Measuring How Fiscal Shocks Affect Durable Spending in Recessions and Expansions

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How big are government spending multipliers? A recent litererature has argued that while government spending multipliers may be small on average, they might be much larger during recessions when there is greater economic slack. However, this simple intuition ignores the significant heterogeneity of spending captured in aggregate GDP. Even if aggregate GDP responds more to fiscal shocks during recessions, some subcomponents of GDP may become less responsive during recessions.

Such compositional differences in cyclical responsiveness matter even if policy makers care only about aggregate multipliers. This is because the government can control not just the timing of its spending but also its composition. If the government has a fixed amount of spending to allocate, it will be most effective at increasing aggregate demand if it targets that spending towards components of GDP which are particularly responsive during recessions.

While it may initially seem counterintuitive that some components of GDP should be less responsive to government spending during periods of slack economic activity, Berger and Vavra (2012) show that theoretical models consistent with household level micro data have exactly this prediction for aggregate durable spending. The basic intuition is straightforward: it is well-known that there are substantial transaction costs that lead consumer durable and housing purchases to be infrequent and lumpy. Berger and Vavra (2012) estimate a household model with fixed costs of durable adjustment to match consumption patterns in the PSID and they find that during recessions, few households adjust their durable holdings. Since fewer households purchase durables, this leads aggregate durable

purchases to be relatively insensitive to fiscal shocks.[1] While Berger and Vavra (2012) test their model using PSID micro data, their result requires strong structural modeling assumptions.

In this paper, we test directly whether the response of durable spending to fiscal shocks is different in recessions and expansions using the non-linear VAR methodology pioneered by Auerbach and Gorodnichenko (2012). As predicted by the theoretical model in Berger and Vavra (2012), we find strong evidence that the aggregate durable spending response to fiscal shocks is substantially larger during expansions than during recessions. This stands in stark contrast to the patterns observed for the aggregate multiplier.

This has direct relevance for the structure of fiscal stimulus. During the Great Recession of 2007-2009 a number of policies such as the "Cash-for-Clunkers" and the "First-Time-Homebuyers" credit were enacted with the purpose of stimulating durable demand. Our VAR evidence suggests that these programs were probably not particularly effective (relative to alternative spending options) at increasing total output. Durable spending is particularly unresponsive to government spending during recessions, so stimulus policies targeting durable spending are unlikely to be cost-effective ways of stimulating aggregate demand.

I. Econometric Specification

Our econometric specification is taken from Auerbach and Gorodnichenko (2012). Their

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[1] While this description captures the basic intuition, the result in Berger and Vavra (2012) is somewhat more subtle: in addition to time-variation in the frequency of durable adjustment, there is also time-variation in the strength of "selection" effects. In models with fixed costs of durable adjustment, the aggregate durable response to shocks depends not just on how many households adjust but also on which households choose to adjust. During booms these selection effects become more important and amplify the direct effects of changing frequency.

STVAR (smooth transistion VAR) model is given by:

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\begin{aligned}
X_t &= [1 - F(z_{t-1})]\Pi_E(L)X_{t-1} \\
&\quad + F(z_{t-1})\Pi_R(L)X_{t-1} + u_t, \\
&\quad u_t \sim N(0, \Omega_t) \\
\Omega_t &= [1 - F(z_{t-1})]\Omega_E + F(z_{t-1})\Omega_R \\
F(z_t) &= \frac{\exp(-\gamma z_t)}{1 + \exp(-\gamma z_t)}, \quad \gamma > 0 \\
var(z_t) &= 0, \ E(z_t) = 0
\end{aligned}
$$

Our baseline specification is quarterly and uses the following variables: $X_t = [G_t, T_t, Y_t, DS_t]'$, where G is log real government spending, T is log real government receipts net of transfers, Y is log real gross domestic product in 2009 dollars and DS is log real spending on durables. In our benchmark specification we measure DS as the sum of spending on consumer durables plus residential investment.[2] In essence, this is the same baseline specification used by Auerbach and Gorodnichenko (2012), with the addition of a new component in the VAR: aggregate durable spending. Our baseline ordering of variables means that shocks to tax receipts, output and durable expenditures have no contemporaneous effect on government spending. This "minimum-delay" identifying assumption is common in this literature because it provides a sensible desciption of realistic lags in the appropriations process at business cycle frequencies.

Again following Auerbach and Gorodnichenko (2012), our empirical model allows the propogation of shocks to differ over the business cycle in two ways. First, we dynamically allow the lag-polynomials of the VAR to differ across expansions ($\Pi_E(L)$) and recessions ($\Pi_R(L)$). Second, we allow for contemporaneous differences in the covariance structure of shocks during expansions expansions (Ω_E) and recessions (Ω_R). The model implies that the economy at a moment in time is a convex combination of expansionary and recessionary dynamics, where $F(z_{t-1})$

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[2] We prefer to use a broad measure of durable spending in our benchmark, but in the following section we show that our results are not sensitive to this assumption.

is the transition function that determines how these two regimes are combined. Following Auerbach and Gorodnichenko (2012) we set z_t to be the standardized seven quarter moving average of output growth and the transition function $F()$ to be the logistic function. Here, positive values of z_t denote expansions. We date the transition function at period $t - 1$ so as to exclude contemporaneous feedback effects from policy actions to the the state of the economy. We calibrate $\gamma = 1.5$ so that the economy spends aproximately 20% of the time in a recessionary period, where we define a recession as a time when $F(z_t) > 0.8$, but the quantitative results are not too sensitive to choosing reasonably different values of γ.

We estimate the system of non-linear equations (1)-(5) using the Monte Carlo Markov Chain methods developed in Chernozukov and Hong (2003). An advantage of this approach is that under standard conditions this approach leads us to find a global optimum. Additionally, standard errors can easily be computed from the simulated Markov chains.

In this paper, we focus on the response of durable expenditures and output to changes in government purchases. In principle we could also examine the impulse response functions to changes in tax receipts, but we choose to focus on impulse response functions to changes in government purchases for two main reasons. First, the literature that has studied aggregate multipliers has generally focused on the response to government spending, and we want to show that different components of GDP respond differently to the same set of shocks. For example, Auerbach and Gorodnichenko (2012) almost exclusively discusses differences in the response of GDP to government spending shocks in recessions an expansions. Second and more importantly, the interpretation of regime-specific differences in estimated impulse response functions to tax receipts faces a substantial complication. As discussed in Blanchard and Perotti (2002), the identification of tax shocks depends crucially on the elasticity of tax revenue to output. Since this elasticity likely varies cyclically, estimating the impulse response of durable spending to tax receipt innovations is subject to a bias of both unknown magnitude and direction.

II.   Results

We begin by considering the effects of aggregate government purchases in a simple linear as well as in a STVAR model that includes regime shifts. As mentioned in the previous section, our basic specification is [*G T Y DS*] for the cholesky decomposition and the sample period is 1947:I-2013:II. Here *DS* is the sum of spending on consumer durables and residential investment in a given quarter. Figure I shows the impulse response functions (IRFs) to a government spending shock. These figures show by how many dollars durable expenditures and output change over time when there is an exogenous $1 increase in government expenditures. In other words, these are the fiscal multipliers for durable expenditures and output. All shaded regions denote 90% confidence intervals.
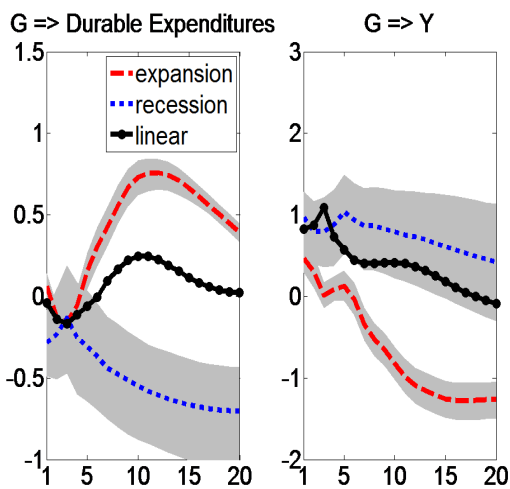

Figure 1: Impulse responses in expansions, recessions and in a linear model

We first discuss the total output multiplier because this object has been the source of extensive research. The dynamic behavior of this multiplier is shown in the right-panel of Figure I. Consistent with previous work (Hall, 2009; Auerbach and Gorodnichenko 2012), the maximum size of this multiplier in a linear VAR is close to one and is achieved after a few quarters. Additionally, consistent with Auerbach and Gorodnichenko (2012), we find evidence that the size (and sign) of the output multiplier is state-dependent. This multiplier has a point estimate above one during recessions and is significantly lower and even becomes negative dur-

ing expansions. This suggests that unexpected changes in government spending lead to much larger changes in output if they occur in recessions.

The left-hand panel of Figure I isolates the response of durable expenditures to the same government spending shocks. The first thing to notice is that the level of this multiplier in all models is lower than the output multiplier. In the linear model, it acheives a maximum value close to 0.3. This lower level is not surprising since most changes in government expenditure only affect durable expenditures indirectly either through interest rate changes or through the level of overall consumer demand. The second and more important feature of the figure is that the durable expenditure multipler is significantly procyclical. During expansions, the multiplier exhibits a hump-shaped pattern and reaches a maximum value above 0.8. In constrast, the value of the multipler during recessions is almost exclusively negative. This large level of state-dependence is consistent with the theoretical results in Berger and Vavra (2012).

While our benchmark results use a broad measure of durable spending it is straightforward to redo the analysis using different subcomponents of durable spending. Figure II separately shows the durable multiplier for consumer durables and residential investment.
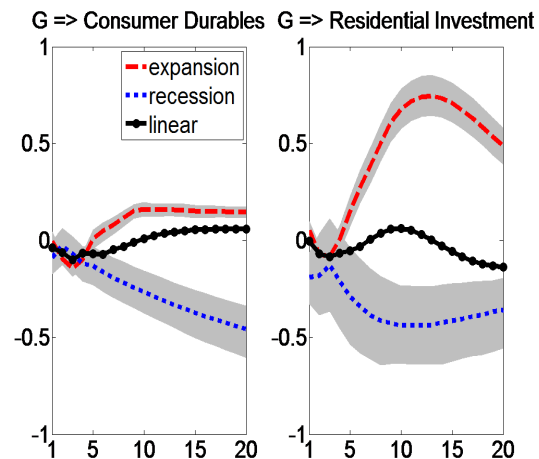

Figure II: Impulse response functions by type of durable expenditure

Both types of durable spending display signficant variation in their responses to government spending at different points in the business cy-

cle. The maximum multipler during expansions is 0.2 for consumer durables and over 0.6 for housing expenditures, whereas the estimated multiplier is almost always negative during recessions. This constrasts with the results from a linear VAR which predicts that the multiplier is close to zero for both consumer durables and residential investment. In the theoretical model of Berger and Vavra (2013), the cyclical sensitivity of durable responsiveness is increasing in the size of fixed adjustment costs. Since housing investment is subject to bigger fixed costs than consumer durables, their model predicts that the magnitude of state dependence should be greater for residential investment, which is exactly what we find in figure II.
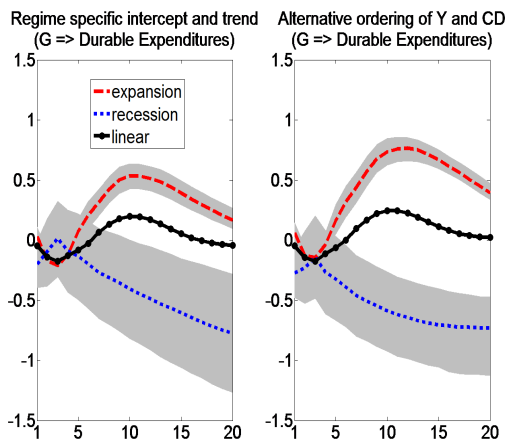

Figure III: Impulse response functions: robustness checks

Finally, figure III displays two robustness checks for our baseline VAR. The left-panel show the results when we allow for regime-specific time trends in the VAR. This more flexible specification has somewhat larger standard errors, but the basic message is uchanged: durable expenditure responses to government spending shocks are significantly larger during expansions than during recessions. The right-panel of figure III displays the results when we switch the ordering of output and durable expenditures in our baseline VAR. Again, the results are very similar quantitatively to what we find in figure I. Thus overall we find strong evidence that the durable expenditure multipler is procyclical.

III. Conclusion

A large theoretical literature argues that aggregate government spending multipliers may be much larger in recessions than in expansions. A much smaller empirical literature has found support for these theoretical conclusions. However, this literature has largely ignored the fact that what is true for aggregate output may not be true for each of its subcomponents. If different subcomponents of GDP exhibit different cyclical sensitivity to government spending then fiscal policy should take such differences into account. If the government only has a fixed amount of spending to allocate across various programs, it can achieve more bang-for-the-buck by implementing programs which target components of GDP which are particularly responsive during recessions.

In this paper, we provide evidence that durable expenditure impulse response to government spending shocks is strongly procyclical. This holds both for consumer durable expenditues as well as for housing investment. While these results might seem counterintuitive, they are consistent with the theoretical predictions of the fixed cost model of durable demand in Berger and Vavra (2012). More broadly, these empirical results are important because policies aimed to stimulate durable purchases are popular during recessions. However, our VAR evidence suggests that these programs are probably not particularly effective (relative to alternative spending options) at increasing total output.

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