COMPARING TAX AND SPENDING MULTIPLIERS:

IT'S ALL ABOUT CONTROLLING FOR MONETARY POLICY

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ABSTRACT

This paper derives empirical estimates for tax and spending multipliers. To deal with endogeneity concerns, I employ a large sample of fiscal consolidations identified through the narrative approach. To control for monetary policy, I study the output effects of fiscal consolidations in countries where monetary authorities are constrained in their ability to counteract shocks because they are in either a monetary union (and hence, lack an independent central bank) or a liquidity trap. My results suggest that for fiscal consolidations, the tax multiplier is larger than the spending multiplier. My estimates indicate that whereas the tax multiplier is roughly 3—similar to the recent estimates derived by Romer and Romer (2010), the spending multiplier is close to zero. A number of caveats accompany these results, however.

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"One area where questions remain is the relative impact of tax changes versus spending changes. Traditional macroeconometric forecasting models tend to find that spending changes, both expansions and contractions, pack a stronger punch than tax changes, particularly when the tax changes are expected to be temporary. But the needed head-to-head test of the two types of fiscal changes, where the same care is used to identify exogenous changes, has not yet been done."

--Christina Romer. "Fiscal Policy in the Crisis: Lessons and Policy Implications."

1. Introduction

Which is larger: the tax multiplier or the spending multiplier? How do the effects of changes in taxes and changes in government spending on real output differ?

Any casual observer of the public debates among economists over the past several years is aware that views differ dramatically about the relative effects of tax changes versus spending changes. Primarily, this reflects the fact that identifying the effects of changes in taxes and changes in government spending is methodologically tricky. For one reason, changes in taxes and changes in government spending respond endogenously to the business cycle, complicating efforts among researchers to identify relatively exogenous fiscal policy shocks. For another reason, even if relatively exogenous shocks can be identified, changes in taxes and spending often occur simultaneously or alongside changes in other policies, such as changes in monetary policy, making it difficult to disentangle the effects of the tax changes from the spending changes or from the other policy changes.

However, recent studies on the effects of fiscal policy have made substantial headway in overcoming these key methodological problems. Of particular relevance, the narrative approach has been pioneered as a way of dealing with endogeneity concerns. Romer and Romer (2010) and Guajardo et al. (2011) implement the narrative approach to identify relatively exogenous fiscal policy shocks. Both studies analyze narrative sources—government documents and policy reports—to identify legislated changes in fiscal policy that occurred for reasons unrelated to prospective macroeconomic developments—changes in taxes in the case of Romer and Romer (2010) and fiscal consolidations in 17 OECD economies from 1978-2009 in the case of Guajardo et al. (2011). Both studies find that fiscal policy shocks have significant real output effects. Romer and Romer (2010) find that a tax increase of 1% of GDP reduces output by 3%, suggesting a tax multiplier of roughly 3, and Guajardo et al. (2011) find, in their baseline specification, that a fiscal consolidation of 1% of GDP reduces output by roughly 0.6%. Furthermore, in comparing their new tax series with the series on the change in the cyclically adjusted revenues—the series traditionally used to measure tax changes, Romer and Romer (2010) find that failing to correct for endogeneity leads to biased estimates of the impact of tax changes on output. Likewise, by comparing their series on fiscal consolidations to the more

traditional cyclically-adjusted primary balance (CAPB) series, Guajardo et al. (2011) also conclude that failing to correct for endogeneity leads to biased estimates of the real output effects of fiscal consolidatons.

While the two studies have made substantial progress in furthering our understanding of the effects of fiscal policy, both studies remain largely silent over the relative impact of tax versus spending changes. Romer and Romer (2010) acknowledge in their paper that because their study focuses on changes in taxes, their findings do not address the question of which type of fiscal action—changes in taxes or changes in government purchases—has greater effects on output.[1] Likewise, the Guajardo et al. (2011) study is also relatively agnostic about the impact of tax changes versus spending changes. They find that tax-based consolidations are associated with greater output effects than spending-based consolidations, but argue that the response of central banks to these different types of fiscal shocks likely explains their results. In their view, because many tax increases—such as increases in sales and excise taxes or in value added taxes—are likely to raise prices on impact, inflation-averse central bankers raise interest rates following tax increases, thereby amplifying the effects of tax-based consolidations. By contrast, they argue that central bankers are more likely to interpret spending-based consolidations as a sign of strong fiscal discipline, and as a consequence, are more likely to lower interest rates following spending based consolidations to cushion the effects.

Thus, even if relatively exogenous fiscal policy shocks are identified, other policy changes can contaminate the results. However, to deal with this second common problem in identifying the effects of fiscal policy, Nakamura and Steinson (2012), in another recent study, pioneer an innovative approach by focusing on the effects of government spending shocks across regions in a monetary union. Specifically, they study the effects of changes in government spending on output by exploiting cross-sectional variation in defense spending across U.S. regions. By focusing on a region that shares a common tax and monetary policy regime, they are able to control for differences in taxes and monetary policy, while using cross-sectional variation in defense spending across U.S. regions to identify the effects of changes in government spending on regional output. Their results indicate that changes in government spending have substantial real output effects. Their implied estimates for the government spending multiplier are roughly 1.5. Because monetary policy is set at a federal level, it is unlikely to respond to regional

[1] Specifically, Romer and Romer (2010) write: "Similarly, our results do not speak to the issue of whether taxes are a more powerful tool of fiscal policy than government purchases. The fact that our estimates of the effects of tax changes are larger than conventional estimates of the effects of changes in purchases is of little relevance: conventional estimates of the effects of purchases, like conventional estimates of the effects of taxes, almost surely suffer from omitted variable bias" (page 799).

variation in government spending, providing Nakamura and Steinson (2012) with strong empirical estimates for the impact of spending changes on output—estimates that are likely to be uncontaminated by the effects of discretionary monetary policy. However, because they focus on changes in government spending, their results, like much of the other work in this literature, do not speak to the issue of the relative effects of tax versus spending changes.

This paper attempts to fill in this gap by conducting an empirical test to identify the effects of tax changes relative to spending changes. It does this by directly addressing these methodological problems. First, to deal with endogeneity concerns, I employ a series on fiscal consolidations identified through the narrative approach—specifically, the series provided by Guajardo et al. (2011), where they identify a large sample of fiscal consolidations motivated by a desire to reduce the budget deficit and unrelated to prospective macroeconomic developments. This series will henceforth be referred to as the IMF series.[2] Second, to control for monetary policy, I study the output effects of fiscal consolidations in countries where central banks are constrained in their ability to respond to fiscal shocks either because they are in a monetary union and hence, lack an independent central bank or because they are in a liquidity trap and nominal interest rates are already up against the lower bound of zero.

In a sense, the strategy employed by this paper blends the narrative approaches pioneered by Romer and Romer (2010) and Guajardo et al. (2011) to deal with endogeneity concerns with the approach used by Nakamura and Steinson (2012) to control for other policy changes. By focusing on fiscal consolidations in countries where central banks are constrained in their ability to respond to fiscal shocks, I am able to estimate the effects of tax changes relative to spending changes, while also controlling for monetary policy. Furthermore, because there is large variation in the relative composition between tax increases and spending cuts in the sample of fiscal consolidations that I study, I am able to tease out empirical estimates for both the tax and spending multipliers.

Section 2 of this paper develops the case that controlling for monetary policy is essential in identifying the effects of fiscal consolidations. Because central bankers are likely to cushion the effects of contractionary fiscal shocks, failing to control for the response of discretionary monetary policy will lead to biased estimates of the effects of fiscal consolidations. By separating fiscal consolidations into two groups—one in which a country's central bank is relatively constrained in its ability to conduct discretionary monetary policy and one in which it is

[2] The series is presented in a companion paper—Devries et al. (2011). An earlier version of the paper appears in the October 2010 International Monetary Fund *World Economic Outlook* and was entitled, "Will It Hurt? Macroeconomic Effects of Fiscal Consolidations."

not, I show that failing to control for monetary policy does indeed lead to biased estimates. In countries where central banks are relatively unconstrained in their ability to counteract fiscal shocks, the output effects of fiscal consolidations are substantially smaller than in countries where central banks are relatively constrained, suggesting that independent central banks do, in fact, cushion the effects of fiscal consolidations. These findings support and corroborate the findings of Guajardo et al. (2011).

Section 3 then studies the relative impact of tax changes versus spending changes. I begin by estimating a regression over the entire sample of fiscal consolidations—separated into tax increases and spending cuts—without controlling for monetary policy, and find that tax increases are associated with stronger effects on output than spending cuts, similar to the initial findings of Guajardo et al. (2011). To investigate whether these findings are the result of the differential response of monetary authorities to tax increases versus spending cuts, however, I divide the sample of fiscal consolidations into the two aforementioned groups—countries with central banks that are unconstrained in their ability to respond to shocks and countries with central banks that are relatively constrained. In doing so, I find little evidence for the explanation put forth by Guajardo et al. (2011). In countries with central banks that are relatively unconstrained in their ability to counteract fiscal shocks, the estimated output effects associated with both tax increases and spending cuts are small—a finding much more consistent with the idea that central banks cushion the effects of contractionary fiscal shocks, than with the notion that central banks amplify the effects of tax increases. Furthermore, in countries with central banks that are relatively constrained in their ability to respond to fiscal shocks, I find that while the estimated output effects of tax increases are strong, negative and statistically significant, the estimated output effects of government spending cuts are trivial. My empirical estimates indicate that a tax increase equal to one percent of GDP reduces output by more than 3% over a three-year period, suggesting a multiplier of roughly three—similar to the findings of Romer and Romer (2010). My empirical estimates indicate that among this sample of fiscal consolidations, the spending multiplier is smaller than the tax multiplier and statistically indistinguishable from zero.

I then consider a number of robustness checks. To take into account the possibility that tax shocks might occur alongside spending shocks, making it difficult to disentangle the effects of the tax increases from the spending cuts, I divide the sample of fiscal consolidations—from countries where central banks are constrained in their ability to respond to fiscal shocks—into three groups: tax-based consolidations (consolidations involving 2/3 or more tax increases), spending-based consolidations (consolidations involving 2/3 or more spending cuts), and an intermediate category for consolidations that fall in between these two extremes. I find that

consolidations based primarily on tax increases are associated with strongly negative effects on output and that consolidations based primarily on spending cuts are associated with negligible real output effects. Furthermore, fiscal consolidations in the intermediate category are associated with output effects in between those of the tax-based and spending-based consolidations. Thus, these results corroborate the initial findings and indicate that fiscal consolidations based on tax increases have larger real output effects than those based on spending cuts, after controlling for monetary policy.

Section 3 then investigates whether unconventional policies—such as quantitative easing in a liquidity trap or chance correlation with monetary policy on the part of the European Central Bank—can explain these results. I find that they cannot. Section 4 concludes and discusses caveats.

2. Identifying the Effects of Fiscal Consolidations: The Importance of Controlling for Monetary Policy

Because a main goal of central banking is to keep output close to potential, monetary authorities respond to shocks that push output away from potential. As a consequence, controlling for the discretionary behavior of monetary policy is essential in testing for the effects of fiscal consolidations. Suppose, for example, that a country increases taxes and decreases government spending and that those actions exert downward pressure on output, prompting the central bank to counteract a contractionary fiscal shock by lowering interest rates. In this situation, the fiscal consolidation might be associated with smaller output effects due to the cushioning effects of lower interest rates.

Indeed, to illustrate the importance of controlling for monetary policy, consider the following specification, which attempts to identify the effects of fiscal consolidations on real output:

$$\Delta Y_{i,t} = \sum_{j=1}^{2} \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^{2} \gamma_s \Delta F_{i,t-s} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where subscript i indexes countries, subscript t indexes years, Y denotes the logarithm of real GDP, ΔF is the measure of fiscal consolidations provided by the IMF series, and μ and λ represent country and year fixed effects.[3] The regression includes lagged values of output growth to model the normal behavior of output, lagged values of the fiscal consolidation variable to estimate the direct impact of fiscal consolidations on output, country fixed effects to control for

[3] The real GDP data are the same as those used in Guajardo et al. (2011). The real GDP data come from the OECD Economic Outlook Database No. 88, code GDPV.

differences in steady state growth rates among countries and year fixed effects to control for macroeconomic shocks in each year. The equation is estimated on the 17 OECD countries covered in the IMF series from 1979 to 2010.[4]

The impulse response function implied by this regression is shown in Figure 1. It maps out the implied response of output to a fiscal consolidation of one percent of GDP. The figure contains one standard error bands. The impulse response function shows that fiscal consolidations have statistically significant effects on output. The estimated cumulative impact on output is a decline of 0.28 percent in the contemporaneous year (t-stat = -2.66), 0.58 percent in year 1, the year following the consolidation (t-stat = -3.58), and 0.47 percent in year 2, two years following the consolidation (t-stat = -2.55).

While the results are statistically significant, the magnitude is small: a fiscal consolidation equal to one percent of GDP reduces output by roughly half a percent over more than two years. This means that a tax hike of one percent of GDP or a cut to government spending of one percent of GDP—or some combination of the two amounting to one percent of GDP—reduces output by less than the size of the consolidation. This result would seem to suggest that the real output effects of fiscal consolidations—though statistically significant—are relatively small.

But could this be the result of monetary policy? If monetary authorities cushion the effects of fiscal shocks by lowering interest rates, then fiscal consolidations would be associated with smaller output effects due to the response of monetary authorities.

To investigate this possibility, I reestimate the preceding regression, but separate the fiscal consolidations into two groups. In one group, I include fiscal consolidations in countries where central banks are constrained in their ability to counteract fiscal shocks because they are either in a monetary union (and hence, lack an independent central bank) or a liquidity trap.[5] In the second group, I include all other fiscal consolidations. Specifically, I estimate the following regression:

$$\Delta Y_{i,t} = \sum_{j=1}^{2} \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^{2} \gamma_s \Delta C_{i,t-s} + \sum_{r=0}^{2} \gamma_r \Delta U_{i,t-r} + \mu_i + \lambda_t + \varepsilon_{i,t}, \quad (2)$$

where ΔC denotes fiscal consolidations in countries where central banks are relatively constrained (group 1), ΔU denotes fiscal consolidations in countries where central banks are relatively

[4] The 17 countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, and the United States.

[5] This group includes fiscal consolidations in Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain since 1999—the date of entry of these economies into the eurozone—and fiscal consolidations in Japan since 1996—when nominal interest rates dropped to near-zero levels.

unconstrained (group 2), Y is the logarithm of real GDP, and μ and λ represent country and year fixed effects.

Figure 2 presents the impulse response functions implied by this regression. They reveal that controlling for monetary policy matters dramatically. In countries where central banks are constrained in their ability to counteract fiscal shocks, the cumulative impact of a consolidation of one percent of GDP on output is a decline of 0.61 percent in the contemporaneous year (t-stat = -2.96), 1.42 percent in year 1 (t-stat = -4.19) and 1.71 percent in year 2 (t-stat = -3.50). These estimates are much larger than those obtained using the previous specification.

Moreover, by contrast, in countries where central banks are relatively unconstrained in their ability to counteract shocks, the estimated maximum effect is a decline of 0.42 percent in year 1 (t-stat = -2.37)—statistically significant, but much smaller than the estimates obtained from group 1. Furthermore, the difference in the estimated impacts across the two groups is statistically significant (t-stats of 2.60 and 2.74 in years 1 and 2)—strong evidence that failing to control for monetary policy biases down the estimated output effects of fiscal consolidations.[6]

To further illustrate this point, consider Figure 3, which examines the impact of fiscal consolidations on the domestic components of GDP—consumption and investment. The specification that I estimate is analogous to regression 2, except consumption and investment replace GDP. Panel A presents the impulse response functions for consumption and Panel B presents the impulse response functions for investment.[7]

Panels A and B reveal that fiscal consolidations are associated with larger effects on both consumption and investment when central banks are constrained in their ability to counteract shocks than when they are relatively unconstrained. For the constrained group—group 1, the estimated cumulative impact is -0.94 percent in the contemporaneous year (t-stat = -4.14), -1.70 percent in year 1 (t-stat = -4.60) and -2.02 percent in year 2 (t-stat = -3.81) for consumption and -2.78 percent in the contemporaneous year (t-stat = -4.06), -5.85 percent in year 1 (t-stat = -5.61) and -5.72 percent in year 2 (t-stat = -3.92) for investment. By contrast, for the unconstrained group—group 2, the estimated maximum impact on consumption is -0.58 percent in year 1 (t-stat = -2.92)—less than one-third the maximum impact for the first group—and the estimated maximum impact on investment is a statistically indistinguishable decline of 1.11 percent (t-stat = -1.91) in the contemporaneous year. Moreover, the differences in the impacts across the two

[6] Dropping Japan and thereby restricting group 1 to a monetary union—members of the eurozone—has virtually no impact on the results. The estimated cumulative impact on output is -0.57 percent in the contemporaneous year (t-stat = -2.61), -1.24 percent in year 1 (t-stat = -3.37) and -1.30 percent in year 2 (t-stat = -2.49) for group 1, compared to an estimated maximum impact of -0.45 percent in year 1 for group 2.

[7] The data on consumption and investment come from the OECD Economic Outlook Database No. 88, codes CPV and ITV.

groups are strongly significant; in both Panel A and Panel B, the two standard error bands do not overlap in year 2.

Together, these results indicate that controlling for monetary policy is crucial in identifying the effects of fiscal consolidations. Fiscal consolidations are associated with much larger effects when central banks are constrained in their ability to counteract fiscal shocks. Estimating the effects of consolidations, without controlling for monetary policy, therefore leads to biased estimates.

3. Taxes versus Spending

This section investigates the effects of tax increases relative to cuts in government spending. As described in the preceding section, controlling for monetary policy is crucial in identifying the effects of fiscal consolidations. Thus, it will likely also matter in estimating the effects of changes in taxes relative to changes in government spending.

To illustrate this, first consider the following regression, which attempts to estimate the effects of changes in taxes and changes in government spending:

$$\Delta Y_{i,t} = \sum_{j=1}^{2} \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^{2} \gamma_s \Delta T_{i,t-s} + \sum_{r=0}^{2} \alpha_r \Delta G_{i,t-r} + \mu_i + \lambda_t + \varepsilon_{i,t}, \quad (3)$$

where subscript i indexes countries, subscript t indexes years, Y denotes the logarithm of real GDP, ΔT is the series on tax increases provided by the IMF fiscal consolidation series, ΔG is the series on spending cuts provided by the IMF fiscal consolidation series, and μ and λ represent country and year fixed effects. The key difference between equation 3 and equation 1 is that I utilize the IMF series on tax increases and spending cuts, rather than the sum-total series on fiscal consolidations.

The impulse response functions implied by this regression are shown in Figure 4. They map out the implied response of output to a tax increase of one percent of GDP and to a spending cut of one percent of GDP. The figure contains one standard error bands. The impulse response functions indicate that tax increases have large and statistically significant effects on output, but not spending cuts. Following a tax shock, output declines by 0.51 percent in the contemporaneous year (t-stat = -2.54) and continues declining over the next two years. The maximum effect is a fall in output of 1.27 percent in year 2 (t-stat = -2.66). By contrast, following a spending shock, the movements in output are small and statistically insignificant. The maximum effect is a decline in output of 0.22 percent in year 1 (t-stat = -0.89). These results seem to suggest that tax increases have large effects on output, but not spending cuts.

But could these results also be due to monetary policy? The Guajardo et al. (2011) study speculates that the differential response of monetary authorities to tax increases relative to spending cuts likely explains these results. They hypothesize that because many tax increases, such as increases in sales and excise taxes or in value added taxes, might raise prices on impact, inflation averse central banks might be more inclined to raise interest rates in response to tax increases, thereby amplifying the fall in output. By contrast, they suggest that central banks are more likely to interpret spending cuts as a credible commitment to fiscal discipline and as a consequence, are more likely to cushion the effects of spending cuts by lowering interest rates, thereby mitigating the fall in output.

To investigate this possibility, I reestimate equation 3, but separate the series on tax increases and spending cuts into two groups, analogous to the preceding section. In group 1—the constrained group, I include tax increases and spending cuts in countries where central banks are constrained in their ability to counteract fiscal shocks because they are in either a monetary union or a liquidity trap. In group 2—the unconstrained group, I include all other tax increases and spending cuts. Thus, I estimate the following regression:

$$(4)\ \Delta Y_{i,t} = \sum_{j=1}^{2} \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^{2} \gamma_s \Delta TC_{i,t-s} + \sum_{r=0}^{2} \alpha_r \Delta GC_{i,t-r} + \sum_{m=0}^{2} \rho_m \Delta TU_{i,t-m} + \sum_{n=0}^{2} \phi \Delta GU_{i,t-n} + \mu_i + \lambda_t + \varepsilon_{i,t},$$

where Y denotes the logarithm of real GDP, ΔTC denotes tax increases in group 1 (the constrained group), ΔGC denotes spending cuts in group 1 (the constrained group), ΔTU denotes tax increases in group 2 (the unconstrained group), ΔGU denotes spending cuts in group 2 (the unconstrained group), and μ and λ represent country and year fixed effects.

Figure 5 presents the results. Panel A shows the impulse response functions implied by tax and spending shocks for the constrained group and Panel B shows the impulse response functions for the unconstrained group.

Consider the results for taxes first. In Panel A, where central banks are constrained in their ability to counteract shocks, the output effects of a tax shock are large and strongly significant. According to the results, the impact of a tax shock equal to one percent of GDP is a decline in output of 1.22 percent in the contemporaneous year (t-stat = 2.54), 2.81 percent in year 1 (t-stat = -3.07) and 3.89 percent in year 2 (t-stat = -3.05). These results indicate that tax increases have strongly contractionary effects on output, with a cumulative multiplier of more than 3. These findings are similar to those of Romer and Romer (2010) who estimate that a tax increase equal to one percent of GDP reduces output by roughly 3 percent after 10 quarters.

By contrast, in Panel B, where central banks are relatively unconstrained in their ability to respond to shocks, the movements in output following a tax shock are small and statistically

insignificant. For a tax shock equal to one percent of GDP, the maximum estimated effect is a statistically insignificant decline of 0.71 percent in year 1 (t-stat = -1.75). The difference in the estimated impacts across the two panels illustrates the importance of controlling for discretionary monetary policy: when central banks are constrained in their ability to counteract contractionary fiscal shocks, the estimated maximum impact of a tax shock is more than five times as large as the estimated impact in countries with central banks that are relatively unconstrained. Furthermore, these results—the small and statistically insignificant point estimates in Panel B relative to the large and strongly significant point estimates in Panel A—are much more consistent with the notion that independent central banks tend to cushion the effects of contractionary tax shocks than with the idea that central banks raise interest rates following tax increases to reduce inflation and thereby amplify the fall in output.

Next consider the results for spending. In Panel B, where central banks are relatively unconstrained, the movements in output following a spending shock are small and statistically insignificant—the estimated maximum cumulative effect is a decline of .26 percent in year 1 (t-stat = -0.97). The surprising result, however, is from Panel A, which shows the impact of a spending shock on output in countries with constrained central banks. Specifically, the estimated cumulative impact of a spending shock equal to one percent of GDP is an increase in output of 0.03 percent in the contemporaneous year (t-stat = 0.07), 0.05 percent in year 1 (t-stat = 0.05) and 0.69 percent in year 2 (t-stat = 0.49)—movements that are statistically indistinguishable from zero. Furthermore, in Panel A, the differences in the estimated impacts between a tax shock and a spending shock are statistically significant (t-stat = 2.11 in year 1 and 2.40 in year 2). Thus, these results indicate that whereas tax increases have strongly contractionary effects on output, spending cuts have small, statistically insignificant effects on output. By extension, the results from Panel A also suggest that among this sample of fiscal consolidations, the tax multiplier is greater than the spending multiplier.

Could these results, however, be biased by the fact that many tax increases occur alongside spending cuts? Ramey (2011) also derives relatively small empirical estimates for the spending multiplier, but a concern that has been raised regarding those estimates is that they were based on government spending shocks in which taxes were also changed substantially, making it difficult to separate the effects of increases in government spending from the contractionary effects of increases in taxes.[8] Since many fiscal consolidations involve both tax increases and spending cuts, could a similar concern be present here?[9]

[8] Romer and Romer (2010) make this point: "Changes in purchases resulting from military developments and other forces likely to be unrelated to other factors affecting output, such as those identified by Ramey

To investigate this issue further, I conduct the following exercise. I divide the sample of fiscal consolidations from group 1—the constrained group—into three categories: tax-based consolidations, spending-based consolidations, and consolidations composed of a relatively equal balance of tax increases and spending cuts. I classify a fiscal consolidation as tax-based if two-thirds or more of the total consolidation comes from tax increases, as spending-based if two-thirds or more comes from spending cuts, and as relatively equal if the consolidation falls in between these two extremes. I then estimate the following equation:

$$(5)\quad \Delta Y_{i,t} = \sum_{j=1}^{2} \beta_j \Delta Y_{i,t-j} + \sum_{s=0}^{2} \gamma_s \Delta TaxBased_{i,t-s} + \sum_{r=0}^{2} \gamma_r \Delta SpendingBased_{i,t-r} + \sum_{m=0}^{2} \gamma_m \Delta Equal + \sum_{n=0}^{2} \lambda_n \Delta Unconstrained + \mu_i + \lambda_t + \varepsilon_{i,t}$$

where Y is the logarithm of real GDP, ΔTaxBased denotes tax-based fiscal consolidations in group 1, ΔSpendingBased denotes spending-based fiscal consolidations in group 1, ΔEqual denotes fiscal consolidations in group 1 that involve a relatively equal balance between tax increases and spending cuts, ΔUnconstrained denotes fiscal consolidations in countries where central banks are relatively unconstrained (group 2), and μ and λ represent country and year fixed effects. Each consolidation variable measures the total fiscal consolidation, reported by the IMF series.[10]

Figures 6 presents the results. Panel A shows the impulse response functions of output to shocks of one percent of GDP for tax-based and spending-based consolidations, with standard error bands. The results corroborate the previous findings. Tax-based consolidations are

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and Shapiro (1998) and Ramey (2008), are usually accompanied by substantial changes in taxes (and sometimes by other policy changes), and so cannot easily be used to identify the effects of government purchases alone." (p. 799). Ramey (2011) also acknowledges this concern, noting, "It should be understood that this multiplier is estimated on data in which distortionary taxes increase on average during a military build-up, and is not necessarily applicable to situations in which government spending is financed differently" (p. 43).

[9] To be clear, fiscal consolidations vary dramatically in terms of composition. Some are entirely tax based, others are entirely spending based and many involve a mix between taxes and spending to varying degrees. As a consequence, the sample of fiscal consolidations that I study should provide the econometric framework specified in equation 4 sufficient variation such that it can separate the movements in output attributable to changes in taxes from those attributable to changes in spending, thereby mitigating concerns about simultaneous changes in taxes and government spending. Nonetheless, it is still important that I address this potential concern.

[10] Specifically, for group 1—the constrained group, the tax-based consolidations are Austria (2001), Germany (1999), Germany (2003), Italy (2007), Japan (1997), Japan (1998), Japan (2007), Portugal (2002), Portugal (2005), and Portugal (2006), the spending-based consolidations are Austria (2002), Germany (2000), Germany (2006), Japan (2003), Japan (2004), Japan (2005), the Netherlands (2004), and Portugal (2000), and the consolidations that involve a relatively equal balance between tax increases and spending cuts are Germany (2007), Ireland (2009), Italy (2004), Italy (2005), Italy (2006), Japan (2006), the Netherlands (2005), and Portugal (2007).

associated with large, negative and strongly significant movements in output, whereas spending-based consolidations are associated with small and statistically insignificant movements in output. Following a tax-based consolidation shock, the estimated cumulative impact on output is -1.25 percent in the contemporaneous year (t-stat = -2.94), -2.85 percent in year 1 (t-stat = -4.11), and -3.74 percent in year 2 (t-stat = -4.03). By contrast, following a spending-based consolidation shock, the estimated impacts are small and statistically insignificant in each year.

Panel B adds the impulse response function for consolidations that involve a relatively equal balance between tax increases and spending cuts without standard error bands to make the estimated impacts easier to visualize graphically. Panel C, however, adds in the standard error bands for completeness. The key result is that the impulse response function for a consolidation shock involving a relatively equal balance between tax increases and spending cuts falls directly in the middle of the impulse response functions for tax-based and spending-based consolidation shocks. Together, these findings indicate that consolidations based on tax increases are associated with larger declines in output than consolidations based on spending cuts. Thus, they corroborate the previous results.

Could these findings be due to Japan—the one country included in the sample because it was in a liquidity trap? Even though Japan's central bank was constrained by the lower bound of zero on nominal interest rates, it could still pursue unconventional policies in a liquidity trap, such as quantitative easing, that might cushion the effects of contractionary fiscal shocks. That tax shocks and tax-based consolidations (in Figures 5 and 6) are associated with such large declines in output, in spite of the inclusion of Japan, suggests that this potential source of bias—which would bias the results toward zero—is not of great concern in estimating the effects of tax increases on output.[11] But could the behavior of Japan's central bank explain the weak results for spending-based consolidations? Might Japan's central bank have cushioned the effects of spending-based consolidations with unconventional monetary policies?

To investigate this possibility, I reestimate equation 5, but exclude the spending-based consolidations from Japan. Figure 7 presents the results. The impulse response functions make it clear that the presence of Japan cannot explain these findings. Excluding spending-based consolidation from Japan increases the difference between tax and spending-based consolidations. Tax-based consolidations are still associated with large, negative, and strongly significant declines in output, but spending-based consolidations are now associated with positive

[11] Japan's central bank, which was concerned about low growth and weak economic performance and, as a consequence, held nominal interest rates against the zero lower bound, was not pursuing contractionary policies during this period. Thus, a bias running in the opposite direction—of contractionary monetary policies associated with tax-based consolidations in Japan—is not a concern here.

movements in output. For a spending-based consolidation shock, the estimated maximum cumulative effect is an increase in output of 0.76 percent in year 2, though the impacts are statistically insignificant in each year (t-stat = 0.42 in year 2, for example).

Could chance correlation with ECB monetary policy explain these results? Even though countries in the eurozone lack an independent central bank, spending-based consolidations might, by chance, happen to be correlated with shifts by the European Central Bank to expansionary monetary policy and tax-based consolidations might happen to be correlated with shifts to contractionary monetary policy. To investigate whether this might be the case, I analyze the behavior of the key ECB policy interest rate following tax and spending-based consolidations. Specifically, I estimate the following regression:

$$(6)\ \Delta PolicyRate_{i,t} = \alpha + \sum_{s=0}^{2} \gamma_s \Delta EurozoneTaxBased_{i,t-s} + \sum_{r=0}^{2} \gamma_r \Delta EurozoneSpendingBased_{i,t-r} + \varepsilon_{i,t},$$

where ΔPolicyRate denotes the change in the policy rate in year t, ΔEurozoneTaxBased denotes tax-based consolidations in the eurozone, and ΔEurozoneSpendingBased denotes spending-based consolidations in the eurozone.[12]

Figure 8 presents the results. It maps out the response of the policy interest rate following a tax-based and a spending-based consolidation shock equal to one percent of GDP, along with standard error bands. The policy interest rate rises by an estimated 68 basis points in the year following a spending-based consolidation, compared to a rise of 38 basis points in the year following a tax-based consolidation. Thus, if anything, the bias introduced by ECB monetary policy runs in the opposite direction. Spending-based consolidations are followed by greater increases in the key policy interest rate than tax-based consolidations. However, because the standard error bands are large, the difference in the response of the policy rate to spending versus tax-based consolidations is not statistically significant—nor are the overall movements in the policy rate significantly different from zero. As a consequence, it would be unwise to draw further from these results, other than to conclude that chance correlation with ECB monetary policy cannot explain these findings.

4. Conclusions and Caveats

This paper conducts an empirical test to identify and compare tax and spending multipliers. To address endogeneity concerns, I utilize a sample of fiscal consolidations

[12] To convert the policy rate data to a yearly frequency, I construct a weighted average of the policy rate over the course of the year, where the weights are the number of days in the year the policy rate is held at that level. The policy rate data come from Trading Economics (www.tradingeconomics.com/euro-area/interest-rate).

identified through the narrative approach. To control for monetary policy, I study the output effects of fiscal consolidations in countries where central banks are constrained in their ability to counteract shocks because they are in either a monetary union or a liquidity trap.

My findings indicate that tax-based consolidations are associated with substantially larger output effects than spending-based consolidations and that the tax multiplier is greater than the spending multiplier. Indeed, whereas the estimated spending multiplier is small and statistically indistinguishable from zero, the estimated tax multiplier is large. The point estimates indicate that the tax multiplier is roughly 3 in the year or two following a tax shock. These results corroborate those of Romer and Romer (2010) who also derive a tax multiplier of 3 based on the U.S. historical record and those of Alesina, Favero, and Giavazzi (2012), who find—using the IMF series on fiscal consolidations—that multi-year fiscal consolidations are associated with prolonged and deep recessions when they are tax-based, but not when they are spending-based.

Together, these findings seem to suggest that the tax multiplier is greater than the spending multiplier. However, a number of caveats accompany these results. The first caveat is that these findings are estimated primarily on data in which most economies were relatively healthy and operating at or near potential, at least in comparison to the state of many of today's economies. Most of the fiscal consolidation episodes come from countries in the European Monetary Union before the 2008 financial crisis. Thus, these findings indicate that in robust, strong economies—ones that are operating at or near potential and pushing up against supply constraints—tax increases have strongly contractionary effects on output, whereas spending cuts do not. However, these results may not apply in a depressed economy operating at below capacity for a prolonged period and suffering from an extended period of deficient aggregate demand. If spending cuts worsen aggregate demand, then spending cuts might have much greater output effects in a depressed economy, even if comparable spending cuts when the economy is operating at or near potential are associated with minor output costs.

The second caveat is that these results do not speak to the merits of tax cuts as opposed to spending increases for the purposes of fiscal stimuli. That tax hikes are associated with stronger output effects than spending cuts does not necessarily mean that the multiplier on tax cuts is greater than the multiplier on spending increases when an economy is weak. It could be such that in a depressed economy—one suffering from a prolonged period of deficient aggregate demand where households are hoarding cash to pay down debt and repair balance sheets—tax cuts might be more likely to be saved than spent, providing little boost to an ailing economy. By contrast, if

increases in government spending can stimulate aggregate demand in a weak economy, then the spending multiplier could conceivably be higher than the tax multiplier in such an environment.[13]

Lastly, a third caveat is that these results may depend on the type of spending cuts and tax increases that are legislated. It is highly likely that different types of spending cuts and tax increases have different effects on the macroeconomy.

[13] For example, Nakamura and Steinson (2012) find some evidence that the spending multiplier is larger in high versus low slack economies. This could also explain the results of Alumnia et al. (2010) who find that deficit-financed changes in defense spending in European nations in the 1930s—when countries were depressed and still recovering from the Great Depression—were associated with substantial changes in output—that is, with government spending multipliers of 2 or more.

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FIGURE 1
The Effect of a Fiscal Consolidation of 1% of GDP on Real GDP: All Consolidations

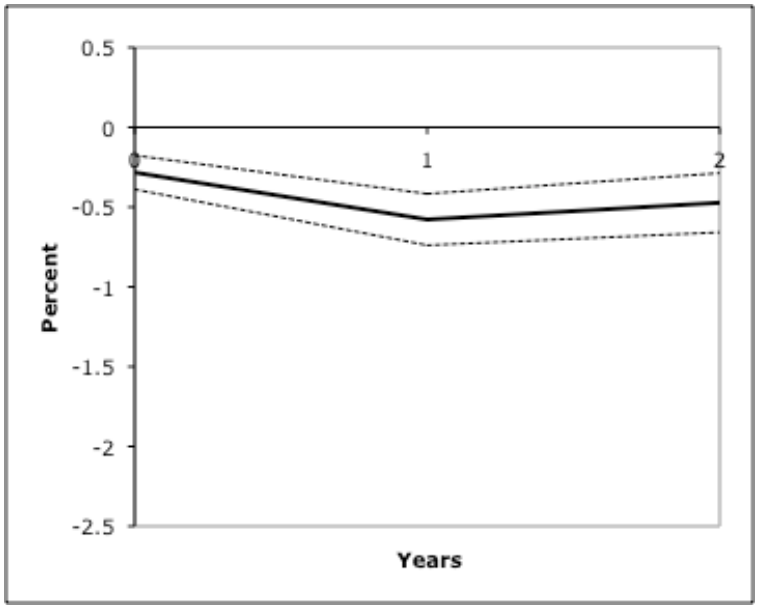


FIGURE 2
The Effect of a Fiscal Consolidation of 1% of GDP on Real GDP:
Fiscal Consolidations in Countries with Constrained vs Unconstrained Central Banks

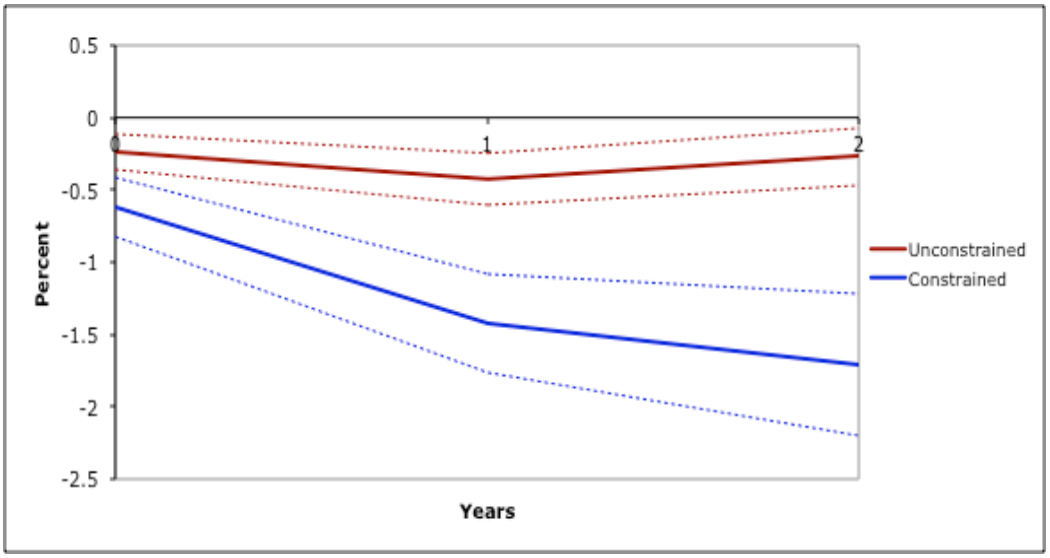
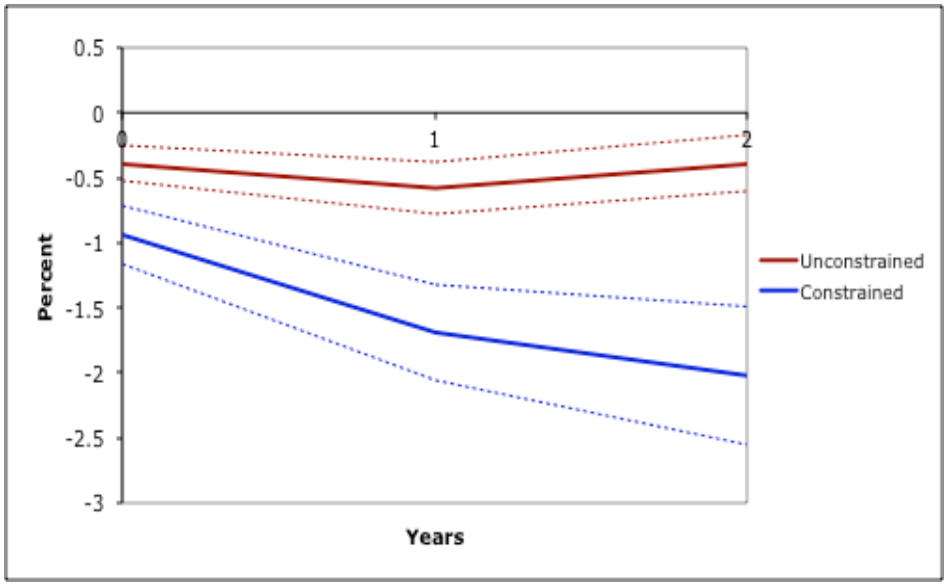


FIGURE 3
The Effect of a Fiscal Consolidation of 1% of GDP on Consumption and Investment: Fiscal Consolidations in Countries with Constrained vs Unconstrained Central Banks

Panel A. Consumption



Panel B. Investment

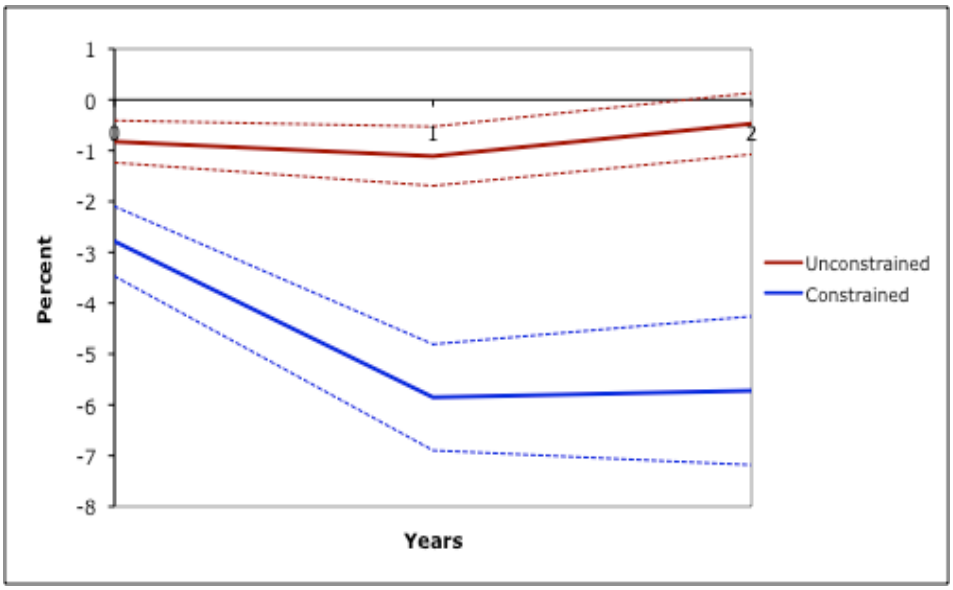


FIGURE 4
Taxes versus Spending: Full Sample

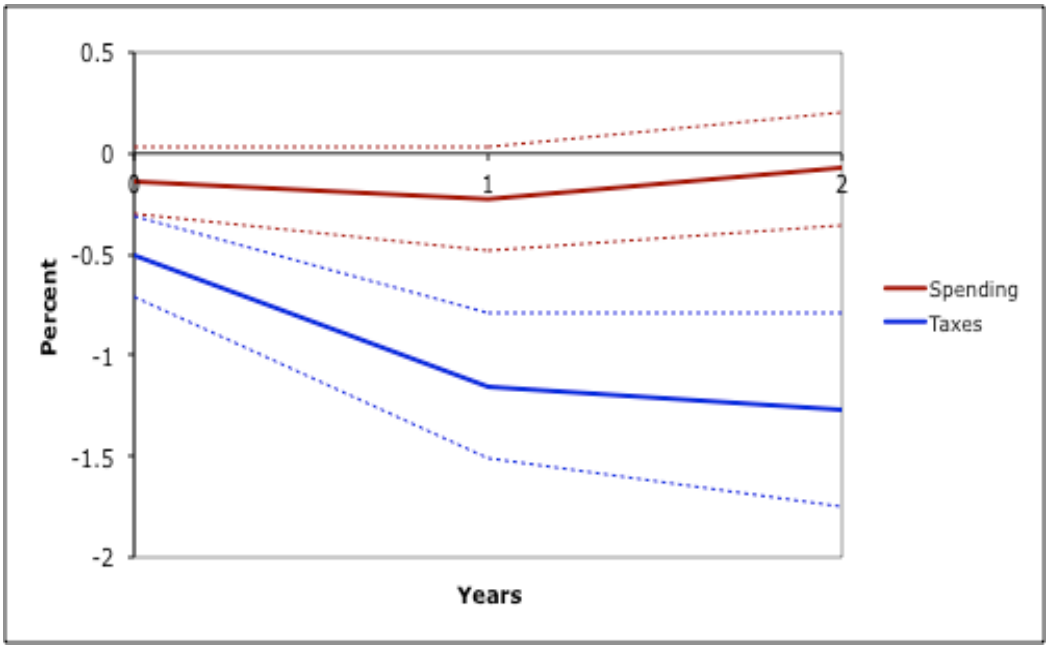
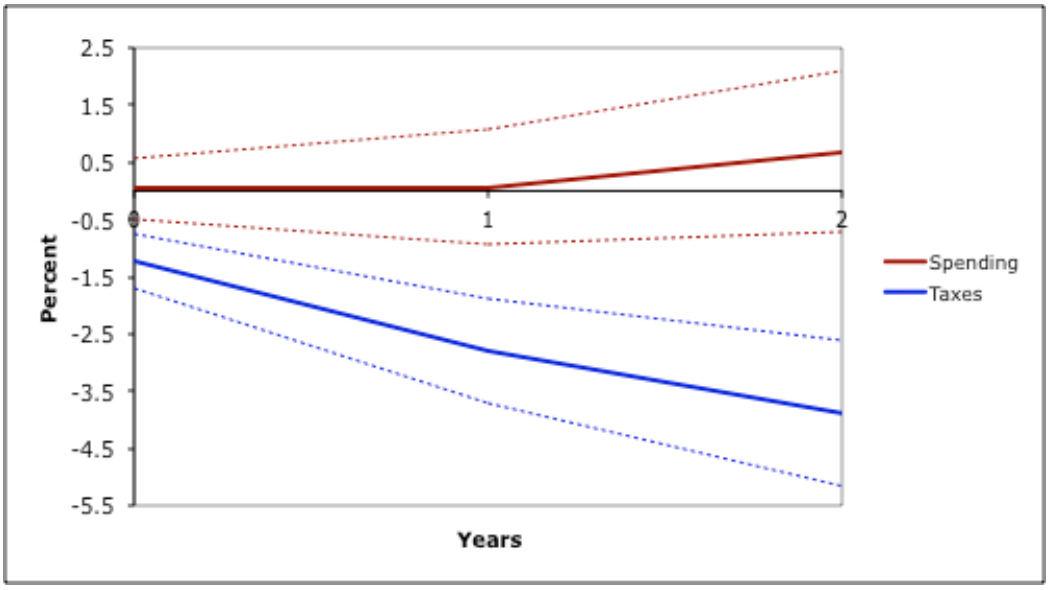


FIGURE 5
Taxes versus Spending:
Countries with Constrained versus Unconstrained Central Banks

Panel A. Constrained Group



Panel B. Unconstrained Group.

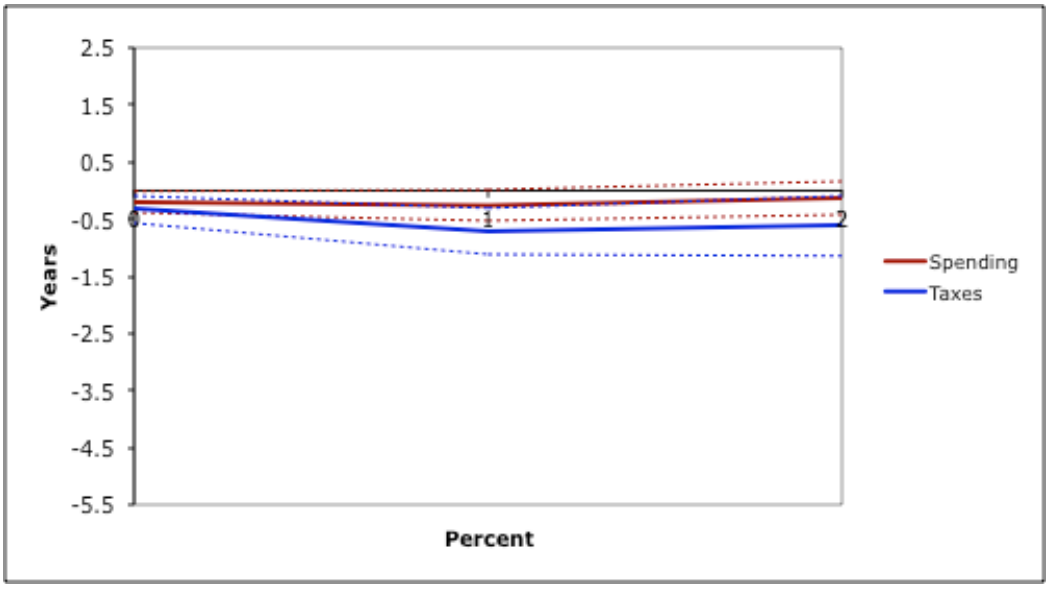
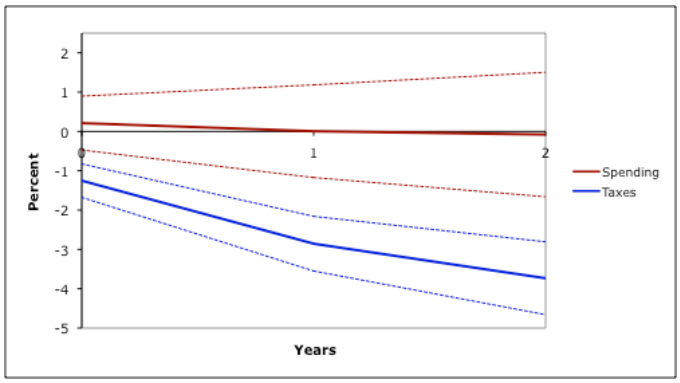
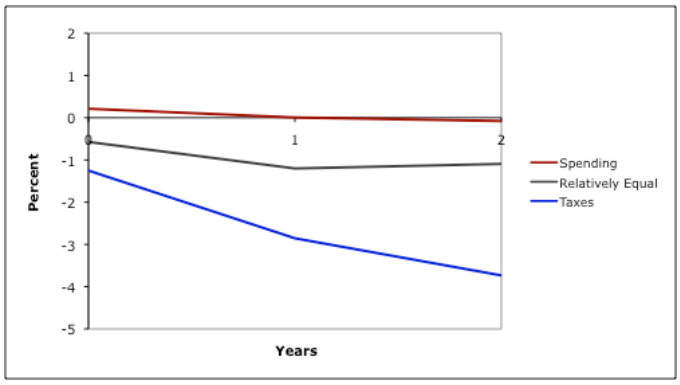


FIGURE 6
The Effects of Different Types of Fiscal Consolidations on Real GDP (All Constrained)

Panel A. Tax versus Spending-Based Consolidations



Panel B. Tax, Relatively Equal and Spending-Based Consolidations



Panel C. Tax, Relatively Equal, and Spending-Based Consolidations with Standard Error Bands

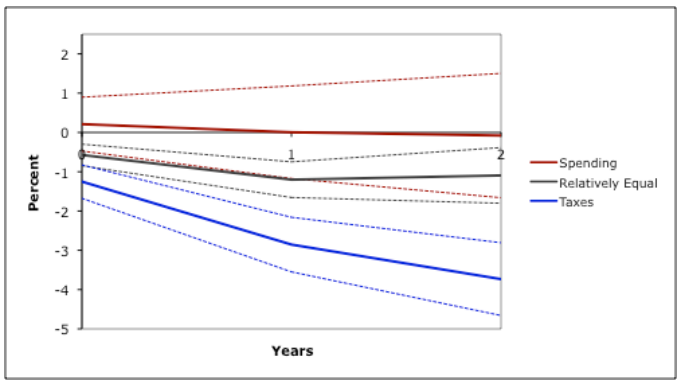


FIGURE 7.
Dropping Spending-Based Consolidations from Japan

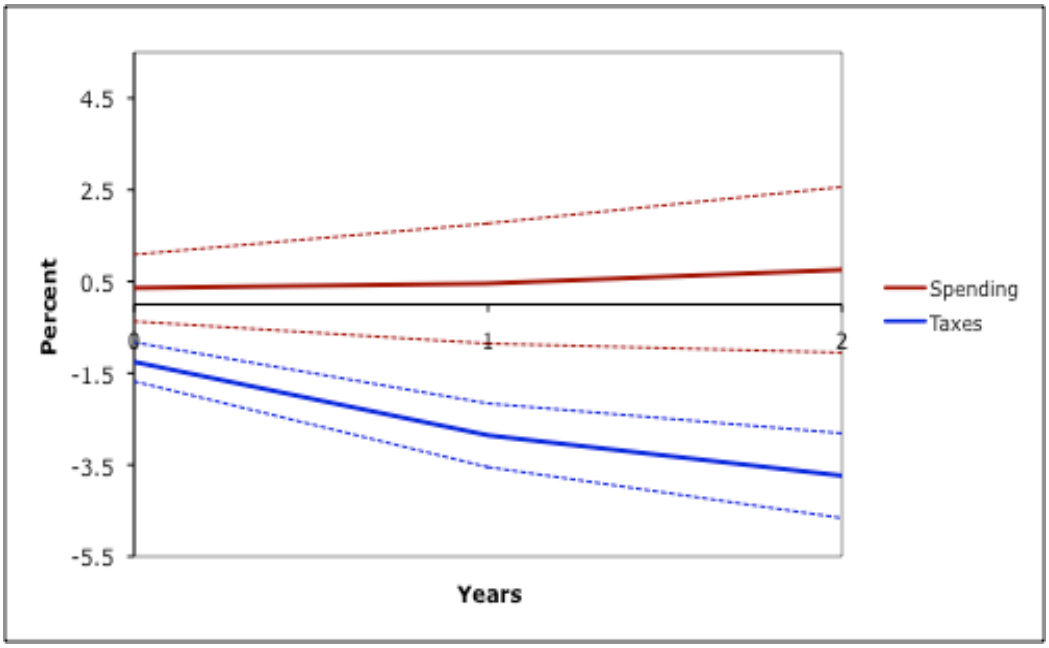


FIGURE 8
The Response of the Key ECB Policy Rate to Tax versus Spending-Based Consolidations