

Monetary Policy in Incomplete Market Models: Theory and Evidence*

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How does the economy respond to a change in government policy or to a macroeconomic shock? The equilibrium impact of a change in policy will depend on two crucial elements. First, the direct effect of that policy on the macroeconomy, for example, the increase in demand induced by an increase in government spending. Second, the indirect effect of the policy because of the response of private households. To quantify the effects of policies, requires understanding the strength of the interaction between direct and indirect effects of policies. In order to do so requires a structural framework that includes nominal rigidities, which operationalize an aggregate demand channel, and matches household-level consumption behavior in response to changes in policy. While direct evidence on micro consumption behavior is readily available, the size of nominal rigidities (and thus the strength of the demand block) can generally only be estimated structurally. Thus, we estimate the model containing both price rigidities and observed micro consumption behavior, providing the first estimates of the strength of the aggregate demand channel that explicitly take into account the indirect effects

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of policy. This enables us to provide new answers about the efficacy of fiscal and monetary policy.

To accomplish this goal, we proceed in two steps. First, we revisit the classic question how the economy respond to a change in monetary policy and in technology. Second, we use this evidence to estimate an incomplete markets (Bewley-Imrohoroglu-Huggett-Aiyagari) model with prices rigidities (as in the New Keynesian literature). Incomplete markets allow the model to match the rich joint distribution of income, earnings and wealth. Further, such heterogeneity is crucial in generating a realistic distribution of MPCs. The price rigidities ensure that the model has a meaningful demand channel operating.¹

The first step of our analysis and the first contribution of the paper is to document the response of the economy to a monetary and technology shocks. The key implication of recognizing the potential importance of market incompleteness is that the response to, e.g., monetary policy crucially depends on the conduct of fiscal policy. In the extreme, fiscal policy can eliminate any differences in the response to monetary policy between models with complete and incomplete markets if it offsets the distributional consequences of monetary policy. That is, theoretically, an appropriately designed transfer scheme between heterogeneous households can render the aggregate consumption, hours and output response identical between the two economies. More generally, the direct effect of monetary policy plus the indirect induced effect on fiscal policy together determine the total effect of a change in monetary policy.

Consequently, understanding of the response of the economy to monetary and technology shocks also requires to measure the response of fiscal policy to shocks. To this end, in addition to measuring the impact of shocks on variables such as output, prices, inflation ... we study the joint response of fiscal variables such as government spending, debt, revenue, etc. Changes in fiscal variables, e.g. an increase in government debt or spending, affect the distribution of income and aggregate outcomes in incomplete markets in contrast to complete markets where they do not matter. This explains why the response of fiscal policy has been largely ignored by the existing literature on complete markets NK models.²

¹There is a growing literature which incorporates nominal rigidities into incomplete markets models, for example Oh and Reis (2012), Guerrieri and Lorenzoni (2015), Gornemann et al. (2012), Kaplan et al. (2016), Auclert (2016) and Lütticke (2015), McKay and Reis (2016), McKay et al. (2015), Bayer et al. (2015), Ravn and Sterk (2013) and Den Haan et al. (2015).

²Sterk and Tenreiro (2016) also emphasize the importance of fiscal policy (in their case government debt) for the transmission mechanism of monetary policy, in a flexible price model with heterogeneous agents.

Having measured impulse responses to monetary and technology shocks in the data, including the responses of fiscal variables, we use them in the second part of the paper as targets to estimate a New Keynesian incomplete markets model. This is important since one cannot just import the parameters estimated using a complete markets model. The reason is not only abstract and theoretical but very concrete. As explained above, fiscal policy might respond to, e.g., a technology shock and thus lead to a different price path in the model. For example, we find in post-1983 US data that government spending increases in response to a positive technology shock. Therefore, the total price response is a combination of the response to the technology shock and to the increase in spending. The first leads to a price decrease whereas the latter leads to a price increase. Depending on the relative strength of the two responses, the total response might be a price increase, decrease or no response at all. This has obvious consequences for the estimation of the degree of price rigidities. For example, suppose that prices do not respond at all to a positive technology shock. Viewed through the lens of a complete markets model, this would be interpreted as a very high degree of price rigidities. View through the lens of an incomplete markets model where spending is increased simultaneously, this would be consistent with very flexible prices. Prices do not change because it is not optimal to do so.

Interestingly, while prices and spending increase in response to a positive technology shock in post-1983 US data, in the earlier period prices fall. We find, consistent with Clarida et al. (2000), that the interest rate rule has changed around the 1980s. Beyond this, we also find a switch in fiscal policy.

We finally ask whether the assumption on financial markets matter for the economy's response to a monetary policy results and find that the answer depends on the conduct of fiscal policy. As discussed above, fiscal policy can (theoretically) eliminate any differences in the response to monetary policy between models with complete and incomplete markets if it offsets the distributional consequences of monetary policy. The direct effect of monetary policy plus the indirect induced effect on fiscal policy together determine the total effect of a change in monetary policy. However, whether fiscal policy is offsetting is ultimately an empirical question of how fiscal policy responds to monetary policy. Our results allow us to answer this question for post WWII data and we find that it matters.

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