Debt consolidation and fiscal stabilization of deep recessions

By Giancarlo Corsetti, Keith Kuester, André Meier, and Gernot J. Müller*

The global financial crisis of 2008–09 has sent public debt on sharply higher trajectories, as governments have provided large-scale support to the financial system, implemented discretionary fiscal stimulus, and accommodated steep drops in tax revenue. With the economic recovery gradually taking hold, the focus is now shifting to fiscal "exit strategies." Indeed, many countries are set to face significant retrenchment in government spending over the medium term. In the US, for example, the Obama administration's 2010 budget pledges to "cut the deficit in half by the end of [its] first term, and [to] bring non-defense discretionary spending to its lowest level as a share of GDP since 1962"; see Office of Management and Budget (2009, p. 1). Similarly, the UK government's December 2009 Pre-Budget Report foresees large medium-term deficit cuts, with two-thirds of the fiscal effort on the expenditure side. Figure 1 shows the outlook for discretionary spending as interpreted by the two countries' respective fiscal watchdogs.[1]

* Corsetti: European University Institute, Via della Piazzuola 43, 50133 Firenze, Italy, giancarlo.corsetti@eui.eu. Kuester: Federal Reserve Bank of Philadelphia, Ten Independence Mall, Philadelphia, PA 19106, keith.kuester@phil.frb.org. Meier: IMF, 700 19th Street NW, Washington, DC 20431, ameier@imf.org. Müller: University of Bonn, Adenauerallee 24-42, 53113 Bonn, Germany, gernot.mueller@uni-bonn. The views expressed in this paper are those of the authors. They do not necessarily represent those of the Federal Reserve Bank of Philadelphia, the Federal Reserve System, the International Monetary Fund or IMF policy.

[1]Data sources: Institute for Fiscal Studies (IFS); HMT 2009 Pre-Budget Report; Congressional Budget Office (CBO); IMF; and OECD. While the credibility of these official plans cannot be taken for granted, private forecasters, like the Economist Intelligence Unit, also project that government spending on goods and services will be curtailed. Indeed, growing market concerns about public debt and voters' resistance to large tax increases may leave policymakers with little other choice.

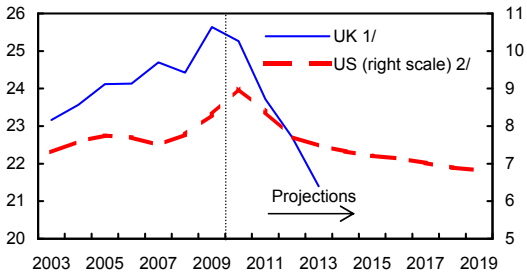

Figure 1. Discretionary Government Expenditure (percent of potential GDP) 1/ Total Departmental Expenditure Limit (IFS). 2/ Federal government (CBO).

In normal times, the prospect of a future "spending reversal" can be shown to amplify the expansionary effect of current fiscal stimulus, see Giancarlo Corsetti, André Meier and Gernot J. Müller (2009). All else equal, anticipated spending reversals reduce inflation as well as nominal and real interest rates, thus stimulating demand in the short run. Yet this mechanism relies on central banks' capacity to control short-term real interest rates. In this paper, we consider the complication arising in deep recessions when monetary policy is constrained in cutting policy rates by the zero lower bound (ZLB). Lower inflation, under such circumstances, inevitably *raises* real rates. Our goal is to formally analyze whether, in the neighborhood of the ZLB, anticipated spending reversals can still be expected to amplify the short-run stimulative effects of fiscal expansions.

I. The Model

Our analysis is based on a standard new Keynesian model. In the following, capital letters denote nominal variables, small letters real variables. The representative household chooses

consumption c_t and employment n_t to maximize

$$E_t \sum_{i=0}^{\infty} (e_{t+i}\beta^i) \left[\log c_{t+i} - \chi \frac{n_{t+i}^{1+\omega}}{1+\omega} \right], \ \chi, \omega > 0.$$

c_t is a CES bundle of differentiated goods c_{jt}, $j \in [0,1]$, with prices P_{jt}. e_t is a unit-mean shock to the time-discount factor $\beta \in (0,1)$. The period budget constraint is

$$\int_0^1 p_{jt} c_{jt} dj + T_t + B_t = n_t W_t + B_{t-1} R_{t-1} + D_t.$$

T_t are lump-sum taxes. B_t are purchases of bonds that pay gross rate R_t in $t+1$. Wages, W_t, are flexible and determined in a competitive labor market. D_t are dividends paid by firms.

Firm $j \in [0,1]$ produces $y_{jt} = z n_{jt}$ of a differentiated good, $z > 0$. In each period, a random fraction of firms, $1-\theta$, $\theta \in [0,1]$, can update its price. The firms' optimizing problem is

$$\max_{P_{jt}} E_t \sum_{i=0}^{\infty} q_{t,t+i} \theta^i \left[\frac{y_{jt+i}(P_{jt})}{P_{t+j}} - \frac{w_{t+i} y_{jt+i}(P_{jt})}{z} \right]$$

subject to demand function $y_{jt}(P_{jt})$.[2] Here $q_{t,t+i}$ is the stochastic discount factor between t and $t+i$, and P_t is the aggregate price level.

Government spending, g_t, is isomorphic to consumption, implying demand functions

$$y_{jt}(P_{jt}) = (P_{jt}/P_t)^{-\epsilon} y_t, \ \epsilon > 1,$$

where $y_t = c_t + g_t$. Government spending follows

$$g_t = (1-\rho)\overline{g} + \rho g_{t-1} + \phi_b(b_t - \overline{b}) + \mu_t, \ \rho \in [0,1).$$

Depending on $\phi_b \leq 0$, spending may respond to deviations of public debt from the target level $\overline{b}$.[3] μ_t is a mean-zero shock that—depending on the scenarios we consider below—may be anticipated. In each period, the government issues debt to satisfy its period budget constraint.

In setting interest rates, the central bank is constrained by the ZLB: $R_t = \max(R_t^*, 1)$. R_t^* is a target level derived from a simple Taylor rule:

$$\log(R_t^*/R) = \phi_\Pi \log(\Pi_t/\overline{\Pi}); \ \phi_\Pi > 1.$$

Above, $R = \overline{\Pi}/\beta$ denotes the steady-state interest rate, and $\overline{\Pi}$ denotes the target for the (gross) inflation rate, $\Pi_t = P_t/P_{t-1}$.

The parameterization uses conventional values. A model period is one quarter. We set $\omega = 1$, $\theta = 0.85$, and $\epsilon = 11$. z is chosen so as to normalize steady-state output to unity. Targeting steady-state $n = 1/3$ determines χ. In order to avoid initial valuation effects, the debt-to-GDP target is $\overline{b} = 0$. The long-run target level of government spending is $\overline{g} = 0.2$. The inflation target $\overline{\Pi}$, once annualized, is 3 percent. $\beta = 0.995$ targets a steady-state nominal interest rate of 4.75 percent (annualized). These values are broadly in line with US averages over the last 25 years. The simulations in the next section also assume that $\rho = 0.9$ and $\phi_b \in \{-0.011, 0\}$. In section III we specify an exogenous path for μ_t and assume $\rho = \phi_b = 0$.

II. Government spending reversals

We set the stage for our analysis by briefly reviewing the macroeconomic transmission of government spending. The classical experiment posits an unexpected, temporary increase in public expenditure on goods and services, ultimately financed by higher taxes. In this case, according to our baseline new Keynesian model, output rises, but private consumption falls relative to trend. The drop in consumption reflects two factors that work in the same direction. First, the exogenous rise in government spending entails a "wealth shock" for the consumers, who now faces a higher tax burden. This effect tends to be limited, however, except in the case of highly persistent fiscal expansions. Accordingly, the response of private spending is dominated by the second factor—intertemporal substitution: consumption falls as rising real interest rates cause households to postpone spending. In the model, current and expected future real rates rise because the increase in public demand creates inflationary pressure, prompting the central bank to tighten policy.

The important role of intertemporal substitution implies that the effectiveness of short-run

[2] While not spelled out above, our simulations further assume that firms that do not reoptimize update their prices by the steady-state inflation rate.

[3] If $\phi_b = 0$, we assume that lump-sum taxes adjust to ensure the stationarity of debt.

stimulus depends critically on the ensuing fiscal adjustment. Figure 2 compares two different fiscal programs. Both start with a temporary but persistent increase in government spending. One (the dashed lines) reproduces the classical experiment discussed above: the budget is balanced exclusively by raising taxes (the timing of which is irrelevant as Ricardian equivalence applies in this case). In the other scenario (the solid lines), the additional spending is initially financed by debt, but subsequently offset through a period of below-trend government spending—a "spending reversal." To facilitate matters, we assume that the spending reversal is complete, *i.e.*, the tax burden does not change at all.

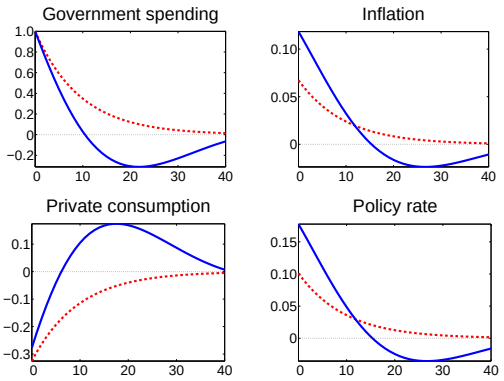

FIGURE 2. EFFECT OF GOVERNMENT SPENDING SHOCK WITH SPENDING REVERSAL (SOLID) VS. TAX FINANCE (DASHED); HORIZONTAL AXES MEASURE QUARTERS, VERTICAL AXES DEVIATIONS FROM STEADY STATE.

The dynamics of private consumption differ sharply across the two scenarios. In the tax-finance scenario, consumption remains depressed throughout. With a spending reversal, instead, consumption follows a hump-shaped pattern, rising above trend from quarter 7 onward. This response closely mirrors the dynamics of government expenditure. In fact, if prices were fully flexible, consumption would peak exactly when government spending reaches its trough. In our new Keynesian model, however, the rise in consumption above trend occurs four quarters before government spending falls below trend.

Key to the consumption dynamics is the anticipation of the spending reversal. Focus on monetary policy first: although the central bank raises the policy rate in the short run to counter the inflationary effect of current fiscal stimulus, the prospective spending reversal generates expectations of a fall in future policy rates below steady-state levels. This immediately eases long-term real interest rates (which capture market expectations for the entire path of future short-term rates), stimulating current private demand. In fact, staggered price setting by firms implies that the looming fiscal retrenchment already exerts a deflationary effect well before spending is cut: all else equal, firms facing price stickiness find it optimal to lower their prices some time ahead of the spending reversal. This in turn induces an earlier reduction in policy rates, bringing forward the switch to an expansionary monetary stance. Figure 2 shows that, as a result, the equilibrium response of consumption to the fiscal stimulus is stronger under the spending reversal scenario than in the tax finance case. Correspondingly, aggregate demand (the sum of private and public expenditure), inflation, and policy rates are also higher in equilibrium in the initial periods.[4]

III. The Zero Lower Bound

In this section, we re-assess the implications of spending reversals when monetary policy is constrained by the ZLB. The central bank's inability to cut nominal rates below zero in response to a severe recessionary shock provides a rationale for fiscal stimulus in the first place.[5] Large fiscal deficits, in turn, raise the prospect of future spending cuts, as governments need to rein in the rise in debt caused by their fiscal stabilization efforts. The ZLB, however, may alter the effect of spending reversals discussed above, as looming spending cuts could interfere with the aim to move the economy away from a state in

[4] Corsetti *et al.* (2009) analyze the model in more detail and provide some evidence for the empirical relevance of spending reversals for US time series.

[5] This is not to deny the possibility that central banks can affect economic conditions even when the short-term nominal interest rate is at the lower bound, as indeed several central banks have attempted through various unconventional operations since 2008. However, the significant uncertainty about the effectiveness and risks of such operations may itself be regarded as a policy constraint.

which monetary policy is constrained.

The challenge facing a fiscal exit strategy is as follows. Spending reversals enhance the short-term expansionary impact of fiscal stimulus insofar as their deflationary effect, all else equal, leads to lower real interest rates. With nominal rates already at the zero bound, however, lower inflation increases real rates. As a result, the prospect of fiscal adjustment *via* spending cuts might actually undermine the effectiveness of current fiscal stimulus.

To investigate this point, we modify our earlier specification, borrowing from Lawrence J. Christiano, Martin Eichenbaum, and Sergio Rebelo (2009). Specifically, we introduce a severe recessionary shock in the form of a sudden but persistent increase in the consumers' time-discount factor. It is worth stressing that our goal is to illustrate qualitative results; the precise quantitative assumptions and findings should not be seen as central to our argument. We assume that the time-discount factor rises to slightly below unity for 16 quarters, before rapidly returning to the steady-state value by quarter 18. In the absence of fiscal stimulus, the ZLB would bind for eight quarters as deflationary pressures give rise to a deep and protracted recession: with the nominal interest rate bound at zero, weak demand causes firms to cut prices; to the extent that pricing decisions are staggered, falling prices generate expectations of lasting deflation; for a given nominal interest rate, these translate into higher real rates, which further weaken demand, thus reinforcing the deflationary dynamics; see, *e.g.*, Gauti B. Eggertsson and Michael Woodford (2003). Under these circumstances, a sizeable increase in public demand can in principle halt the deflationary dynamics. Indeed, Christiano *et al.* (2009) derive large fiscal multipliers for the ZLB case.

In the following, we assume that government spending increases by one percent of steady-state GDP at the time of the deflationary shock, and that the stimulus remains in place for eight quarters. Both the path of the time-discount rate and the government's fiscal plans become known on impact. The simulations assume perfect foresight thereafter. As in Christopher J. Erceg and Jesper Lindé (2010), the time of the exit from the ZLB is endogenous.

Our focus is on the role of different consolidation strategies. Specifically, we assume that half of the upfront stimulus, calculated in present-value terms at steady-state prices, is offset by a subsequent spending reversal. We then investigate how the timing of the reversal affects the short-run effect of fiscal stimulus. As measures of policy effectiveness, Figure 3 reports the value of the fiscal impact multipliers for consumption and output (left column), as well as the number of quarters during which monetary policy is constrained by the ZLB (right column). In the figure, the upper and lower panels refer to reversals spread over four and twelve quarters, respectively, corresponding to different degrees of gradualism in implementation.

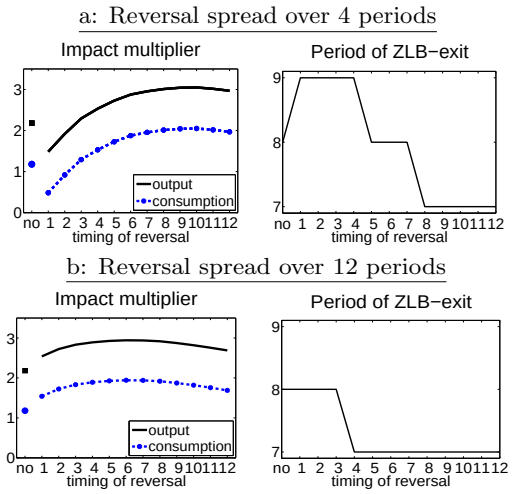

Figure 3. Fiscal multipliers and number of quarters at the ZLB under alternative reversal patterns. Horizontal axes measure quarters between the end of the stimulus and the beginning of the reversal; "no" refers to the case of no reversal (full tax finance).

The main finding is clear-cut. Relative to the pure tax-finance scenario (denoted by "no" in Figure 3), spending reversals increase the impact multipliers considerably in most cases.[6] In equilibrium, the anticipation of medium-term expenditure cuts stimulates current demand and thereby raises near-term inflation expectations—a desirable outcome at the ZLB. However, the beneficial effect of public spend-

[6] Similar findings emerge if we consider multipliers in later periods.

ing is quite sensitive to when the reversal starts. As shown by the upper panel of Figure 3, a very early and intense reversal may actually lower fiscal multipliers and lengthen the ZLB episode.

In fact, a premature spending reversal adds to the existing deflationary pressure from the preference shock in two ways. First, when the reversal starts, demand contracts. With nominal rates still close to zero, the ZLB may become binding again. Second, as price setters are forward-looking, disinflation sets in well ahead of the reversal, possibly while the ZLB is still binding. This causes a rise in real rates and may further delay the exit from the ZLB. If the reversal occurs somewhat later, instead, its deflationary effect unfolds at a time when the central bank has regained its ability to counter low inflation by cutting the policy rate. The anticipation of this policy path raises current demand and inflation and thus lowers real rates precisely when they are exceedingly high. In the experiment depicted in the upper panel of Figure 3, multipliers are largest when fiscal consolidation starts about eight quarters after the initial stimulus is phased out. In this scenario, the economy also exits from the ZLB one quarter earlier than without a reversal. It is important to stress, however, that postponing the reversal much further would again reduce its stimulative short-run effect, as the relevant anticipation effects would materialize later in time.

Similar results follow from exercises in which an equally-sized reversal is implemented more gradually, over 12 quarters instead of four—the lower panel of Figure 3. However, as the contraction in public demand in each quarter is now smaller than in the previous exercise, the deflationary impulse is also weaker. For this reason, early implementation neither reduces the fiscal multipliers, nor prolongs the ZLB episode, relative to the case of no reversal.

IV. Conclusion

The effectiveness of fiscal stimulus cannot be assessed independently of the medium-term fiscal outlook. Given the sharp deterioration of public finances during the global financial crisis, many countries are expected to undergo a period of signficant fiscal consolidation once the current stimulus policies have been phased out. Consolidation efforts are likely to include not only tax increases but also sizeable spending cuts. Our theoretical analysis suggests that such prospective spending cuts generally *enhance* the expansionary effect of current fiscal stimulus. This is because the anticipation of lower future public demand reduces inflation expectations and thus, *via* the monetary policy reaction, immediately eases long-term real interest rates. By the very nature of this transmission mechanism, however, the timing of the spending reversal is crucial if monetary policy is constrained by the zero lower bound (ZLB) and the economy therefore faces the risk of deflationary dynamics.

While the precise quantitative results from our simulations are sensitive to the model's specification and parameters, our main conclusion is rather general. Prospective spending cuts raise current fiscal multipliers even when the ZLB is binding. However, compared to the case without ZLB constraints, the spending reversal must not come too early on the recovery path, or at least must be suitably gradual. With this qualification in mind, our results support the case for a timely and credible commitment to medium-term expenditure restraint. Indeed, well-designed measures to reduce future public spending not only help attenuate concerns about fiscal sustainability, but may also make the initial fiscal stabilization effort more effective.

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