



Tax multipliers: Pitfalls in measurement and identification



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ABSTRACT

To analyze the pitfalls in measuring and identifying tax shocks, we build a novel value-added tax rate dataset for the period 1980–2009. The problem of identification (i.e., changes in tax policy not triggered by output fluctuations) is clearly disentangled from the problem of measurement (i.e., finding a tax policy variable under the direct control of policymakers). On the identification front, our results favor the use of narratives à la [Romer and Romer \(2010\)](#). On the measurement front, our findings support the use of tax rates as the true measure of tax policy as opposed to revenue-based measures, such as cyclically adjusted revenues.

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1. Introduction

In the aftermath of the global financial crisis and ensuing recession triggered by the fall of Lehman Brothers on September 15, 2008, many governments across the world implemented aggressive countercyclical fiscal policies. More recently, large fiscal deficits and concerns about debt sustainability in industrial countries, particularly in Europe, have shifted the tone of the discussion from stimulus to fiscal adjustment. Since then – and following the influential paper by [Giavazzi and Pagano \(1990\)](#) – there has also been a revival of studies suggesting the possibility that fiscal adjustments might have no effect on output, or be even expansionary, especially when driven by spending cuts.¹ As a result of the policy focus first on fiscal stimulus and later on fiscal consolidation, there has also been a flourishing of studies estimating fiscal multipliers, both on the spending and the taxation side.

The main challenge and point of contention among researchers has been how to address the possible endogeneity of fiscal policy or, to put it differently, how to identify fiscal policy shocks (i.e., changes in fiscal policy variables that are not directly or indirectly related to output changes). Two main approaches have been used to address these endogeneity problems. The first approach has followed the seminal contribution of [Blanchard and Perotti \(2002\)](#) by imposing short term restrictions in the context of structural vector autoregressions (SVAR). On the expenditure side, the Blanchard–Perotti approach assumes that discretionary government spending requires at least one quarter to respond to news about the state of the economy. On the taxation side, the output elasticity of tax revenues is used to differentiate “discretionary” changes in

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¹ See, for example, [McDermott and Wescott \(1996\)](#), [Giavazzi et al. \(2000\)](#), [von Hagen and Strauch \(2001\)](#), [von Hagen et al. \(2002\)](#), [Lambertini and Tavares \(2005\)](#), [Ardagna \(2004\)](#), [Alesina and Ardagna \(2010\)](#), and [IMF \(2010\)](#).

taxation (also referred to as changes in cyclically adjusted revenues) from those driven by endogenous reactions of tax revenues to output fluctuations. The Blanchard–Perotti approach is by far the most popular identification strategy due to its ease of implementation and data availability (e.g., Perotti, 2004; Favero and Giavazzi, 2007, 2012; Mountford and Uhlig, 2009; Ilzetzki, 2011; Ilzetzki et al., 2013). This strategy has been criticized on the basis that most changes in government spending and taxes are actually anticipated by agents (e.g., Ramey and Shapiro, 1998; Leeper et al., 2008; Ramey, 2011; Auerbach and Gorodnichenko, 2013; Riera-Crichton et al., 2015).

The second approach has developed around the so-called “natural experiment” approach. This identification strategy assumes that some exogenous changes in fiscal policy are, in fact, observable. On the spending side, studies have typically focused on particular spending categories, such as military buildups, that are unlikely to respond to output fluctuations (e.g., Barro, 1981; Ramey and Shapiro, 1998; Hall, 2009; Ramey, 2011; Barro and Redlick, 2011). On the taxation side, Romer and Romer (2010), hereafter RR, use the narrative record – such as presidential speeches and congressional reports – to identify, on a case-by-case basis, the nature of legislated federal tax changes in the United States from 1945 to 2007. RR identify tax changes exogenous to the business cycle, because they either were passed for long-run growth reasons or involve increases seeking to reduce an inherited budget deficit. On tax changes induced by long-run growth considerations, they argue that: “[t]he quintessential exogenous change might be a tax cut motivated by a belief that lower marginal tax rates will raise output in the long run. Such an action is fundamentally different from the countercyclical actions [...] because the goal is to raise normal growth, not to offset shocks acting to reduce growth relative to normal.” Regarding deficit-driven tax changes, they argue that “[a]n inherited deficit reflects past economic conditions and budgetary decisions, not current conditions or spending changes. If policymakers raise taxes to reduce such a deficit, this is not a change motivated by a desire to return growth to normal or to prevent abnormal growth. So it is exogenous.”

Our analysis contributes to the literature on tax multipliers. Building on the above discussion on *identification*, the paper revisits the merits of the SVAR vs. the “natural experiment” approach.² To implement the latter, we take as the starting point the action-based fiscal consolidation episodes identified by an IMF study in 15 industrial countries for the period 1980–2009, and then develop our own narrative to ensure exogeneity. This strategy is in the spirit of RR’s identification of tax changes driven by inherited fiscal deficits.

The main and novel contribution of this paper, however, is related to the much less explored issue of *measurement* of tax policy (i.e., finding a tax policy variable under the direct control of the policymaker). As discussed in Kaminsky et al. (2004) and Vegh and Vuletin (2015), an obvious, yet critical, observation is that policymakers’ main tax instrument is the tax rate. While policymakers control and legislate on tax rates, tax revenues are a policy *outcome* not under the policymakers’ direct control. To fix ideas, define real tax revenues (R) as follows:

$$R_t = \text{TAX RATE}_t \cdot \text{TAX BASE}_t, \quad (1)$$

where TAX BASE_t denotes the real tax base. The policymaker controls TAX RATE but not TAX BASE and, hence, does not control R .³ Taking logarithmic changes, it follows from Eq. (1) that

$$r_t - r_{t-1} = (\text{tax rate}_t - \text{tax rate}_{t-1}) + (\text{tax base}_t - \text{tax base}_{t-1}), \quad (2)$$

where r , tax rate , and tax base are the log of real tax revenues (R), tax rate (TAX RATE), and the real tax base (TAX BASE), respectively. Eq. (2) indicates that the percentage change in tax revenues ($\Delta r_t \equiv r_t - r_{t-1}$) can be decomposed into the sum of the percentage change in the tax rate ($\Delta \text{tax rate}_t \equiv \text{tax rate}_t - \text{tax rate}_{t-1}$) and the percentage change in the tax base ($\Delta \text{tax base}_t \equiv \text{tax base}_t - \text{tax base}_{t-1}$).

Given the lack of readily available cross country data on tax rates, the standard measure utilized in the tax multiplier literature to capture discretionary changes in tax policy is the so-called cyclically adjusted revenues (e.g., Giavazzi and Pagano, 1990; Alesina and Perotti, 1997; Blanchard and Perotti, 2002; Alesina and Ardagna, 2010; Favero and Giavazzi, 2012; Perotti, 2012; Ilzetzki, 2011). The change in cyclically adjusted revenues is typically calculated as:

$$\Delta \text{cyclically-adjusted}_t = r_t - r_{t-1} - \eta(y_t - y_{t-1}), \quad (3)$$

where y is the log of real output and η is the historical (i.e., average) output elasticity of tax revenues. The first two terms on the right-hand side of (3) denote the percentage change in tax revenues. The third term aims at capturing the percentage change in tax revenues associated with GDP-driven changes in the tax base. In principle, this cyclically adjusted measure offers an intuitive way of dealing with the fact that the tax base moves endogenously with the business cycle. The idea is, of course, that once tax revenues are cyclically adjusted, changes will reflect the discretionary action of policymakers. Indeed, assuming that $\text{tax base}_t = \eta \cdot y_t$, it follows that $\Delta \text{cyclically-adjusted}_t = \Delta \text{tax rate}_t$.^{4,5} In other words, cyclically adjusted revenue changes seem to capture discretionary changes in tax policy (i.e. changes in tax rates).

² In this dimension, our paper is thus related to the recent contribution of Mertens and Ravn (2014), which tries to reconcile SVAR and narrative estimates of tax multipliers. The authors use narrative measures as proxies for structural shocks and trace differences in the magnitude of tax multipliers to incorrect assumptions on the output elasticity of tax revenues and measurement errors in narrative series of tax shocks.

³ This concern is particular to tax policy, since government spending is, in principle, the appropriate policy instrument on the spending side.

⁴ Assuming that $\text{tax base}_t = \eta \cdot y_t$, implies, of course, that η is the elasticity of the tax base with respect to GDP.

⁵ To see this, replace (2) in (3) and use the fact that $\Delta \text{tax base}_t = \eta \cdot \Delta y_t$.

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