

fiscal multipliers

The concept of fiscal multipliers is examined in the context of the major theoretical approaches. Differing methods of calculating multipliers are then recounted (structural equations, VAR, simulation). The sensitivity of estimates to conditioning on the state of the economy (slack, financial system) and policy regimes (exchange rate system, monetary policy reaction function) is discussed.

Introduction

The fiscal multiplier plays a central role in macroeconomic theory; at its simplest level, it is the change in output for a change in a fiscal policy instrument. For instance,

$$\frac{dY_t}{dZ_t}$$

where Y is output (or some other activity variable) and Z is a fiscal instrument, either government spending on goods and services, on government transfers, or taxes or tax rates. Since there are typically lags in the effects, one should distinguish between impact multipliers (above) and the cumulative multiplier:

$$\frac{\sum_{j=0}^n dY_{t+j}}{\sum_{j=0}^n dZ_{t+j}}$$

The interpretation of the fiscal multiplier is complicated by the fact that it is not a structural parameter. Rather, in most relevant contexts, the multiplier is a function of structural parameters and policy reaction parameters.

The issue of fiscal multipliers took on heightened importance in the wake of the 2008 global financial crisis, in which monetary policy and nondiscretionary fiscal policy proved insufficient to stem the sharp drop in income and employment. Substantial confusion regarding the nature and magnitude of fiscal multipliers arose; many of the disagreements remain.

This survey reviews the theoretical bases for the fiscal multiplier in differing frameworks. Then the differing methodologies for assessing the magnitude of differing multipliers are reviewed. Special cases and allowances for asymmetric effects are examined.

Theory

The neoclassical synthesis

The simplest way to understand multipliers is to consider an aggregate supply–aggregate demand model in the Neoclassical Synthesis – essentially a framework with short run Keynesian-type attributes and long run Classical properties. While this framework is not particularly rigorous, it turns out that many of the basic insights gleaned in other approaches can be understood in this framework.

For the moment, think of the aggregate demand as separable from the aggregate supply. Demand depends on fiscal policy and monetary policy, while the long run aggregate supply curve is determined by the level of technology, labour force, and capital stock. In the short run, a higher price level is associated with a higher economic activity.

Over time, the price level adjusts toward the expected price level and any deviation of output from full employment is eventually eroded. Hence, in the long run, the Classical model holds, so that any fiscal policy has zero effect. This framework is sometimes called the Neoclassical synthesis.

The more responsive the price level to the output gap, the smaller the change in income for any given government spending increase. In the extreme case, where there is no response of wages and prices to tightness in the labour and product markets, then the multiplier is relatively large. In this Keynesian model, the multiplier is a positive function of the marginal propensity to consume. From the national income accounting perspective, a distinction has to be made between spending on goods and services, and transfer expenditures. The former will have a larger impact on output than the latter.

In the other extreme case, where wages and prices are infinitely responsive to the output gap, the short run aggregate supply and long run aggregate supply curve are the same. Then clearly the fiscal multiplier is zero. (Note that the supply side perspective can be interpreted in the framework of the Neoclassical Synthesis. The long run aggregate supply depends on the capital stock and labour force employed, as well as the level of technology. If marginal tax rate reductions increase employment and/or investment, then the multiplier for tax rate changes could be positive, even in the absence of demand effects.)

In addition, the multiplier also depends critically on the conduct of monetary policy. When policy controls the money supply, the multiplier depends on the income and interest sensitivities of money demand. In the more general case where there is a monetary policy reaction function, the multiplier will depend on the reaction function parameters. For instance, if the central bank is completely accommodative (i.e. keeps the interest rate constant), the multiplier is larger than if it is non-accommodative (as discussed further in the section on monetary regimes).

New Classical approaches

The real business cycle (RBC) approaches can be thought of as stochastic versions of the Classical Models. One of the defining features of these types of models is the incorporation of microfoundations, in particular intertemporal considerations. With infinitely lived agents and no nominal rigidities, non-distortionary taxes have no impact on the present value of income. Hence, tax cuts have no impact on consumption, and thus on income. This tax cut result is often characterised as Ricardian equivalence (Barro, 1974).

The implications of government spending are more difficult to analyse. In particular, if government spending is financed by higher non-distortionary taxes, then after tax income declines. As a consequence, labour effort increases, and output (measured as the sum of private and public consumption) rises. In the standard setup, where government consumption yields no utility, social welfare decreases even though output rises.

When distortionary taxes are used to pay for government spending, then both output and social welfare will decline. Then the government spending multiplier would be negative.

While the stereotype of the RBC approach is consistent with small multipliers, small variations in the assumptions can deliver large multipliers.

For instance, assuming that government capital and private capital and labour are complements can deliver large fiscal multipliers (Baxter and King, 1993). Notice, however, that the multipliers in this case do not arise from the familiar demand-side effects, but rather from supply-side effects.

New Keynesian models

New Keynesian models represent the result of combining microfounded models incorporating intertemporal optimisation with Keynesian-type nominal and real rigidities. Such models are associated with Gali and Woodford, for instance. The basis of these models are the real business cycle models, with money introduced using money in utility functions. The deviations from the RBCs usually come in the form of rigidities, both nominal and real. Nominal rigidities are often introduced by way of sticky prices; prices adjust at random points in time (often called Calvo pricing). Real rigidities often include adjustment costs (say, for investment) and deviations from full intertemporal optimisation: for instance, rule-of-thumb or hand-to-mouth consumers (e.g. Gali *et al.*, 2007). In addition to allowing the models to fit the data better, the inclusion of these rigidities provides a role for fiscal as well as monetary policy.

Because the models are built around an essentially neoclassical framework, policies do not have large long run effects. However, in the short term, monetary and fiscal policies have an effect on output. The magnitude of the impact depends on the various parameters of the model, and – as in the Keynesian model – the nature of the monetary policy reaction function. An excellent overview of how these factors come into play in determining the multiplier is provided by Woodford (2011).

One key limitation highlighted by the financial crisis and the ensuing recession and recovery is the omission of financial frictions. In fact, the financial sector in the typical New Keynesian model is usually very simple (a single bond, for instance; in two-country models, uncovered interest parity might be relaxed by the inclusion of an *ad hoc* risk premium term).

Summing up, one can see that the different types of model will deliver fiscal multipliers of almost any magnitude. Moreover, even models of a particular class can deliver quite different multiplier values, depending on underlying parameter values and the assumptions regarding monetary policy reaction functions. As a consequence, one can only address the magnitude of multipliers by empirics.

Empirics

There are many ways of calculating multipliers, with the approaches often associated with certain theoretical frameworks. However, in general, there are three major approaches: (1) structural econometric, *à la* Cowles Commission; (2) vector autoregressions (VARs); and (3) simulation results from dynamic stochastic general equilibrium (DSGE) models. There are also other miscellaneous regression approaches.

Structural econometric approaches

The earliest approach to estimating multipliers involved estimating behavioural equations for the economy. Since the multiplier depends critically upon the marginal propensity to consume, estimates of the

consumption function are central to the enterprise of calculating the multiplier. This enterprise is closely associated with the Cowles Commission approach to econometrics, which used (Keynesian) theory to achieve identification in multi-equation systems.

Large-scale macroeconomic models are the descendent of the early Keynesian Klein Goldberger model (Goldberger, 1959), and – despite the disdain with which such models are held in academic circles – they still provide the basis for most estimates of multipliers. It appears that business sector economists still find such models useful for forecasting and policy analysis. They include the models run by Global Insight-IHS and Macroeconomic Advisers.

The equations in such models include, for instance, a consumption equation, an investment equation and price adjustment equations. Identification would require that there should be sufficient number of exogenous variables. Two assaults on this approach include the Lucas econometric policy evaluation critique, and the charge of incredible identifying assumptions (Sims, 1980).

In the former case, the relevant question is whether the estimation procedure (which typically incorporates a complicated lag structure) actually identifies parameters that are invariant to policy changes (such as government spending changes). (Ericsson and Irons (1995) have argued that the Lucas critique is actually seldom relevant, given that large policy changes are rare.) In the latter, the concern is that identification is not possible, since there are very few truly exogenous variables. This concern motivates the enterprise of estimating vector autoregressions (described below).

While it is customary to disparage these types of model as eschewing intertemporal considerations, this characterisation is not always accurate. Some macroeconomic models incorporate model-consistent expectations – essentially an implementable version of rational expectations. Taylor (1993) is an early example of a relatively conventional macroeconomic model with forward-looking expectations. Other cases include the IMF's Multimod and the Fed's FRB/US model: see Laxton *et al.* (2008) and Brayton *et al.* (2007).

Vector autoregressions (VARs)

Sims (1980) argued that the Cowles Commission approach to estimating large systems of equations required 'incredible' identifying assumptions. His alternative approach involved estimating a small system of equations, where each variable is modelled as a function of lags of all variables in the system. In Sims' original formulation, a recursive ordering is assumed.

Since there are no exogenous variables, the response is expressed in terms of the error term – or shock. That is, the response is expressed in terms of the unpredictable component of government spending or tax revenues, and not in terms of a given change in either of those instruments.

There is no reason why the nature of shocks should follow a recursive ordering. Alternative approaches include long run restrictions, wherein one variable is not affected by a shock in another variable in the long run. This approach was pioneered in Blanchard and Quah (1989). Short run restrictions can also be incorporated, such that a shock to one variable has no immediate impact on another, as in Clarida and Gali (1993). Blanchard and Perotti (2002) used institutional features to add additional restrictions. Yet other types of restriction, including negative or positive responses, are also feasible (Mountford and Uhlig, 2009). Ramey (2011b) focused on news

in defence spending as a means of circumventing issues of identifying exogenous shocks. In all these cases, belief in the results depends upon how plausible one finds the identifying restrictions – including the restrictions on the number of relevant equations. These VARs typically employ relatively few equations, due to the large number of parameters that have to be estimated.

Another way of dealing with the issue of distinguishing between endogenous and exogenous fiscal measures is to use a narrative approach, as pioneered by Romer and Romer (1989) for monetary policy. Romer and Romer (2010) estimated the impact of tax changes on output using this approach.

Simulations using dynamic stochastic general equilibrium models

In response to the criticism of the *ad hoc* nature of the large-scale macroeconomic models, most recent analyses of policy effects have been conducted using dynamic stochastic general equilibrium (DSGE) models which incorporate, to a greater or lesser degree, New Keynesian formulations.

The equations in these models are either calibrated (that is parameter values are selected) or estimated, or a combination thereof is used. The majority of these models incorporate Ricardian equivalence, contrary to the bulk of empirical evidence. Hence, almost by assumption, fiscal multipliers are typically small relative to those obtained in traditional macroeconomic models. In cases where Ricardian equivalence is dispensed with, multipliers are typically larger. (See for instance Kumhof *et al.* (2010). Note that instead of the future tax burden rising with spending, future spending might be restrained. Corsetti *et al.* (2010) and Corsetti *et al.* (forthcoming) trace out the dynamics in this case.)

Miscellaneous approaches

Since multipliers are changes in output for a change in a fiscal instrument, estimation can proceed in a variety of ways. The simplest entails regression of output changes on instrument changes; the challenge is controlling for other effects. Since discretionary fiscal policy reacts, by definition, to other factors that might be unobservable to the econometrician, there are serious challenges to this approach. For instance, Almunia *et al.* (2010) use panel regression analysis (in addition to VARs) for a set of countries; Nakamura and Steinsson (2011) for a set of states; and Acconcia *et al.* (2013) for Italian provinces. In contrast, Barro and Redlick (2009) use a long time series for the USA. (Reichling and Whalen (2012) survey ‘local multipliers’, which tend to focus on employment – rather than output – effects in subnational units. Other relevant studies (typically focusing on employment effects) include Chodorow-Reich *et al.* (forthcoming), Mendel (2012) and Moretti (2010).)

A survey of basic results

Obviously the literature is too voluminous to review comprehensively. I focus first on the USA. CBO (2012a, Table 2) has provided a range of estimates that the CBO considers plausible, based upon a variety of empirical and theoretical approaches (see Table 1).

For goods and services, the range is 0.5 to 2.5; in line with demand side models, the cumulative multiplier for government spending on transfers to

Table 1 Ranges for US cumulative output multipliers (source: CBO (2012a), Table 2).

Type of activity	Estimated output multipliers	
	Low estimate	High estimate
Purchase of goods and services by the Federal Government	0.5	2.5
Transfer payments to state and local governments for infrastructure	0.4	2.2
Transfer payments to state and local governments for other purposes	0.4	1.8
Transfer payments to individuals	0.4	2.1
One-time payments to retirees	0.2	1.0
Two-year tax cuts for lower- and middle-income people	0.3	1.5
One-year tax cut for higher-income people	0.1	0.6

individuals are typically lower, and range from 0.4 to 2.1. Tax cuts for individuals have a multiplier of between 0.3 and 1.5, if aimed at households with a relatively high marginal propensity to consume. (See the survey of approaches in the appendix to CBO (2012a).)

When assessing whether a government spending multiplier is large or small, the value of unity is often taken as a threshold. From the demand side perspective, when the spending multiplier is greater than one, then the private components of GDP rise along with government spending on goods and services; less than one, and some private components of demand are crowded out. (Since transfers affect output indirectly through consumption, multipliers for government transfers to individuals should be smaller than multipliers for spending on goods and services.)

Reichling and Whalen (2012) discuss the range of multiplier estimates associated with various approaches. Ramey (2011a) also surveys the literature, and concludes spending multipliers range from 0.8 to 1.5. Romer (2011) cites a higher range of estimates, conditioned on those relevant to post-2008 conditions.

The above estimates pertain to the US. Obviously, one can expand the sample to other countries and other times. Van Brusselen (2009) and Spilimbergo *et al.* (2009) survey a variety of developed country multiplier estimates.

Almunia *et al.* (2010) find, using a variety of econometric methodologies, that fiscal multipliers during the interwar years are in excess of unity, when looking across countries. Barro and Redlick (2009) incorporate WWII data in their analysis of US multipliers; critics have noted that rationing during the WWII period makes extrapolation of their results to peacetime conditions questionable.

Distinctions

Large, closed vs. small, open economies

Theory suggests that, at least from the demand side, fiscal multipliers should be smaller in open economies (where openness is measured in the context of trade of goods and services), holding all else constant. This is because the leakage from a small open economy due to imports or purchases of internationally tradable goods more generally rising with income mitigates

the recirculation of spending in the economy. In a closed economy, the marginal propensity to import is arguably smaller. Ilzetzi *et al.* (forthcoming) estimate panel VARs and find that indeed small open economies have smaller multipliers.

In addition, for large economies, some portion of the leakage of spending that occurs through imports would return as increased demand for exports. That means that the large country multiplier would be larger than that for a small country, holding all other characteristics – such as trade openness – constant.

Fixed vs. flexible exchange rate regimes

Ilzetzi *et al.* find that countries under fixed exchange rates have larger multipliers than those under flexible exchange rates. This finding is in accord with the Mundell–Fleming model, which predicts that under fixed exchange rates, the monetary authority is forced to accommodate fiscal policy. With high capital mobility (which is likely in the set of countries examined), monetary policy has to be very accommodative, in order to maintain the exchange rate peg. Corsetti *et al.* (2012) obtain similar results regarding the magnitude of the multiplier, even after controlling for other factors (debt levels etc.) despite the fact that they find the policy rate rises. They argue imperfect peg credibility accounts for this effect.

In a slightly different context, Nakamura and Steinsson (2011) confirm this result. Examining states in the USA, they find that the fiscal multiplier is 1.5 for government spending on goods and services. Since the USA is a monetary union, they interpret this multiplier as one pertaining to small economies on fixed exchange rates.

Monetary regimes (inflation targeting, zero interest rate bound)

Perhaps the most important insight arising from the debates over fiscal policy during and after the great recession is that the multiplier depends critically on the conduct of monetary policy. This insight is obvious if one thinks about policy in a standard IS-LM framework, where the interest rate is constant either because of accommodative monetary policy (Davig and Leeper, 2009), or because the economy is in a liquidity trap. Christiano *et al.* (2011) provide a rationale for this effect in the context of a liquidity trap in a DSGE.

Coenen *et al.* (2012) show that in DSGEs, the degree of monetary accommodation is critical. When central banks follow a Taylor Rule or inflation forecast-based rules, then multipliers are relatively small. However, when monetary policy is accommodative – that is interest rates are kept constant – then the cumulative multiplier is greater. This finding is consistent with the idea that fiscal policy in a liquidity trap is equivalent to a helicopter drop. As DeLong (2010) notes, when the price level is fixed, a helicopter drop changes nominal demand one-for-one, and therefore must have real effects. However, a helicopter drop is a combination of (i) an open market operation (OMO) purchasing bonds for cash, and (ii) a bond-financed tax cut. The monetary effects of an OMO plus the fiscal effects of a tax cut must therefore add up to the effects of a helicopter drop. In a liquidity trap, where one believes an OMO is powerless, fiscal expansion must therefore be powerful.

This insight is of particular importance because estimates of multipliers based upon historical data are likely to be less relevant in current circumstances, where interest rates have been kept near zero since 2008.

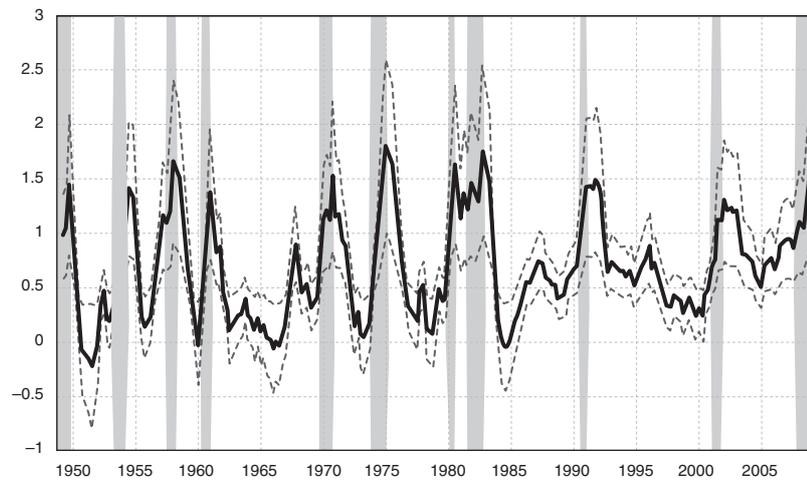


Figure 1 Historical multiplier for total government spending (Source: Auerbach and Gorodnichenko (2012b)).

There is some evidence that the effects of fiscal policy in Europe have been unusually large in recent years (see Blanchard and Leigh, forthcoming). One of the reasons is that the zero lower bound has prevented central banks from cutting interest rates to offset the negative short-term effects of fiscal consolidation.

Asymmetric fiscal effects

Many of the earlier studies assumed that the impact of fiscal policy was homogeneous across different states of the economy. Recent work has sought to relax this assumption. Given that the size of the multiplier is more relevant in certain circumstances than others, accounting for heterogeneous effects is critically important.

State-dependent multipliers

The demand side interpretation of the multiplier relies upon the possibility that additional factors of production will be drawn into use as demand rises. If factors of production are constrained, or are relatively more constrained, as economic slack disappears, then one might entertain asymmetry in the multiplier.

Auerbach and Gorodnichenko (2012a,b) and Fazzari *et al.* (2012) use VARs which allow the parameters to vary over expansions and contractions (Auerbach and Gorodnichenko use a smooth transition threshold where the threshold is selected a priori. Fazzari *et al.* estimate a discrete threshold.). Baum *et al.* (2012) condition on the output gap. The common finding in these instances is that multipliers are substantially larger during recessions.

To highlight the variation in the multiplier for the USA, I reproduce Figure 5 from Auerbach and Gorodnichenko (2012b), which plots their estimates of the multiplier over time (Figure 1).

A different perspective on why long term multipliers are larger during periods of slack is delivered by Delong and Summers (2012). (Quantification of long-term impacts of depressed activity on potential GDP can be found in CBO (2012b).) They argue that long periods of depressed output can itself affect potential GDP, following the analysis of Blanchard and Summers (1986). The prevalence of high rates of long-term unemployed is one obvious

channel by which hysteretic effects can be imparted. When combined with an accommodative monetary policy or liquidity trap, the long term multiplier can be substantially larger than the impact multiplier.

Hence fiscal multipliers are largest exactly at times when expansionary fiscal policy is most needed. Estimates of multipliers based on averaging over periods of high and low activity are therefore useful, but not necessarily always relevant to the policy debate at hand.

Low versus high debt levels

Ilzetzki *et al.* (forthcoming) determine that fiscal multipliers are essentially zero when debt is above (the sample) average. Corsetti *et al.* (2012) also find multipliers are smaller when public debt is high, controlling for other factors, although the measured differences are modest.

In high-debt situations, contractionary fiscal policy can in principle stimulate activity in the short run if it raises confidence in the government's solvency and reduces the need for disruptive adjustments later on (Blanchard, 1990). A recent theoretical analysis of fiscal policy under conditions of high sovereign risk is by Corsetti *et al.* (forthcoming). A number of empirical studies find evidence of such expansionary effects (Giavazzi and Pagano, 1990; Alesina and Perotti, 1995; Alesina and Ardagna, 2010; and others). Other papers suggest that such findings of expansionary effects are sensitive to how fiscal consolidation is defined (IMF, 2010), and that the famous cases of expansionary contractions were typically driven by external demand rather than confidence effects (Perotti, 2011).

Ordinary versus stressed financial systems

Historical estimates of the fiscal multiplier also condition on data when the financial system is operating normally, or is at least not highly impaired. However, the financial conditions during the crisis were arguably abnormal. To the extent that credit constraints were more binding (e.g. Eggertsson and Krugman, 2010), households could be expected to behave in a more 'Keynesian' fashion, with less reference to 'permanent income'. This would tend to result in a larger multiplier. See also Fernández-Villaverde (2010).

Corsetti *et al.* (2012), confirm empirically (using VARs) that during times of financial crisis, fiscal multipliers are larger. They conjecture that liquidity-constrained households are more pervasive during crises. They add the caveat that this finding holds true when public finances are strong.

Conclusion

The magnitude of the fiscal multiplier, in theory and in the data, depends on the characteristics of the economy. In some senses this observation is obvious. What is less recognised is that the state of the economy is as, or more, important than many other aspects that have been the focus of analysis. The most critical aspects include the degree of slack in the economy, the state of the financial system, and the conduct of monetary policy.

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See also

monetary and fiscal policy overview;
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