy is much less powerful than implied by these models, both as it pertains to monetary shocks and as it pertains to stabilizing the economy in response to other demand shocks.

In more preliminary work, Valerie Ramey and I study why cross-sectional consumption studies find very large marginal propensities to consume (MPCs) for durable goods, and to what extent these MPCs can be used to learn about aggregate consumption responses.

## References

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