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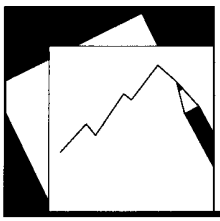

IMF Working Paper

Government for the People: On the Determinants of the Size of U.S. Government

Tamim Bayoumi and
Fernando M. Gonçalves

INTERNATIONAL MONETARY FUND

 WP/07/289

IMF Working Paper

Western Hemisphere Department

Government for the People: On the Determinants of the Size of U.S. Government

Prepared by Tamim Bayoumi and Fernando M. Gonçalves[1]

December 2007

Abstract

Trends in the size of U.S. government are examined. In the postwar period, general government primary spending rose by ¼ percent of GDP a year through 1975, stabilizing thereafter. With higher social transfers offset by a lower burden of defense spending, expansion reflected a baby-boom driven rise in education spending. The parallel improvement in tax efficiency helped equate the benefits of higher spending with the costs from higher taxation, in accordance with a marginalist view of the size of government. Looking forward, the retirement of baby boomers appears likely to expand government and lead to a more efficient tax system.

JEL Classification Numbers: H20, H50, J10

Keywords: Government size; Demographic structure; Education spending; United States

Authors' E-Mail Addresses: tbayoumi@imf.org; fgoncalves@imf.org

[1] We would like to thank participants of a presentation in the 2007 LACEA meeting, and Marcio Garcia for comments and suggestions. Volodymyr Tulin and Andrew Swiston provided outstanding research assistance.

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I. INTRODUCTION

What determines the size of the United States government over the long term? This perennially important question is of particular interest currently, given that the United States is on the edge of a significant demographic shift. The retirement of the baby boom generation will result in a rapid rise in the proportion of the elderly, implying significant upward pressure on major entitlement programs—most notably Medicare and Social Security.[2] How is the U.S. fiscal system likely to react?

This paper approaches this question by focusing on the post-World War II trends in the size of the U.S. general government, as well as the composition of spending and revenues. The postwar period was chosen as it is a lengthy period that contains a large but slow-moving demographic shock (the birth and movement into middle age of the baby boom generation) while excluding major wars and the consequent rapid shifts in government priorities. As such, it is likely to be particularly pertinent for analyzing the underlying determinants of the size of government in the economy.

Existing conceptual frameworks predict a variety of results for the relationship between public spending and revenue, which can be broadly divided into three types.[3] The first view, generally identified with conservatives, is that government is a leviathan that, given the opportunity, will spend money even on projects of little or no value due to the imperatives of the political process. For example, Milton Friedman's aversion to large governments led him to famously assert "I never met a tax cut I didn't like" (Friedman, 2003). In his view tax cuts tend to generate politically intolerable budget deficits that eventually force spending cuts, while budget deficits could not be reduced through tax increases as this would simply invite more spending. Even more succinctly, David Stockman (President Reagan's budget director) viewed tax cuts as a way of "starving the beast".[4] In this view, government will expand unless tax policy intervenes.

An alternative view, often identified with liberals, focuses on the potential benefits of government spending in reducing market failures and improving social welfare. The

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[2] See, for example, Congressional Budget Office (2007).

[3] Buchanan and Wagner (1977) argue that tax cuts reduce the perceived cost of government programs, leading to a greater demand for such programs, more government spending and larger deficits. Tax-smoothing models in the tradition of Barro (1979) generally assume that government spending is exogenous, implicitly hypothesizing that governments spend first and tax later. Wildavski (1992) argues that the institutional separation between appropriations and taxation in the United States renders decisions on spending unrelated to revenue policy. Finally, some theoretical models assume fiscal synchronization—i.e., revenue and spending decisions are made simultaneously (e.g., Meltzer and Richard, 1981).

[4] Stockman (1986).

government is best placed to intervene in the economy because of its vast resources and ability to legislate. As the potential benefits from such actions are viewed as large, the economic costs of taxation are downplayed, just as the conservative approach downplays the potential benefits of government spending. In this framework, policy makers' realization of the value of public programs has driven the size of government.

This paper adopts a third view—a marginalist view—according to which the size of government is determined by the point at which the benefits of another dollar in government spending equals the cost of another dollar in tax revenue for the population at large (generally identified with the median voter). In such a model, increases (decreases) in the size of government can reflect evolving perceptions of voters about the value of government spending (for example, the value of spending in education) or shifts in the efficiency of the tax system. However, this is not simply an amalgam of the other two approaches. Those models suggest that the size of government is out of equilibrium and will vary over time depending on the ideology of policy makers, while the marginalist model has the implication that the size of government is close to equilibrium and (except in times of crisis or major tax innovations) should shift gradually in response to changes in public views on the appropriate scope of government or the tax "technology".

The studies that have attempted to empirically evaluate these relationships in the United States have reached no consensus.[5] The wide range of results may be the product of different time periods, degrees of aggregation and modeling approaches. But while the specific data sample and methodology adopted in each study varies, all of them perform some version of Granger-causality tests between government spending and revenue, with most recent studies invariably correcting for long run relations (i.e., cointegration between the variables) and controlling for real developments.[6]

Given our focus on government size, we differ from the majority of previous work by scaling revenue and spending by GDP.[7] But we follow the previous literature in performing

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[5] Bohn (1991) and Chang et al. (2002) find evidence favoring the starve-the-beast hypothesis; Islam (2001) obtains that the spend-and-tax hypothesis holds for the United States; Miller and Russek (1990) find evidence of fiscal synchronization; and Baghestani and McNown (1994) conclude that there is fiscal separation between revenue and spending in the United States. In a more recent study, Romer and Romer (2007) focus on legislated changes in taxes not motivated by current or planned changes in spending and find no evidence of the starve-the-beast hypothesis.

[6] Besides using some measure of GDP or GNP (nominal, real, or potential), some studies control for other macroeconomic variables such as inflation and real gross debt (see the survey by Payne, 2003).

[7] The typical approach is to analyze revenue and spending directly in levels. An important exception is Bohn (1991), who analyzes ratios to GNP. He also imposes the intertemporal budget constraint in the estimation stage of an error-correction model. Given that the government can run high budget deficits or surpluses for long periods of time, Bohn focuses on the longest data set available for the United States at the time of his writing

(continued)

causality tests of the intertemporal relationship between revenue and spending in the United States. As we shall see, in many of our results we find evidence that (excluding the economic cycle) primary spending and revenues of government as a ratio to GDP have trended only slowly over time in the postwar period.[8]

If the marginalist view is valid, however, these aggregate data may obscure important dynamics in the composition of government revenue and spending. In particular, if voters' priorities are changing one would expect that some spending categories are dwindling while others are becoming more important. Therefore, we extend the previous literature and look at the dynamics of major categories of spending and revenue. More specifically, we analyze the secular decline in defense spending and the concomitant rise in social spending as shares of GDP in the United States. In addition, the marginalist hypothesis also suggests that increases in government size will increase pressure to lower the marginal cost of taxation. Accordingly, we examine the degree to which the tax system has become more efficient over time, and how this is related to trends in the size of government.

The remainder of the paper is as follows. The next section briefly discusses possible explanations of the rise in the size of government as a share of GDP from 1900 to 1952. Section III then analyzes the trends in revenue and spending as shares of GDP since 1952 for different levels of the U.S. government (general, federal, and state and local). Section IV extends this work to the components of spending, while Section V focuses on revenue components. Section VI concludes and discusses the policy implications of our results.

II. Why Did the Federal Government Expand So Much Since 1900?

Figure 1 depicts the series of federal government's revenue, spending, and surplus as shares of GDP since 1900, illustrating the dramatic increase in the size of federal government.[9] The main increases occurred roughly around the two world wars. Before World War I, federal revenue and spending were about 2 percent of U.S. GDP. After a large increase in spending and (to a less extent) revenue over the 1914–1918, these shares stabilized at some 4 percent through the early 1930s, when the spending ratio started to gradually increase. With the advent of World War II, total federal spending ballooned to more than 40 percent of GDP while total federal revenue rose to around 20 percent. After the

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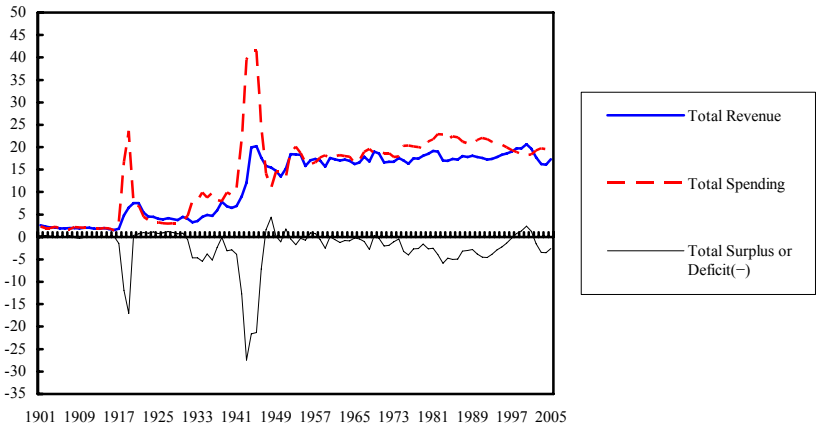
(1792–1988). The dynamics of such series, however, is dominated by war events. As mentioned before, we focus instead in the post-WWII period, and do not impose the intertemporal budget constraint.

[8] In many cases there seems to be no trend. Rather, revenues and spending have reverted back to their initial value in response to shocks, making the issue of whether taxes cause spending or vice versa largely irrelevant.

[9] All variables we analyze are expressed as shares of GDP. To avoid tedious repetition, in many occasions we will refrain from restating that the variables we are analyzing are scaled by GDP. This means, for instance, that "government revenue" actually means "government revenue as a share of GDP."

end of World War II, the ratios to GDP of revenue and spending remained much higher than their pre-war levels—over 15 percent during the entire postwar period.

Figure 1. Federal Government Revenue, Spending, and Surplus (as shares of GDP), 1901-2005



Source: Data on nominal federal revenue and spending, and on GDP after 1928 are from Historical Tables, Office of Management and Budget (OMB), U.S. Government; data on GDP from 1901 to 1928 are from Economic History Services Website (http://eh.net/node); authors' calculations.

What events explain the increased role of the federal government over time? The shift over the First World War apparently largely reflected an improved tax technology. The 16th Amendment to the U.S. Constitution, which gave Congress authority to enact the personal income tax, was ratified in 1913 soon after a constitutional way of taxing corporate income had been found in 1909. Personal and corporate taxes rapidly became the most important source of federal revenues. Indeed, as can be seen in Table 1, the doubling of the size of the federal from 1913 to 1922 as a ratio to GDP was entirely funded from income taxes. There was also a more modest increase in the state and local government spending ratio, suggesting that the greater government involvement in the economy as a result of the war may have also led to some increase in government programs.

The main drivers of the expansion of government over the great depression and World War II came from public acceptance of two major new roles for government. The first was in the creation of a social safety net, a gradual process which started with the New Deal in the 1930s and, as discussed below, has continued to this day.[10] The second was the central role of the United States in international security, implying greater military spending as a ratio to GDP which peaked in the early 1950s and has fallen subsequently.[11] As can be seen in Table 1, while the enormous expansion in the size of federal government from 1927 to 1952 largely reflected war spending, over half of the remaining expansion in federal spending ratio was on education and transfers. There was also a change in revenue

[10] On the 1930s, see Kennedy (1999) (the Social Security Act was signed by President Franklyn Roosevelt in 1935). On the post World War II period see Patterson (1996, 2005).

[11] Gaddis (2005) provides an overview.

technology—payroll withholding, introduced in 1943, significantly increased the number of taxpayers and thus tax collection. However, this appears to have been a response to pressures to raise revenues in the face of large deficits, rather than an independent driver of spending.

This brief overview of historical events suggests that the increase in the size of government since 1900 can be reconciled with the marginalist view described in the introduction, according to which the size of government is a function of changes in the tax "technology" and changes in views of the median voter. Hence, even for this large increase in government size there is no need to introduce more "political" explanations for the size of government. We now move onto a more detailed discussion of the period after World War II.

III. Revenue and Spending in the Postwar Period

A. Graphical Analysis

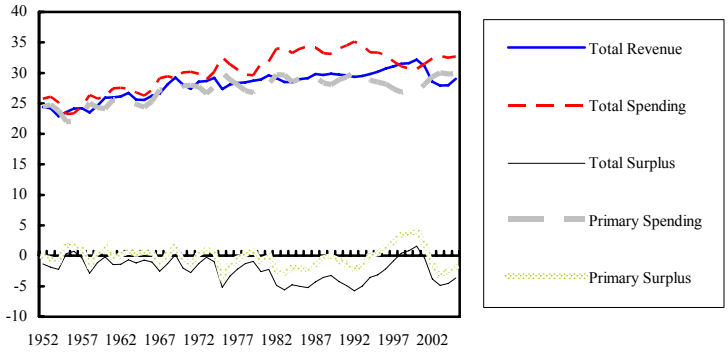
We start by examining trends in general government, the broadest definition of the government, which integrates the federal and state and local levels, before analyzing the latter two separately. As the distortionary effect of World War II on government accounts persisted through the first years immediately after the end of the war, reflecting demobilization and immediate postwar turmoil, this analysis starts in 1952, the year that post-1945 defense spending peaked as a ratio to GDP (reflecting the Korean war).

Figure 2 depicts general government total revenue, spending, and surplus as shares of GDP since 1952, as well as the primary spending and primary surplus ratios, using data from the national income and product accounts (NIPA). Total spending as a ratio to GDP, while experiencing short-term variations associated with the cycle, trended upward through the early 1980s, before stabilizing through the early 1990s and then falling. The total revenue ratio showed a similar trend through the mid-1970s, and then largely stabilized before falling recently. As a result of the divergent trends after the mid-1970s, there were historically large deficit ratios throughout the 1980s and part of the 1990s. The subsequent fall in the spending ratio was such that the United States experienced small budget surpluses in the late 1990s for the first time since soon after World War II, before drops in revenues moved the government accounts back into deficit.

The path for primary spending and the primary surplus tell a more gradual and less dramatic story. Primary spending rose at around the same rate as revenues through the middle of the 1970s before stabilizing thereafter. As a result, while the primary surplus ratio fluctuates from year to year—apparently reflecting the business cycle—it appears to have no significant underlying trend over time. Given that the debt ratio has been relatively stable over time while inflation has not, it seems most likely that the fluctuations in interest

spending largely reflect changes in compensation for anticipated inflation.[12] Accordingly, we focus on trends in primary spending, revenues, and the primary surplus as the best measure of the size of government. For the entire sample period, the growth rates of revenue and primary spending were very similar and gradual. Both revenue and primary spending were about 25 percent of GDP in 1952, stabilizing at around 29 percent of GDP after the mid-1970s.

Figure 2. General Government Revenue, Spending, and Surplus (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

It is also of interest to examine whether the trends observed in general government are matched in its components, given that federal and state and local government have different spending responsibilities (for example, defense is a federal responsibility, education largely a state and local government one) and institutional constraints (while federal deficit spending is unconstrained except for the need to raise the federal debt limit, all but one state has some form of balanced budget rule).[13] In addition, for the federal government its is possible to compare NIPA series with those provided in the federal budget, to see if lawmakers at the highest level of government are being provided with an accurate picture of federal finances.

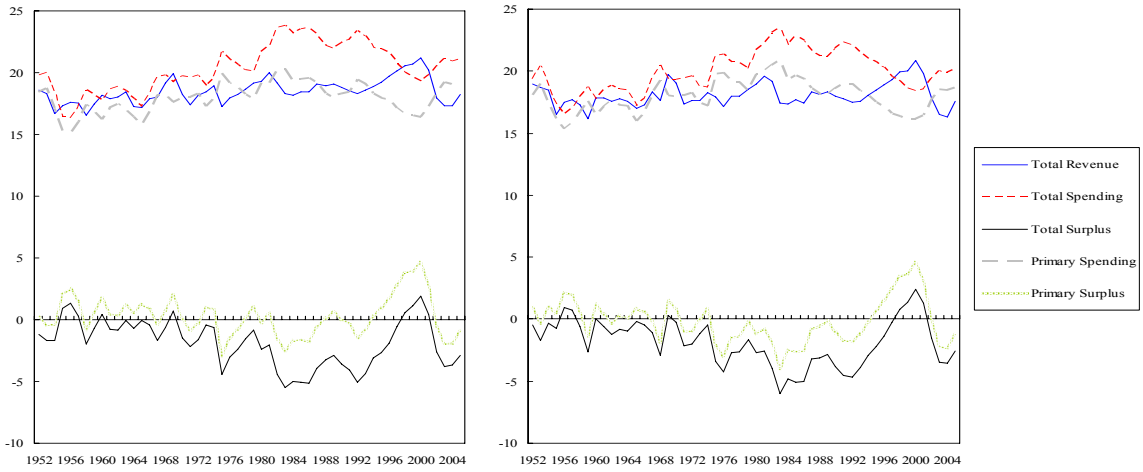
Accordingly, Figure 3 uses two different data sources—the NIPA from the Bureau of Economic Analysis on the left and budget data from the Office of Management and Budget on the right—to illustrate the evolution of federal government spending and revenue as a ratio of GDP from 1952 to 2005. While the NIPA data contains information on a national accounts basis, the OMB data contains the information about past spending available to Congress at budget time. Comparing the two graphs, it is clear that the respective series are very similar. The lack of a significant difference (caused, for example by off-budget operations) implies law makers are well informed about the size of the federal government

[12] Interest payments peak in the 1980s, somewhat after the peak in inflation, as the unexpected burst of inflation in the 'seventies led to a partially offsetting reduction in government debt as a ratio to GDP.

[13] Bayoumi and Eichengreen (1995).

(this is also true for disaggregated data, such as defense spending). Given the similarity of the data from the two sources, in what follows we focus our analysis on the NIPA data.

Figure 3. Federal Government Revenue, Spending, and Surplus (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; Historical Tables, Office of Management and Budget (OMB), U.S. Government; authors' calculations.

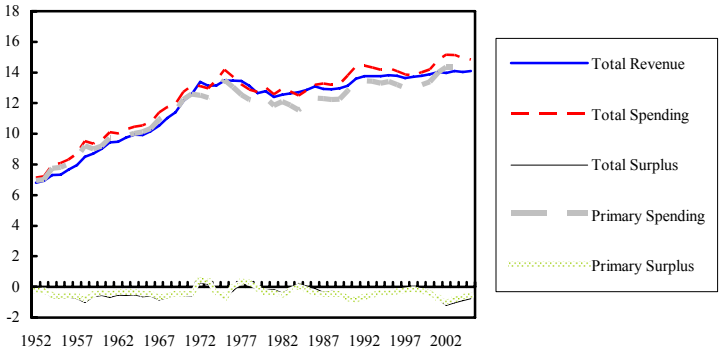
The panels of Figure 3 report for the federal government the equivalent series as are reported for general government in Figure 2. Unsurprisingly, given the important role played by the federal government in overall national finances, the trends across these two levels of government have many similarities. Total spending as a ratio to GDP experienced large increases starting in mid-1970s, achieving a peak in 1983 and, with revenues relatively constant as a ratio to GDP, there were historically large deficits throughout the 1980s and part of the 1990s. Again, except for the period soon after World War II, the years 1994–2002 were the only postwar years in which the United States experienced budget surpluses.

The time series of primary spending and primary surplus, however, tell a slightly different story from their general government equivalents. In particular, primary spending, revenues, and the primary surplus as a ratio to GDP appear to have experienced no trend over the entire period. While it might be tempting to ascribe this stability to a relatively constant social view about the appropriate size of government, this is inconsistent with the steady expansion of general government through the mid-1970s. Rather, as discussed further below, it appears to reflect offsetting trends in federal government spending priorities over time.

Next, Figure 4 depicts the evolution of state and local government spending and revenue as shares of GDP in the United States from 1952 to 2005. State and local spending (on both a total and primary basis) and revenues show very similar upward trends over time, resulting in no significant budget deficits or surpluses in the period, consistent with the

prevalence of constitutional or statutory limitations on deficits and hence debt.[14] There also appears to be a break in behavior in the mid-1970s, with the rate of increase of spending as shares of GDP growing faster earlier in the sample. Given that federal government series are stationary, the discrepant behavior of the state and local government series before and after 1975 is also what drives the different behavior of general government for each of these periods.[15]

Figure 4. State and Local Government Revenue, Spending, and Surplus (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

To investigate trends in primary spending, revenues, and the primary surplus ratios at various levels of government more formally, Table 2 reports augmented Dickey-Fuller tests of whether primary spending and revenues ratios are stationary (first differences are always stationary for all of these series and their components analyzed later in this paper). Given the evidence of a change in behavior in the mid-1970s, we split the sample in 1975. These tests confirm the inferences discussed above. More specifically, general government primary spending and revenues trend upwards from 1952–1975 at about ¼ percent of GDP a year, while the primary surplus does not (implying the first two series are cointegrated). State and local government primary spending and revenue ratios trend up over the entire sample, while the primary deficit is stationary. By contrast, all of the general government series from 1976 to 2005 and the federal series over both periods show no trends at all, implying that primary spending, revenues, and the primary deficit all have a natural tendency to return to their average values. This autonomous tendency to revert to average values limits the degree to

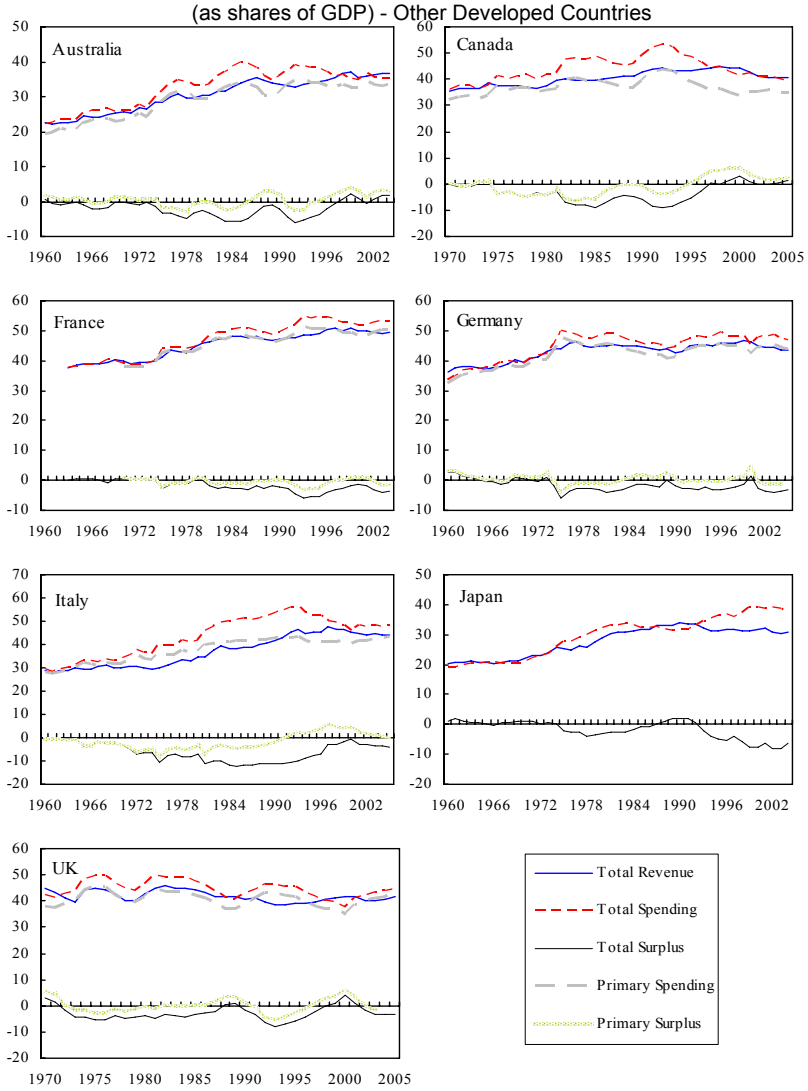
[14] Only Vermont has no form of balanced budget amendment, but these amendments differ significantly across other states. Poterba (1994), Bayoumi and Eichengreen (1995), and Bohn and Inman (1996) use the differences among balanced budget rules to perform formal analyses of their impact on deficit behavior of state and local governments. They all obtain the result that more stringent balanced budget requirements do limit budget deficits.

[15] The fact that state and local government spending and revenue ratios trend up since the mid-1970s while both federal and general government ratios spending do not reflects rising transfers from the federal to lower levels of government as a ratio to GDP over this period.

which one half of the equation—primary spending or revenues—can be said to be driving the other one.

Finally, it is useful to compare these trends in the size of U.S. general government with those of other developed countries. Accordingly, Figure 5 shows historical data on general government revenue and spending as shares of GDP for Australia, Canada, France, Germany, Italy, Japan, and the United Kingdom. Two features stand out. First, the United States has had a much smaller government than European countries and Canada, and, to a much lesser extent, Australia and Japan. Second, except for the United Kingdom, the U.S. pattern of a slow rise in government followed by a stabilization is replicated elsewhere.

Figure 5. General Government Revenue, Spending, and Surplus
(as shares of GDP) - Other Developed Countries



Source: OECD, Analytic Database.
Note: Prior to 1991, data on Germany are from Western Germany.

B. The Dynamics of Government Spending and Revenue

While the graphical analysis presented above provides many insights, it is difficult to use this approach to examine the dynamics between primary spending and revenues, and hence the evidence for the "starving the beast" hypothesis. We approach this by estimating vector autoregressive (VAR) models including primary spending and revenue ratio, with the lags in the model suggested by standard tests. To control for the economic cycle, real GDP growth and its first lag were also included as exogenous variables in the VAR. Given the split in behavior in the mid-1970s seen in most series, we estimate separate models for the two halves of the sample.[16] In those periods where primary spending and revenues are nonstationary, an error correction term (ECM) between levels of primary spending and revenues is also included.

Table 3 reports the six VARs we estimated involving three levels of government (general, federal, and state and local) and two time periods (1952–75 and 1976–2005). In the cases where an ECM is included, the coefficients on the mechanism are reported, together with the estimated coefficients in the two VAR equations. A significant coefficient indicates that as revenues rise above spending revenues tend to fall/spending tends to rise to regain *long-term* equilibrium. In addition, for all VARs, Granger causality tests are reported testing whether *short-term* lagged changes in the revenue ratio significantly affect current changes in the primary spending ratio and/or vice versa. Hence, we report tests of both short-term causality and, where appropriate, its long-term equivalent.

The results suggest little evidence in favor of the starving the beast hypothesis. For general government in the first period, the results from the ECM suggest that a rise in the surplus leads to a significant long-term fall in revenues, while there is only a small and insignificant impact on primary spending. Similarly, the short-term dynamics captured by the Granger causality tests suggest that increases in spending lead to higher revenues in both periods, with no link from revenues to spending. Granger causality tests for federal spending and revenue ratios find no link in either direction. Finally, the ECM and Granger causality tests for state and local government are similar to the general government results again suggest that a rise in the primary surplus leads to a statistically significant long-term fall in revenues (it also leads to a somewhat perverse fall in spending). Granger causality tests indicate that spending causes revenue in both periods—plausibly reflecting the impact of balanced budget amendments.

[16] The debt-to-GDP ratio was trending down before 1975 and trending up for most of the post-1975 period (except for the last few years). Therefore, we do not include debt ratios in the analysis because by splitting the sample in 1975 we are already controlling for trends in this variable.

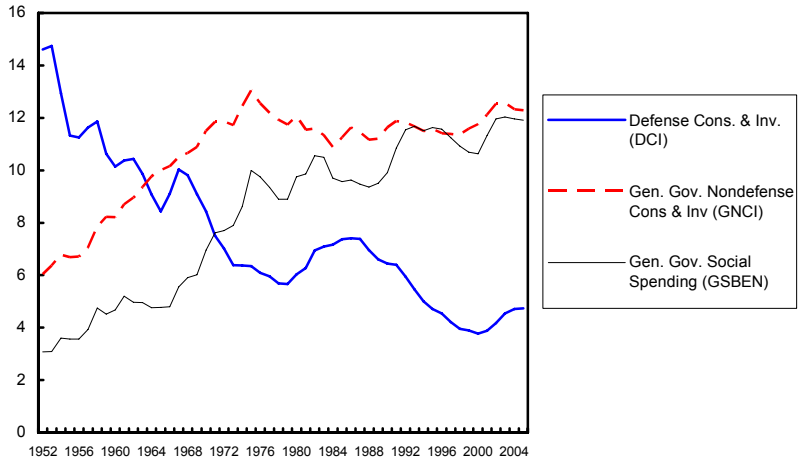
IV. Major Components of Government Spending

The consistency of the evidence that spending drives revenue might appear inconsistent with the marginalist approach adopted in this paper. However, as there were no significant changes in the revenues technology over our postwar sample, it follows that the size of government should be determined by the publics' view of the appropriate priorities for government spending. A key element in determining the appropriateness of the marginalist approach is thus how the size of government reflects changes in the structure of government spending. A similar analysis of government revenue is left to section V.

A. General Government Spending: Guns or Butter?

Figure 6 depicts the dynamics of three main components of general government primary spending identified in the NIPA—defense and nondefense consumption and investment as well as government social transfers. Defense spending has fallen relatively steadily as a ratio to GDP in the postwar period, despite temporary rises as a result of the Vietnam war in the late 1960s and early 1970s and the Reagan defense buildup in the 1980s. The ratio fell from around 15 percent in early 1950s to less than 5 percent by 2005, with the rate of decline appearing to lessen in the mid-1970s. This reduction was accompanied by a significant increase in general government social spending (from about 3 percent of GDP in early 1950s to 12 percent of GDP in 2005) and nondefense spending (from 6 to about 12 percent of GDP). As with defense spending, these trends slowed in the mid-1970s; indeed, nondefense consumption and investment stabilized after this point. One implication of these trends is that while the size of government has expanded over time, its direct impact on the economy through consuming or investment resources has actually declined relatively steadily as a ratio of the economy since mid-1970s.

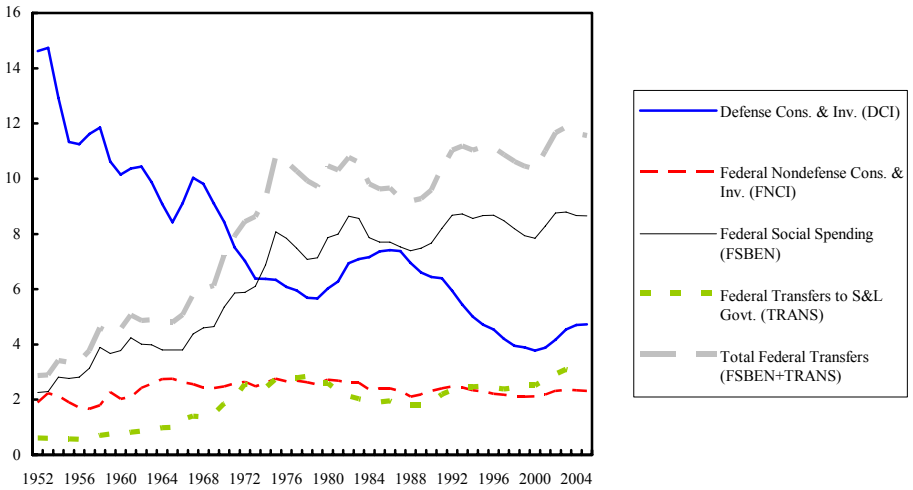
Figure 6. General Government Primary Spending Components(as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

Figure 7 depicts the ratios to GDP of major components of federal government primary spending using NIPA data.[17] The strong decline in defense spending discussed above is largely offset by upward trends in federal social transfers (from 3–4 percent of GDP in the early 1950s to almost 9 percent in 2005) and transfers to state and local governments (from around ½ percent of GDP in early 1950s to about 3 percent in 2005). On the other hand, contrary to general government, the federal nondefense spending has been relatively stable, remaining within a range of 2 to 3 percent of GDP during the entire sample period. Recalling that aggregate federal primary spending as a ratio to GDP had no trend, it follows that declines in defense spending ("guns") have been largely offset by increases in social and state and local government transfers.

Figure 7. Federal Government Primary Spending Components
(as shares of GDP), 1952-2005

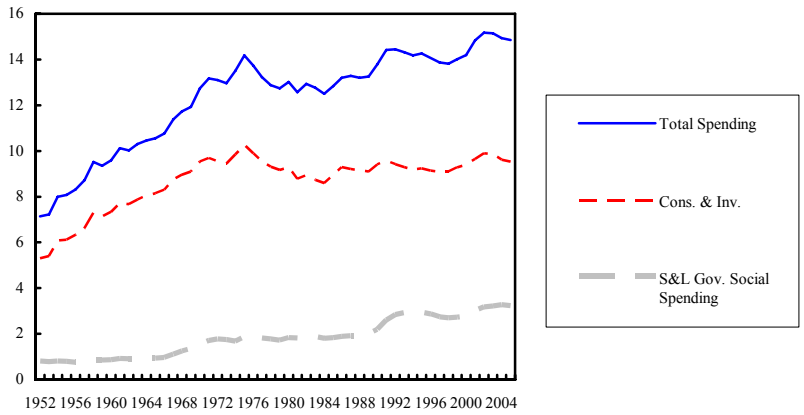


Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

Figure 8 depicts the components of state and local government's spending. There is a marked increase in (nondefense) consumption and investment as a ratio to GDP through the mid-1970s, primarily driven by education spending, after which both education and total direct spending stabilized (Figure 9). This rise in the education spending ratio apparently reflected changes in public preferences due to the baby boom. As discussed in Poterba (1997), a falling fraction of elderly residents leads to a significant increase in per-child educational spending. Because the first half of our sample coincides with a large demographic change—the birth and moving into the school age of the baby boom generation—the dynamics of education spending likely reflects the aggregate effect of Poterba's finding, consistent with the marginalist approach.

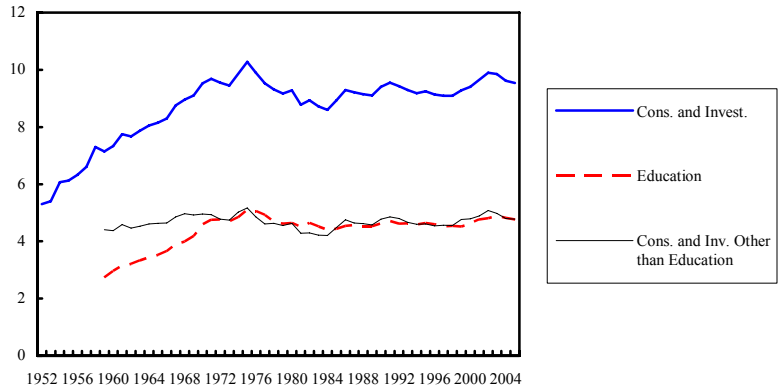
[17] Budget data provide a similar picture, except the distinction between consumption or investment and transfers is difficult to identify, as it is less relevant for budget analysis than for the NIPA, which needs the distinction to derive GDP from the spending side.

Figure 8. State and Local Government Primary Spending Components
(as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

Figure 9. State and Local Government Consumption and Investment - Education and Other
(as shares of GDP), 1952-2005



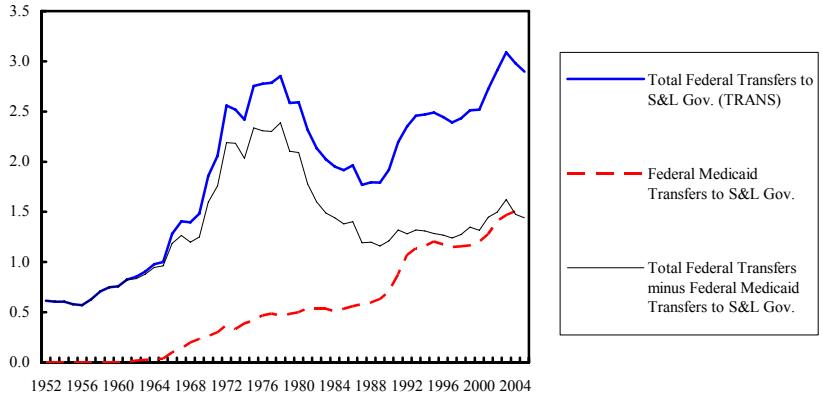
Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.
Note: Data on education spending of state and local government is only available from 1959 on.

The state and local spending data also show a gradual increase in state and local government social transfers as a ratio to GDP through the entire sample, which parallels the rise in federal transfers to state and local government as a share of GDP. As can be seen in Figure 10, the rise in federal transfers reflects two main factors—a steady rise in Medicaid spending from its inception (with Medicare) in 1965 and a bulge in non-Medicaid transfers associated with revenue sharing programs whose principles were laid during the Great Society programs of the late 1960s (formalized with the 1972 State and Local Assistance Act, and terminated in 1986 in the face of large federal deficits).[18] These revenue sharing arrangements meant that some of the "transfers" received during this period are more

[18] Medicaid is the government health insurance program for poor individuals. The program is managed by states but partially funded by the federal government (the exact ratio is open to some dispute, as there are incentives for states to game the system). The "federal Medicaid transfers" depicted in Figure 9 represent the part of the program that is financed by federal resources.

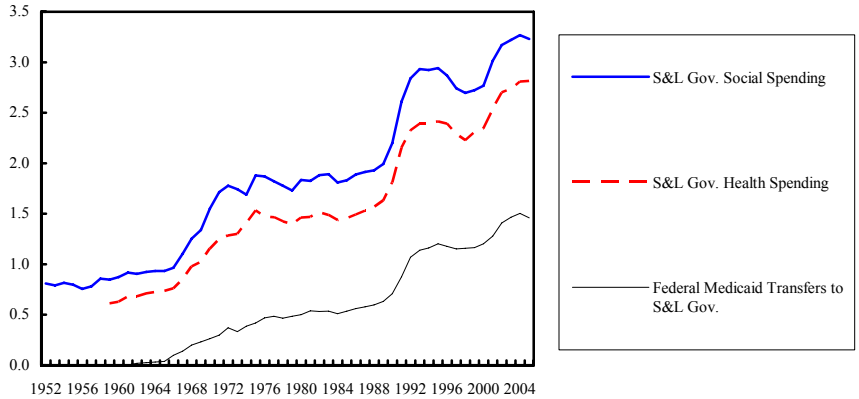
accurately characterized as own revenues. As can be seen in Figure 11, the rise in state and local government social transfers as a share of GDP, on the other hand, has been dominated by health spending, and most of the growth of this has, in turn, been driven by increases in federal Medicaid transfers.

Figure 10. Federal Transfers to State and Local Government: Total and Medicaid Transfers (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

Figure 11. State and Local Government Social Spending: Total, Health and Federal Medicaid Transfers (as shares of GDP), 1952-2005



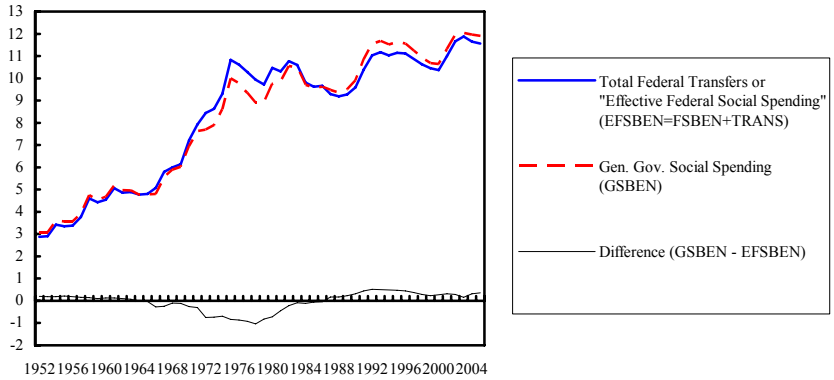
Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.
Note: Data on health spending by state and local government is only available from 1959 on.

Finally, Figure 12 compares general government transfers for social spending with total federal transfers (social and to state and local government). As can be seen, federal money has driven the rise in general government social spending, either directly or through higher Medicaid transfers to state and local government.

This analysis provides a relatively simple explanation of the driving forces behind recent changes in the size of government involving three underlying forces. Defense spending has fallen over time as a ratio to GDP as the cost of the U.S. commitment to local and global security was reduced first by the thawing of the cold war and then by the break-up of the Soviet Union (Gaddis, 2005). This downward trend in spending on defense was offset

by a rise in spending on social transfers as a ratio to GDP effectively paid for by the federal government as the social safety net was gradually extended over time, most notably by the creation of Medicare and Medicaid. In addition, the birth of the baby boom fueled a marked increase in education spending as a ratio to GDP through 1975, thereby expanding the size of general government.

Figure 12. General Government Social Spending and Total Federal Transfers (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

Augmented Dickey Fuller tests of the stationarity of general government defense spending, nondefense consumption and investment, and social transfers as a ratio to GDP for the 1952–75 and 1976–2005 periods are reported in Table 4. As expected, they confirm that all of the series have significant trends, except for nondefense consumption and investment after 1975. Similar tests confirm that all components of federal spending (including, slightly surprisingly, nondefense consumption and investment) have trends, while state and local government nondefense spending trends in the first period and not in the second. We next examine the dynamics between these different types of spending over time.

B. Dynamics of Spending Components

As in the last section, the relationships between the components of spending are tested using VARs, both for the period before and after 1975. As there are more series involved, the structure of the ECM requires some description. In the case of general government, for the first period defense, nondefense, and social spending ratios were included in the ECM, while (given nondefense consumption and investment series was stationary) only defense and social spending were included in the second period. For the federal data all three series were included, while for state and local government and ECM was only estimated for the first period as there was only one nonstationary series subsequently.

The general government results reported in Table 5 suggest that social spending was a substitute for defense spending but (at least in the earlier period) a complement to nondefense consumption and investment. The error correction terms suggest that in the first period long-

term adjustment occurred almost exclusively, and fairly rapidly, through social spending. In other words, the underlying path of general government social spending was determined by defense and nondefense spending. Since 1976, however, a different long-term relationship emerges. Defense spending and social transfers remain substitutes, but in this period it is defense spending that responds to changes in social transfers, albeit relatively slowly. In neither periods do Granger causality tests suggest significant short-term linkages.

In short, while the reduced cost of defense, particularly offset by rising education spending, appear to have been the driving force behind the expansion in social transfers and education early in the postwar period, expanding the social safety net appears to have become the dominant factor subsequently. Results for federal government spending, also reported in Table 4, confirm this switch in behavior, with defense and nondefense consumption and investment spending explaining the long-term behavior of federal transfers in the first period, but the relationship reversing subsequently. Granger causality tests also point to such a switch. Finally, the state and local government results again suggest nondefense consumption and investment spending drove social spending through 1975.

This reversal in the importance of defense and social spending coincided with a diminution in the security threat. The first half of the period saw the aftermath of the Korean war, the Cuban missile crisis, and the Vietnam war, all of which were seen at the time as crucial to the survival of the western ideals that the United States espoused. As the cold war became less intense, however, policy apparently came to be more driven by domestic needs—most notably the desire to expand social spending across a range of programs. In short, the relative importance given to the three basic driving forces of the size of government—the need to provide security, provide the baby boom with education, and expand the social safety net over time—appears to have changed over time.

V. Major Components of Government Revenue

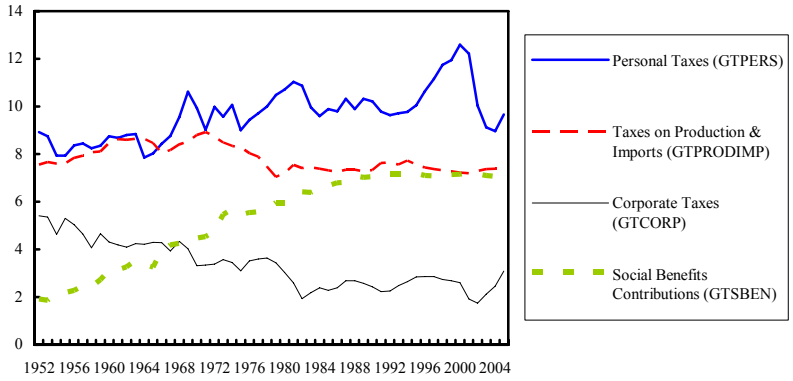
A. Graphical Analysis

Figure 13 illustrates the path of the major sources of general government revenue over our sample as a ratio to GDP. As with the case of spending, there appears to be a relatively dynamic early period followed by a later period with few trends, although in the case of revenues the break appears to be around the early 1980s rather than the mid-1970s. Before this date, revenues from social security benefits and (to a lesser extent) taxes on personal incomes as a ratio to GDP rose over time, while ratios of taxes on corporate incomes fell. Taxes on production and imports rose modestly through the early 1970s, fell subsequently, before stabilizing in a similar manner to the other main sources of revenue.

These trends suggest that the increase in the size of government, and hence the revenue ratio, over the first half of the sample was accompanied by an improvement in the efficiency of the tax system. In particular, there was a steady increase in taxes on the

relatively immobile factor labor (through social benefits and, to a lesser extent, personal income taxes) partly offset by a fall in the burden on relatively mobile factor, namely capital. Since the early 1980s, however, the tax system appears to have moved into relative stasis. This pattern is consistent with a marginalist interpretation of trends in government, insofar as a period of rising revenues would increase pressure from voters to ensure that revenues were collected in an efficient manner so as to lower the economic costs of the accompanying expansion in the size of government.

Figure 13. General Government Revenue Components (as shares of GDP), 1952-2005

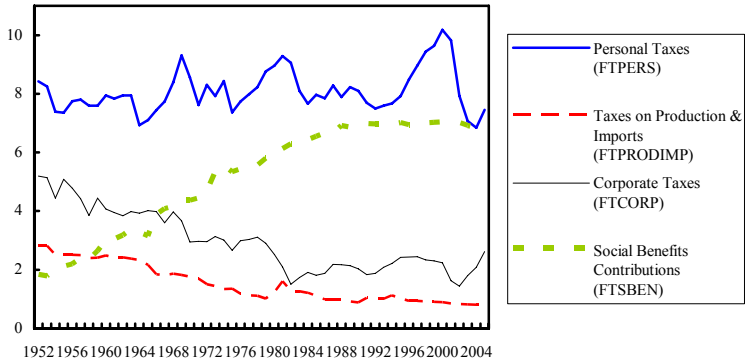


Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

The shift from capital to labor taxation in the first half of the sample is most clear in the case of federal government (Figure 14). In this case the rise in receipts from social benefits is essentially offset by dwindling taxes on both corporate income and production/imports, with income tax receipts remaining relatively constant over time (all as a ratio to GDP). By contrast, in the case of state and local governments, in addition to the trends in federal government transfers discussed earlier, the expansion of spending over the first half of the sample appears to reflect increases in both indirect taxes on production/imports (particularly through the mid-1970s) and a more gradual trend in personal income tax receipts (Figure 15). One interpretation of these trends is that a steady improvement in the efficiency of the federal tax system allowed state and local government to expand their more limited tax bases—most notably indirect taxes.

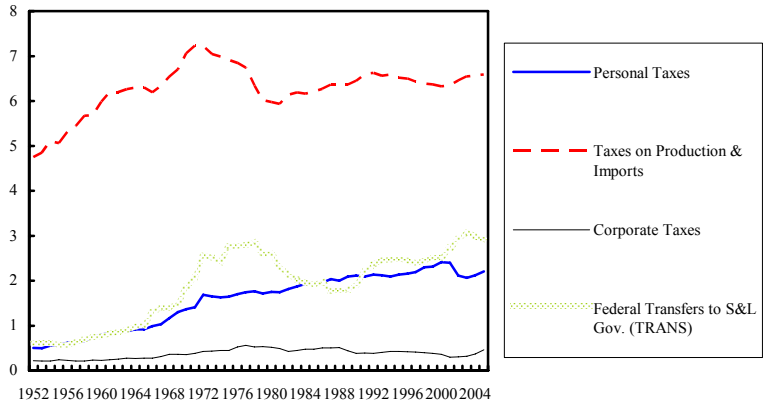
The Augmented Dickey Fuller tests reported in Table 6 confirm these trends, with all sources of revenues except federal personal tax receipts as a ratio to GDP trending through 1982 and no series trending subsequently.

Figure 14. Federal Government Revenue Components (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

Figure 15. State and Local Government Revenue Components (as shares of GDP), 1952-2005



Source: National Income and Product Accounts (NIPA), Bureau of Economic Analysis; authors' calculations.

B. Dynamics of Revenue Components

Table 7 reports VAR results for revenue components in a similar format to earlier results. For general government, the ECM in the first period suggests that revenues from social benefits were substitutes for personal income taxes and complements with corporate income taxes (production taxes have a small and insignificant coefficient). Consistent with the thesis that changes over time were driven by a desire to improve the efficiency of the tax system, long-term adjustment falls on personal income taxes and (to a lesser extent) benefits. In other words, reductions in corporate income tax ratios drove a rise in revenue ratios from labor income. For the federal government social benefit revenues adjust, while for state and local governments social benefits adjust through in the first period and corporate income taxes adjust in the second period. The Granger causality test results are varied, but tend to suggest that in the short-term changes in the corporate revenue ratio are driven by other components, in contrast to the long-term results.

VI. Concluding Remarks

This paper has examined the determinants of the size of the United States government. We first analyzed the dynamics of the size as measured by revenue and primary spending as shares of GDP. While the size of federal government as a ratio to GDP has been stable since early 1950s, general government revenue and primary spending ratios grew from early 1950s until mid-1970s from some 25 to 29 percent of GDP as a result of the expansion in state and local government. This was driven by higher education spending as the baby boom generation was born. Furthermore, this expansion in government was accompanied by an improvement in the tax system, as revenues on (relatively mobile) capital fell as a ratio to GDP and those on (relatively immobile) labor were increased. By contrast, over the last 30 years, the size of general government and the structure of the tax system have been basically stable.

We further explored the revenue-spending nexus by investigating their causality relations. At all levels of government we find that the evidence points to the fact that, if anything, the primary spending ratio Granger causes the revenue ratio, rather than vice versa. This implies that strategies to reduce the size of government through tax cuts are not supported by historical relationships. Rather, the results suggest that spending needs appear to drive revenue policy.

In contrast to these somewhat tenuous links between revenue/spending ratios and the size of government, there are more striking trends between key components of spending as shares of GDP. In particular, the fall in defense spending as a share of GDP since early 1950s was offset by the increase in government social transfers effectively paid for by the federal government, while the expansion of general government through the mid-1970s reflected higher direct state and local government spending, mainly on education. In sum, we find that a fall in spending on "guns" as a ratio of GDP has been more than offset by higher spending on "butter" on the same basis. Furthermore, in the first half of the period "guns" have largely driven "butter" while since 1975 the reverse has been true.

These results are consistent with a "marginalist view" of the size of government, in which voters equate the marginal value of higher government spending with the marginal cost of higher taxes. The size of government is expected to be change gradually, except when crises create rapid changes in priorities or the tax technology is transformed. With few crises and a stable tax technology, changes in the size of government have been driven by gradual changes in spending priorities.

The steady erosion in defense spending as a ratio to GDP and as a driving force in budgetary policy appears to reflect the cooling of the cold war. By contrast, the rising size and importance of social spending reflects both the gradual acceptance of an expanding social safety net (a process started before the war under president Roosevelt) and, in the early

postwar period, a rise in education spending driven by the birth of the baby boom generation. Furthermore, consistent with the marginalist model, the expansion in the size of government early in the period was accompanied by an improvement in the efficiency of the tax system, lowering the marginal cost of higher revenues. It is less consistent with the view encompassed in "starving the beast" or spend-and-tax hypotheses, in which the size of government is seen as more of a political process, less anchored to underlying economic trends.

What are the implications of the marginalist view for the size of United States government going forward? With the upcoming retirement of baby boomers, there will likely be an increase in voters' perceptions of the marginal benefits of government social spending on the elderly, only marginally offset by lower spending on education. This suggests another period of gradually rising primary spending, this time driven by federal government transfers. Given the speed at which entitlement spending is projected to increase on current policies, this gradual increase in government will need to be accompanied by significant reform of entitlement programs and, as occurred in the 1950s through the mid-1970s, is likely to be linked with a lowering of the perceived cost of higher taxation through an efficiency-improving reform of the tax system.

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Table 1. Historical Data on the Size of U.S. Government (in percent of GDP)

Federal Government

	Spending			Income Tax Revenue
	Total	Education and Transfers	Defense	
1913	2.5		0.6	
1922	5.1	0.2	1.2	2.6
Change	2.6	0.2	0.6	2.6
1927	3.7	0.2	0.7	2.2
1952	20	2.1	13.5	13.6
Change	16.3	1.9	12.8	11.4

State and Local Government

	Spending		Income Tax Revenue
	Total	Education and Transfers	
1913	5.8	1.5	
1922	7.7	2.4	0.1
Change	1.9	0.9	0.1
1927	8.2	2.5	0.2
1952	8.6	2.8	0.5
Change	0.4	0.3	0.3

Table 2. ADF Unit Root Tests: Revenue, Primary Spending and Primary Surplus

General Government	1952-1975		1976-2005	
	t-stat	p-value	t-stat	p-value
Revenue (GREV)	-1.17	0.67	-3.12	0.04 **
Primary spending (GPSP)	-1.14	0.68	-2.86	0.06 *
Primary surplus (GPSUR)	-5.59	0.00 ***	-2.81	0.07 *
Federal Government	1952-1975		1976-2005	
	t-stat	p-value	t-stat	p-value
Revenue (FREV)	-3.54	0.02 **	-3.41	0.02 **
Primary spending (FPSP)	-3.53	0.02 **	-2.71	0.08 *
Primary surplus (FPSUR)	-5.05	0.00 ***	-2.75	0.08 *
State and Local Government	1952-1975		1976-2005	
	t-stat	p-value	t-stat	p-value
Revenue (SLREV)	0.20	0.97	-0.70	0.83
Primary spending (SLPSP)	0.22	0.97	-1.09	0.71
Primary surplus (SLPSUR)	-3.40	0.02 **	-3.28	0.03 **

Notes: ADF is the Augmented Dickey-Fuller test, which is performed with one lag. *,**,*** indicate rejection of the null hypothesis of nonstationarity at 10, 5, and 1 percent level of significance respectively.

Table 3. ECM Estimates and Granger Causality: Revenue and Spending

General Government	1952-1975		1976-2005	
ECM Results				
Cointegrating Equation				
GREV	1.00		…	
GPSP	-1.01	(-54.82) ***	…	
ECM Coefficients				
GREV	-2.15	(-1.67) *	…	
GPSP	0.83	(0.57)	…	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
GREV does not cause GPSP	1.81	0.77	3.08	0.55
GPSP does not cause GREV	10.54	0.03 **	10.04	0.04 **
Federal Government	1952-1975		1976-2005	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
FREV does not cause FPSP	1.87	0.17	0.68	0.41
FPSP does not cause FREV	0.54	0.46	0.20	0.66
State and Local Government	1952-1975		1976-2005	
ECM Results				
Cointegrating Equation				
SLREV	1.00		…	
SLPSP	-1.23	(-22.47) ***	…	
ECM Coefficients				
SLREV	-0.69	(-2.82) **	…	
SLPSP	-0.35	(-2.19) **	…	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
SLREV does not cause SLPSP	1.81	0.77	3.08	0.55
SLPSP does not cause SLREV	10.54	0.03 **	10.04	0.04 **

Notes: t-statistics in (). Lag length of the VAR was established by the sequential modified likelihood ratio (LR) test. REV and PSP stand for ratios to GDP of government revenue and primary spending respectively. G, F, and SL, stand for general, federal and state and local government levels respectively. *,**,*** indicate rejection of the null hypothesis of nonstationarity at 10, 5, and 1 percent level of significance respectively.

Table 4. ADF Unit Root Tests: Main Components of Spending

General Government	1952-1975		1976-2005	
	t-stat	p-value	t-stat	p-value
Defense Cons. & Inv. (DCI)	-2.49	0.13	-1.52	0.51
Nondefense Cons. & Inv. (GNCI)	0.09	0.96	-2.88	0.06 *
Social Spending (GSBEN)	1.81	0.99	-1.15	0.68
Federal Government	1952-1975		1976-2005	
	t-stat	p-value	t-stat	p-value
Defense Cons. & Inv. (DCI)	-2.49	0.13	-1.52	0.51
Nondefense Cons. & Inv. (FNCI)	-1.70	0.42	-2.06	0.26
Effective Federal Social Spending (EFSBEN=FSBEN+TRANS)	1.68	0.99	-1.29	0.62
State and Local Government	1952-1975		1976-2005	
	t-stat	p-value	t-stat	p-value
Nondefense Cons. & Inv. (SLNCI)	-0.05	0.94	-3.34	0.02 **
S&L Social Spending (SLSBEN)	1.04	1.00	-0.67	0.84

Notes: ADF is the Augmented Dickey-Fuller test, which is performed with one lag. *,**,*** indicate rejection of the null hypothesis of nonstationarity at 10, 5, and 1 percent level of significance respectively.

Table 5. ECM Estimates and Granger Causality: Spending Components

General Government	1952-1975		1976-2005	
ECM Results				
Cointegrating Equation				
GSBEN	1.00		1.00	
DCI	0.70	(2.16) **	1.08	(3.94) ***
GNCI	-0.71	(-2.30) **	…	
ECM Coefficients				
GSBEN	-0.16	(-4.89) ***	0.02	(0.63)
DCI	0.00	(0.05)	-0.08	(-2.60) **
GNCI	-0.04	(-0.94)	…	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
DCI does not cause GSBEN	1.11	0.58	1.40	0.50
GNCI does not cause GSBEN	1.42	0.49	…	
GSBEN does not cause DCI	2.85	0.24	1.45	0.49
GNCI does not cause DCI	0.61	0.74	…	
GSBEN does not cause GNCI	4.44	0.11	…	
FDCI does not cause GNCI	1.48	0.48	…	
Federal Government	1952-1975		1976-2005	
ECM Results				
Cointegrating Equation				
EFSBEN	1.00		1.00	
DCI	0.65	(6.28) ***	2.11	(4.62) ***
FNCI	-2.40	(-4.09) ***	-4.20	(-1.88) *
ECM Coefficients				
EFSBEN	-0.22	(-7.36) ***	-0.02	(-0.59)
DCI	-0.06	(-0.44)	-0.10	(-4.66) ***
FNCI	0.05	(0.78)	-0.02	(-1.12)
Granger Causality				
Null Hypothesis	Chi-square	Pvalue		
DCI does not cause EFSBEN	7.03	0.03 **	3.45	0.49
FNCI does not cause EFSBEN	5.71	0.06 *	8.84	0.07 *
EFSBEN does not cause DCI	0.50	0.78	17.37	0.00 ***
FNCI does not cause DCI	0.16	0.93	28.84	0.00 ***
EFSBEN does not cause FNCI	0.09	0.96	5.49	0.24
DCI does not cause FNCI	2.37	0.31	3.03	0.55
State and Local Government	1952-1975		1976-2005	
ECM Results				
Cointegrating Equation				
SLSBEN	1.00		...	
SLNCI	-0.36	(-7.69) ***	...	
ECM Coefficients				
SLSBEN	-0.20	(4.01) ***	...	
SLNCI	-0.07	(-0.54)	...	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue		
SLNCI does not cause SLSBEN	0.51	0.48	...	
SLSBEN does not cause SLNCI	2.21	0.14	...	

Notes: t-statistics in (). Lag length of the VAR was established by the sequential modified likelihood ratio (LR) test. SBEN, DCI and NCI stand for ratios to GDP of social, defense, and non-defense spending respectively. G, F, and SL, stand for general, federal and state and local government levels respectively. *,**,*** indicate rejection of the null hypothesis of nonstationarity at 10, 5, and 1 percent level of significance respectively.

Table 6. ADF Unit Root Tests: Revenue Components

General Government	1952-1981		1982-2005	
	t-stat	p-value	t-stat	p-value
Personal Taxes (GTPERS)	-1.34	0.60	-3.16	0.04 **
Taxes on Production and Imports (GTPRODIMP)	-2.48	0.13	-3.07	0.04 **
Corporate Taxes (GTCORP)	-1.80	0.37	-3.72	0.01 **
Social Benefits Contributions (GTSBEN)	1.00	0.96	-3.43	0.02 **
Federal Government	1952-1981		1982-2005	
	t-stat	p-value	t-stat	p-value
Personal Taxes (FTPERS)	-2.81	0.07 *	-3.46	0.02 **
Taxes on Production and Imports (FTPRODIMP)	-1.18	0.67	-3.93	0.01 ***
Corporate Taxes (FTCORP)	-2.33	0.17	-3.38	0.02 **
Social Benefits Contributions (FTSBEN)	0.11	0.96	-3.39	0.02 **
State and Local Government	1952-1981		1982-2005	
	t-stat	p-value	t-stat	p-value
Personal Taxes (SLTPERS)	-0.37	0.90	-2.22	0.20
Taxes on Production and Imports (SLTPRODIMP)	-2.54	0.12	-2.91	0.06 *
Corporate Taxes (SLTCORP)	-0.36	0.90	-2.33	0.17
Social Benefits Contributions (SLTSBEN)	-1.76	0.39	-3.43	0.02 **

Notes: ADF is the Augmented Dickey-Fuller test, which is performed with one lag. *,**,*** indicate rejection of the null hypothesis of nonstationarity at 10, 5, and 1 percent level of significance respectively.

Table7. ECM Estimates and Granger Causality: Revenue Components

General Government	1952-1981		1982-2005	
ECM Results				
Cointegrating Equation				
GTSBEN	1.00		…	
GTPERS	-0.71	(-3.47) ***	…	
GTPRODIMP	-0.17	(-0.87)	…	
GTCORP	0.96	(3.44) ***	…	
ECM Coefficients				
GTSBEN	-0.18	(-1.62) *	…	
GTPERS	0.75	(2.77) **	…	
GTPRODIMP	-0.03	(-0.26)	…	
GTCORP	0.03	(0.25)	…	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
GTPERS does not cause GTSBEN	0.86	0.35	0.03	0.87
GTPRODIMP does not cause GTSBEN	1.53	0.22	0.27	0.60
GTCORP does not cause GTSBEN	0.00	0.99	1.80	0.18
GTSBEN does not cause GTPERS	0.28	0.59	0.07	0.79
GTPRODIMP does not cause GTPERS	3.14	0.08 *	0.10	0.75
GTCORP does not cause GTPERS	0.02	0.88	30.80	0.00 ***
GTSBEN does not cause GTPRODIMP	3.30	0.07 *	0.06	0.81
GTPERS does not cause GTPRODIMP	0.49	0.49	7.02	0.01 ***
GTCORP does not cause GTPRODIMP	0.18	0.67	2.00	0.16
GTSBEN does not cause GTCORP	4.03	0.04 **	6.73	0.01 ***
GTPERS does not cause GTCORP	3.27	0.07 *	18.21	0.00 ***
GTPRODIMP does not cause GTCORP	0.47	0.50	0.29	0.59
Federal Government	1952-1981		1982-2005	
ECM Results				
Cointegrating Equation				
FTSBEN	1.00		…	
FTPRODIMP	1.79	(6.80) ***	…	
FTCORP	0.58	(2.85) **	…	
ECM Coefficients				
FTSBEN	-0.46	(2.69) **	…	
FTPRODIMP	-0.18	(-1.64) *	…	
FTCORP	-0.22	(-1.28)	…	
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
FTPERS does not cause FTSBEN			0.16	0.69
FTPRODIMP does not cause FTSBEN	1.19	0.27	0.64	0.42
FTCORP does not cause FTSBEN	0.30	0.58	1.95	0.16
FTSBEN does not cause FTPERS			0.01	0.94
FTPRODIMP does not cause FTPERS			0.34	0.56
FTCORP does not cause FTPERS			20.01	0.00 ***
FTSBEN does not cause FTPRODIMP	8.71	0.00 ***	0.60	0.44
FTPERS does not cause FTPRODIMP	1.40	0.24	0.31	0.58
FTCORP does not cause FTPRODIMP			0.33	0.56
FTSBEN does not cause FTCORP	3.06	0.08 *	0.01	0.93
FTPERS does not cause FTCORP			21.27	0.00 ***
FTPRODIMP does not cause FTCORP	0.06	0.81	1.03	0.31
State and Local Government	1952-1981		1982-2005	
ECM Results				
Cointegrating Equation				
SLTSBEN	1.00			
SLTPERS	-0.01	(-0.16)	1.00	
SLTPRODIMP	0.00	(0.02)		
SLTCORP	-0.21	(-2.07) **	3.70	(6.23) ***
ECM Coefficients				
SLTSBEN	-0.61	(-3.60) ***		
SLTPERS	0.68	(0.34)	0.03	(0.26)
SLTPRODIMP	3.13	(1.19)		
SLTCORP	-0.27	(-0.34)	-0.16	(-3.77) ***
Granger Causality				
Null Hypothesis	Chi-square	Pvalue	Chi-square	Pvalue
SLTPERS does not cause SLTSBEN	14.50	0.00 ***		
SLTPRODIMP does not cause SLTSBEN	18.51	0.00 ***		
SLTCORP does not cause SLTSBEN	9.97	0.01 ***		
SLTSBEN does not cause SLTPERS	0.19	0.91		
SLTPRODIMP does not cause SLTPERS	1.87	0.39		
SLTCORP does not cause SLTPERS	2.45	0.29	2.44	0.12
SLTSBEN does not cause SLTPRODIMP	16.63	0.00 ***		
SLTPERS does not cause SLTPRODIMP	0.65	0.72		
SLTCORP does not cause SLTPRODIMP	0.73	0.69		
SLTSBEN does not cause SLTCORP	0.54	0.76		
SLTPERS does not cause SLTCORP	1.25	0.54	4.01	0.05 **
SLTPRODIMP does not cause SLTCORP	0.49	0.78		

Notes: t-statistics in (). Lag length of the VAR was established by the sequential modified likelihood ratio (LR) test. TSBEN, TPERS, TPRODIMP, and TCORP stand for ratios to GDP of social contributions, personal taxes, production and import taxes, and corporate taxes respectively. G, F and SL stand for general, federal and state and local governments, respectively. *,**,*** indicate rejection of the null hypothesis of nonstationarity at 10, 5, and 1 percent level of significance respectively.