



# Fiscal stimulus and distortionary taxation <sup>☆,☆☆</sup>



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## ABSTRACT

We quantify the fiscal multipliers in response to the American Recovery and Reinvestment Act (ARRA) of 2009. We extend the benchmark medium-scale New Keynesian model, allowing for credit-constrained households, the zero lower bound, government capital, and distortionary taxation. The posterior yields modestly positive short-run multipliers around 0.53 and modestly negative long-run multipliers around  $-0.36$ . We compare and relate recent literature multiplier calculations to ours. We explain the central empirical findings with the help of a simple three equation New Keynesian model with sticky wages and credit-constrained households.

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## 1. Introduction

Since the financial crisis, fiscal policy has been at the heart of policy debates. Many European governments struggle with the debt they accumulated because of their fiscal response to the financial crisis. In the US, the debt ceiling, and cuts to transfer programs or direct tax increases to finance the government deficit are key policy issues that point to the costs of increased government spending. At the same time, it is often argued that the effect of government spending on GDP and unemployment is larger in a financial crisis, making discretionary spending more attractive. In this paper, we bring both aspects of “fiscal stimulus” together. We quantify the size, uncertainty, and sensitivity of fiscal multipliers in response to a fiscal stimulus, as in the American Recovery and Reinvestment Act (ARRA) of 2009 in the United States, using an extension of a benchmark New Keynesian model.

Purists might disagree with the focus on the size of fiscal multipliers. Policy should care about welfare, rather than derivative measures such as GDP or unemployment. Policy should solve a Mirrlees–Ramsey problem and use the best combi-

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nations of available tools to maximize welfare, subject to constraints imposed by markets and the asymmetry of information. We do not disagree. Indeed, there is considerable literature on these topics. We address welfare issues in Section 7, but they are not the main focus of this paper.

Many public debates focus on the effects of fiscal spending on GDP and unemployment. Economists have the tools to answer these questions, and therefore, perhaps they should. Several recent papers have addressed these issues. This paper seeks to contribute to this literature. We quantify the relative importance of the optimistic analysis of fiscal policy in New Keynesian models of the zero lower bound (ZLB) (e.g., Eggertsson, 2010 and Christiano et al., 2011) relative to the pessimistic assessment of fiscal policy in a neoclassical growth model with distortionary taxes as in Uhlig (2010b). We therefore use a model that adds many New Keynesian frictions to the backbone of the neoclassical growth model with distortionary taxes, building on the models in Christiano et al. (2005) and Smets and Wouters (2007). We extend the fiscal sector in these models by including distortionary labor taxes and productive government capital. We also add rule-of-thumb consumers to give transfers a role. The ARRA is modeled as a gradual build-up of government transfers, government consumption, and government investment. We simulate the ARRA effect with a deterministic ZLB duration, using the model posterior to quantify parameter uncertainty.

In a nutshell, we find: While the benchmark long-run multiplier is modestly negative, rather than substantially negative as in the pure neoclassical model, and while the precise answer is sensitive to some key assumptions and uncertain parameters, much of the pessimistic assessment survives indeed. For a benchmark parameterization, we find modestly positive short-run multipliers with a posterior mean of 0.53 and modestly negative long-run multipliers centered around  $-0.36$ . These multipliers are substantially higher than multipliers away from the ZLB, but lower than the short-run multiplier of 1.2 reported in Christiano et al. (2011) and of 1.55 in Coenen et al. (2012).

Using our posterior estimates, we show that four key model ingredients explain the bulk of the difference between our estimates of the short-run multiplier and those in the literature. First, rule-of-thumb consumers matter and increase the short-run multiplier. Rule-of-thumb-consumers increase the multiplier by about 0.31 and thereby explain most of the difference between Christiano et al. (2011) and Coenen et al. (2012). Second, the composition of the stimulus matters: Moving from a consumption-only stimulus to the ARRA composition of fiscal stimulus with consumption, investment, and transfer components lowers the multiplier by 0.70. This explains most of the difference between our results and Coenen et al. (2012). The remaining two important components of are model are the introduction of the empirical built-up in government expenditures and the presence of distortionary rather than lump-sum taxes. Both lower the median posterior multiplier further, by about 0.12 each.

Comparing median multipliers abstracts from our uncertainty about model parameters. We therefore use Bayesian estimation techniques as well as sensitivity analysis to quantify the uncertainty in our answers. Given our model, the data turns out to be quite informative about multipliers. While the 90% prior confidence intervals exceed 1.0 in our baseline scenario, the 90% posterior confidence interval for short-run multipliers is typically in the order of 0.15 or smaller. This implies that the model features described above matter more than the parameter uncertainty within our model, as also pointed out by Leeper et al. (2011). This is desirable: The model assumptions should be crucial.

Multipliers are, however, sensitive to some key model parameters. Both short-run and long-run multipliers increase in the fraction of transfers given to rule-of-thumb consumers and the anticipated length of the zero lower bound, but fall when taxes are adjusted faster. Multipliers are non-linear in the degree of price and wage-stickiness, but fall when nominal rigidities are smaller than estimated. Long-run multipliers in particular are also sensitive to the specification of distortionary taxes the size of the tax base and which type of taxes is adjusted.

We develop a version of the workhorse three equation New Keynesian model that explains the key results of our sensitivity analysis. For example, our finding that adjusting labor taxes faster lowers multipliers and more flexible prices and wages can lower the multiplier at the ZLB is seemingly at odds with the literature: Eggertsson (2011) suggests that raising labor taxes at the ZLB should increase the multiplier in the workhorse New Keynesian model. Farhi and Werning (2012) point out that the government spending multiplier should increase with price flexibility at the ZLB in the same model. Both arguments operate through higher expected inflation channel which lowers real interest rates at the ZLB. We show that introducing distortionary labor taxes and rule of thumb consumers into the three equation New Keynesian model with rigid wages explains the opposing results of our sensitivity analysis. In particular, it shows that adjusting labor taxes at the ZLB can even push the pure government consumption multiplier below one because of a traditional Keynesian demand effect due to the rule-of-thumb consumers. This direct demand effect can dominate the substitution effect through expected inflation.<sup>2</sup> Second, when taxes are adjusted only slowly the response of the monetary policy to higher labor taxes after exit from the ZLB explains why more nominal rigidity raises the multiplier in our model: More flexible wages imply a higher pass-through of labor taxes to wage and ultimately price inflation. According to the Taylor rule, monetary policy reacts aggressively to higher inflation. Lower future consumption leads agents to also lower their demand in the short-run and results in lower multipliers.

<sup>2</sup> Our finding complements the finding in Erceg and Linde (2014) that tax rules can lower the slope of the Phillips Curve and thereby weaken the expected inflation channel. Since the expected inflation channel underlies Eggertsson (2011), this Phillips Curve channel can further explain why distortionary tax financing lowers the multiplier even at the ZLB.

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