The Effectiveness of Government Spending in Deep Recessions: A New Keynesian Perspective*

BY KEITH KUESTER

As the recent recession unfolded, policymakers in the U.S. and abroad employed both monetary and fiscal stabilization tools to help mitigate the downturn. One of the tools that can be used by fiscal policymakers is to actively purchase more goods and services: the idea being that the government's demand can offset the weak demand by households and firms. For such a policy to be effective, one needs to know the extent to which government spending can stimulate the economy. One of the models frequently used by economists who study business cycles suggests that the answer depends very much on the extent to which monetary policy can be employed to stabilize the economy. In this article, Keith Kuester reviews the literature on the effectiveness of government spending during severe recessions.

The U.S. economy is emerging from the deepest recession since the Great Depression. From late 2007 to the trough in the second quarter of 2009, output fell by more than 5 percent. At its peak, the unemployment rate had more than doubled from pre-recession levels. Many other economies witnessed similar declines.

As the recession unfolded, policymakers in the U.S. and abroad employed both monetary and fiscal stabilization tools to help mitigate the downturn. One of the tools used by fiscal policymakers was to actively purchase more goods and services, the idea being that the government's demand can offset

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[1] Fiscal stimulus packages, such as the American Recovery and Reinvestment Act of 2009, very broadly consist of one or both of two categories: outright purchases of goods or services by the government (government spending henceforth) and changes in transfers or taxes. This article is concerned with government spending.

*The views expressed here are those of the author and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

the weak demand by households and firms.[1] For such a policy to be effective, one needs to know the extent to which government spending can stimulate the economy, especially when the economy is in a severe recession.

One of the models frequently used by economists who study business cycles suggests that the answer depends very much on the extent to which monetary policy can be employed to stabilize the economy. "Conventional" monetary policy-making typically operates by targeting a certain level for an overnight interest rate. In the United States, for example, the Federal Reserve targets the federal funds rate. Monetary policy can reduce this interest rate in a recession to help stimulate private demand. The figure on the next page shows the level of the effective federal funds rate for more than half a century. Grey areas mark periods of recession. As can be seen, in the last recession, the Federal Reserve cut the federal funds rate essentially to a level of zero.

At that point, lowering the federal funds rate further is no longer feasible

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[2] When interest rates are at zero, central banks can still try to influence aggregate demand using "unconventional" monetary policy tools. In exceptional circumstances, such interventions can be warranted. Central banks can, for example, engage in purchases of financial assets to try to reduce interest rates in certain sectors. For example, during the recent recession, the Fed purchased mortgage-backed securities issued by the federal housing agencies. Fed Chairman Ben Bernanke, in a speech, called this "credit easing." Central banks can also increase the quantity of money and thereby try to influence aggregate demand, a strategy known as "quantitative easing." Chairman Bernanke's speech discusses the set of tools available to the Federal Reserve beyond conventional interest rate policy. The *Business Review* article by Michael Dotsey assesses some of the alternative policy tools in greater depth.
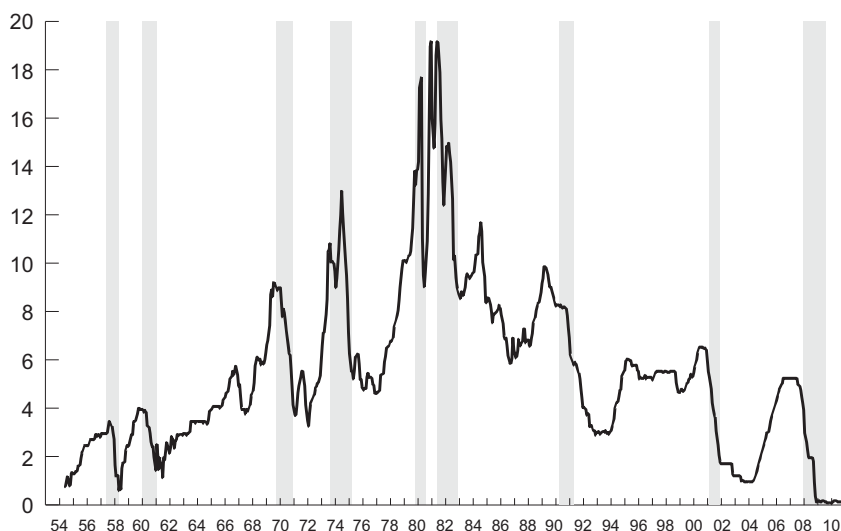
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because the nominal interest rate cannot fall below zero.[2] The zero lower bound on nominal interest rates occurs because cash yields a zero interest rate. Consider, for example, interest rates on loans. Imagine that you borrow a dollar today. You can store it as cash. If the interest rate is negative, you pay back less than you borrowed, and you do not need all of the cash you received initially in order to repay the loan. As a result, you would have made money from nothing. At the same time, the lender would take a sure loss. Therefore, no lender would offer loans with a negative interest rate. Similarly, interest rates on deposits cannot fall below zero either. You would be better off keeping your cash rather than depositing the money into a savings account that pays a negative interest rate. For these reasons, nominal interest rates cannot fall below zero.[3]

As the figure shows, in December 2008 the federal funds rate reached this level (of very close to zero) for the first time in the postwar period. The lack of historical evidence with overnight interest rates at zero suggests that previous experience may be only a limited guide to the effectiveness of government spending when monetary policy is constrained by the lower bound on interest rates. In order to ascertain the efficacy of government spending in the latest recession, researchers have therefore relied on theoretical arguments.

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[3] Clearly, the cash would need to be stored and could be stolen or destroyed, a fact that the argument above ignores. People may be willing to pay a fee to avoid the risk and the storage cost. Interest rates on some accounts could therefore fall somewhat below zero to the extent that this fee is reflected in the interest rate. What matters for the logic that follows is that there is a lower bound for interest rates, the existence of which places constraints on what monetary policy can do to stabilize economic fluctuations. Of lesser importance is whether the bound is exactly at zero, as assumed in the exposition that follows, or slightly below zero.

FIGURE

Effective Federal Funds Rate
(monthly average of daily data)

Effective federal funds rate, percent annualized. Grey areas mark official recession dates as determined by the National Bureau of Economic Research.
Source: Haver.

The literature reviewed in this article assumes that only conventional monetary policy is used. It argues that in a situation in which monetary policy is constrained by the lower bound on interest rates, government spending may be more effective than it usually is. This reasoning is based on the class of so-called New Keynesian models that have become one of the benchmark models for economists who study business cycle fluctuations. See, for instance, the article by Richard Clarida, Jordi Galí, and Mark Gertler for an introduction to this class of models.[4]

THE NEW KEYNESIAN MODEL

In their simplest form, New Keynesian models describe three economic relationships. The first relationship says how firms and households

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[4] The article by Michael Woodford and the one by Lawrence Christiano, Martin Eichenbaum, and Sergio Rebelo present a more technical overview of the arguments in this article.

adjust their demand for goods and services in response to changes in the real rate of interest. The real interest rate is the nominal interest rate minus the expected rate of inflation. Basically, the higher the real interest rate, the more goods consumers can buy in the future by forgoing a purchase today. Higher real interest rates therefore induce households to consume less and save more. Higher real interest rates also mean that firms must earn a higher rate of return on a project in order for the project to be cost-effective. A higher real interest rate therefore means less investment, too. In sum, a higher real interest rate means that private demand — the sum of consumption by households and of investment by firms — is lower.

The second relationship in the New Keynesian model concerns the link between inflation and how much firms produce. This relationship is central to the model and has been

given the name the New Keynesian Phillips curve. This Phillips curve is derived from a structural model of firms' price-setting behavior that has two key elements. First, firms have some pricing power. They can choose to sell more of their product by setting a lower price, or they can choose to sell somewhat less but at a higher price. Second, firms adjust their prices in response to events that have an impact on the economy, but the price adjustment is sluggish. That is, not all firms immediately adjust their prices to the full extent. These two features of the model allow monetary policy to affect output in the short run.[5]

According to the New Keynesian Phillips curve, if firms face lower demand for their goods or services, they will be inclined to reduce their prices to some extent, since they face lower costs of production. The costs tend to be lower, for example, since less demand means less revenue, which can allow firms to negotiate lower wages with their workers. Also, if firms expect future demand to be weaker or future inflation to be lower, they will be inclined to reduce their current prices in order not to get too far out of line with their competitors' prices and the price level in general. As a result, according to the model, inflation falls when aggregate demand (and thus aggregate output) falls.

The third and final relationship in the model describes how monetary policy is conducted. To conduct monetary policy, central banks generally vary a short-term interest rate in response to economic conditions. Indeed, the literature that this article discusses assumes that monetary

policy is carried out by using only the conventional monetary policy means of setting the overnight interest rate. This process usually involves lowering short-term interest rates when economic growth is weak or when inflation or expected inflation is below some desired level. Conversely,

it involves raising short-term interest rates when economic growth is strong or when inflationary pressures build up. It has been theoretically shown in a wide class of economic models that low and stable inflation allows the economy to employ resources more efficiently, which, in turn, is conducive to moderate long-term interest rates and maximum employment.[6] Such behavior therefore describes good conduct of monetary policy in this model environment.

Another property of well-designed monetary policy is that if inflationary pressures increase, central banks will raise the nominal interest rate by more than the amount by which expectations of inflation increase.[7] This behavior implies that the real rate rises when inflationary pressures increase. Such an increase of the real interest

rate reduces aggregate demand, as discussed above. This, in turn, brings down inflation through the New Keynesian Phillips curve relationship. Conversely, typically, the central bank reduces nominal rates by enough to make sure that the real interest rate falls when inflation falls below the

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desired level (or if economic activity is depressed). Thus, in general, the deeper a recession, the lower the real interest rate.

However, remember that nominal interest rates cannot fall below zero. Regardless of how low inflation may be expected to go or how severe a recession is, the central bank cannot reduce the nominal interest rate any further than to a level of zero. Importantly, once that bound on the interest rate is reached, the more depressed economic activity is, and thus the lower inflation is, according to the model, the *higher* is the real rate of interest. Note that this is the opposite of the relationship between inflation and the real interest rate that applies in "normal times." The reason is that monetary policy is constrained when the lower bound on the nominal interest rate is reached and cannot follow its usual stabilization practice. In such a circumstance, when the nominal interest rate is zero, the real interest rate is just the negative of the expected inflation rate. Lower inflation expectations then mean a higher real rate of interest.

These observations allow us to characterize how private demand is

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[5] Keith Sill's *Business Review* article describes this relationship in much more detail. It also explores the extent to which the resulting price-setting relationship can be used to infer the degree of inflationary pressure in an economy.

[6] The goals of monetary policy are spelled out in the Federal Reserve Act, which specifies that the Board of Governors and the Federal Open Market Committee should seek "to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."

[7] See, for example, the discussion in the paper by Clarida, Galí, and Gertler.

related to inflation. It turns out that demand is negatively related to inflation in normal times but positively related if monetary policy is constrained by the zero lower bound. The explanation for this is as follows: In "normal times," when inflation falls below a level that monetary policymakers deem consistent with price stability, monetary policy lowers the nominal interest rate by enough, so that the real interest rate falls. In response to this, households save less and demand more consumption goods. Firms invest more. In "normal times," therefore, because monetary policymakers want to ensure stable inflation, private demand tends to rise when inflation falls and tends to fall when inflation rises.

If the zero lower bound is binding, in contrast, monetary policy cannot ensure that this is the case. The relationship between inflation and private demand — according to the model — is reversed! In this circumstance, lower inflation implies a higher (rather than a lower) real interest rate, since conventional monetary policy cannot react by lowering the nominal interest rate. As a result, lower inflation implies *less* aggregate demand for goods and services.

This puts us in a position to discuss the effect of government spending in the model and to see why that effect can crucially depend on whether monetary policy is constrained.

GOVERNMENT SPENDING RAISES INFLATION IN THE NEW KEYNESIAN MODEL

The Phillips curve relationship is important for the logic that follows because it means that government spending in the model is inflationary. The reason is as follows. Higher government spending means that the government buys more goods and services from firms. Just as with higher private demand, the additional demand gener-

ated by the government means that firms have to produce more. Workers work longer hours, and firms use their capacity more intensively. As a result, wages and production costs increase, and firms raise their prices. Therefore inflation increases. This is so regardless of whether monetary policy is constrained by the zero lower bound on interest rates. What differs in the two regimes is how the real interest rate and private demand react to this increase in government spending.

In "normal times," if inflation rises, the central bank increases the nominal interest rate such that the real interest rate rises. As a result, households save more and consume less. Firms invest less. In short, private demand falls if government spending rises. Therefore, economic activity rises by less than the amount by which government spending has increased: Government spending has crowded out private demand because of higher real interest rates. The model therefore suggests that, normally, output rises by less than one dollar if government spending rises by a dollar. The technical term for this is that the "government spending multiplier" is less than one.[8]

THE GOVERNMENT SPENDING MULTIPLIER AT THE LOWER BOUND

Suppose now that a negative shock leads to a very strong reduction in private demand. Examples for such shocks are manifold. For instance, a collapse in asset prices could make households feel less wealthy, or financial turbulence could increase credit spreads and risk premiums. Or households' or firms' confidence

in future economic prospects may be diminished for other reasons. As private demand crumbles, and inflationary pressures succumb, the central bank reduces the nominal interest rate to counteract the recessionary impulse.

If the recessionary impulse is exceptionally deep, the central bank would want to reduce the nominal interest rate to less than zero. But it cannot do so: The lower bound on nominal interest rates becomes binding. As a result, unless the central bank now resorts to nonconventional monetary policy means, which this article does not take into account, the real rate of interest is higher than what the central bank would like to achieve, and aggregate demand is lower than desired.

Let us look at the effect of government spending under such circumstances. Higher government spending means more demand and thus higher inflation. Since the zero lower bound is binding, the higher inflation rate induced by the increase in government spending means that the real rate of interest will be *lower* than it would have been without the increase in government spending. This is so because at the zero lower bound, the real rate of interest is just the negative of the rate of inflation. Note that a lower real interest rate is precisely what monetary policy would have liked to achieve but could not by using only conventional monetary policy means.[9] The central bank thus does not raise the nominal interest rate in response to an increase in government spending.

[8] For a review regarding the existing empirical evidence on the effectiveness of government spending for "normal times," see the paper by Robert Hall.

[9] This, of course, raises the question of why central banks would want to confine themselves to using only conventional interest rate policy in the first place. Footnote 2 presents a brief discussion of nonconventional policy and provides references for further reading.

The lower real interest rate means that private consumption and investment increase. In the model, government spending, through the lower real interest rate, thus crowds *in* private consumption and investment when the zero lower bound is binding. In sum, not only does government spending rise, but so does private demand. Aggregate demand and output thus rise by more than the amount of government spending. This is at the core of why government spending multipliers may be bigger than one and therefore bigger than usual if the zero lower bound is binding.

REFINEMENTS AND CAVEATS
The above analysis has ignored the fact that both households and firms base their decisions not only on the current economic environment but also on their expectations about the future. The anticipation effects of fiscal policy are important in the model environment. For example, in order to affect private demand today, government spending need not occur immediately; a credible announcement of *future* spending can suffice. The reason is that a future increase in spending increases demand in that period and will therefore increase inflation in that period. This affects the real interest rate in the future and thus also the long-term real interest rate that households and firms face today. This means that government plans for future spending can affect saving and investment decisions today. Broadly speaking, announcing future government spending "crowds in" private demand today if the zero lower bound is expected to still be binding at the time of the higher spending and crowds it out otherwise. As Robert Hall, for example, emphasizes, these anticipation effects — at the zero lower bound — can lead to a stronger (cumulative)

response of output for a given dollar amount of the increase in government spending, suggesting that the credible commitment to future government spending alone can — via the effect on the long-run real interest rate — help stabilize current output. However, if the zero lower bound is not expected

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to be binding at the time of future spending, the long-term real interest rate rises, and such an announcement crowds out private demand today. This would be the case, for example, when the increase in government spending is persistent.

The above reasoning helps to explain some of the quantitative differences in the effectiveness of government spending that different studies find in a zero lower bound environment. Much of it hinges on the different timing of the increase in government spending. For example, Christiano, Eichenbaum and Rebelo find multipliers that are much bigger than one. In a similar model environment, the study by John Cogan, Tobias Cwik, John Taylor, and Volker Wieland reports multipliers of "just above" 1 percent for the first quarter of spending. Their estimates of the multipliers fall quickly to levels well below one in subsequent quarters of fiscal stimulus through government spending.

The difference between these two findings can be explained by the differences in the assumptions about the spending plans. Christiano and his co-authors assume that the government spending program ends once monetary policy ceases to be constrained by the

zero lower bound. In contrast, Cogan and his co-authors look at spending programs that last well beyond that point. As a result, in their simulations, there are many periods in which government spending increases the real interest rate and thus crowds out private demand, both at the time of spending and in the initial periods in which the zero lower bound is still binding.

For similar reasons, Christopher Erceg and Jesper Lindé emphasize that the size of the government spending packages matters for their cost-effectiveness. In the New Keynesian model environment, the bigger the government spending package, the earlier the zero lower bound may cease to bind. This means that government spending thereafter will – again – crowd out private demand. As a result, Erceg and Lindé stress that the first dollar of government spending in a zero lower bound situation increases output by more than the second dollar and so forth.

This suggests that if the New Keynesian model is a good guide for policy, fiscal stimulus may be most effective if it is well targeted in the sense that it is contingent on the disruption in the economy still being present and the zero lower bound still being binding.[10] In line with this, several papers argue that the deeper the economy is into a recession and the longer the recession is anticipated to last, the more effective will be fiscal stimulus through an increase in government spending.[11]

More recently, fiscal consolidation has received growing interest. Turning

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[10] That the benefit of fiscal stimulus depends on how persistent the economic disruption will be implies that it may be difficult for policymakers to ascertain the appropriate timing and amount of fiscal stimulus.

[11] See, for instance, the paper by Michael Woodford.

the above arguments upside down, my paper with Giancarlo Corsetti, André Meier, and Gernot Mueller argues that a credible upfront commitment to cut government spending in some *future* period, when the economy has already left the zero lower bound, can stimulate demand while the zero lower bound is still binding. The reason is that cuts in government spending reduce inflation. If well timed, they can thus reduce long-term interest rates. Such a commitment provides further stimulus to an economy that is still caught in the zero lower bound (that is, in times of a deep recession), and it helps to finance fiscal deficits. My co-authors and I stress that the timing of such spending reversals matters, however. If the consolidation comes too soon, we argue, the associated deflationary tendencies occur while the lower bound on interest rates is still binding, putting upward pressure on real interest rates and reducing the government spending multiplier.

All this said, the above analysis simplifies matters in a number of dimensions. Therefore, some caveats seem in order. First, the economic effects of government spending depend on the entire path of government spending, not just current spending.

Second, the implications for tax rates have not been fully explored. If future declines in government spending do not offset all of the increase in government spending in earlier periods, tax rates must eventually increase to balance the government's budget. Taxes, however, distort the economy. Increased taxes on labor income, for example, would tend to reduce the supply of labor. To the extent that these taxes are expected to be higher after the zero lower bound ceases to bind, future productive capacity will be reduced. In addition, inflationary pressures increase in the future. Both effects induce households to consume less initially, which weakens the effectiveness of the initial fiscal stimulus.[12] Third, the arguments are largely based on theory and model relationships that have been deduced for "normal times." Given that the zero lower bound very rarely binds, empirical evidence on government spending multipliers in such a situation is scarce. This means that, in practice, macroeconomists remain quite uncertain about the precise quantitative effects of temporary in-

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[12] The paper by Erceg and Lindé shows some simulations; the paper by Gauti Eggertsson discusses tax policy at the zero lower bound.

creases in government spending when monetary policy is constrained by the zero lower bound. This is an exciting avenue for future research.

CONCLUSIONS

This article has assessed the effect of temporary increases in government spending on economic activity through the lens of a benchmark New Keynesian model. Several caveats notwithstanding, the literature finds that when monetary policy is constrained by the zero lower bound on interest rates, such fiscal stimulus may be more effective than in weaker recessions. The literature also highlights that such a policy must be carefully designed to have the desired effect: Fiscal stimulus is most effective if it is contingent on the disruption to the economy still being present and the zero lower bound still being binding. That said, none of the studies claim that higher government spending is a panacea for tackling the causes of why the economy ended up in a deep recession in the first place. In addition, the precise magnitude of the impact of government spending on the economy remains uncertain. **BR**

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