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A RECONSIDERATION OF THE EFFECTS OF BUDGET POLICY ON INVESTMENT

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Abstract:
William Gale and Peter Orszag (2005) note that those using the user cost of capital model have explicitly or implicitly assumed revenue-neutral tax changes. Gale and Orszag expand the traditional model to consider deficit-financed tax reductions. This paper builds upon their approach to quantify the significance of spending changes in a spending and tax user cost of capital framework. Overall, the results suggest that—holding tax policy constant—a decrease in spending will significantly increase overall business demand for investment. This framework is then applied to a policy simulation of the medium- to long-term results of a reduction in federal spending equivalent to the size and timing of the Budget Control Act of 2011 and finds it will result in a 1.5% increase in investment (or a $31.5 billion increase when scaled to the 2013 US economy).

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I. Introduction

Understanding the effects of spending and tax policy on business investment behavior has long been an objective of economists and policymakers alike. To this end, Robert Hall and Dale Jorgenson (1967) formalized a model of the user cost of capital, an estimation of how the tax code influences a business's demand for investment. In particular, the model is a measure of the required pretax rate of return a project must earn to be just barely profitable (i.e., for a marginal investment), which takes into account both investor- and entity-level taxation and major features of the tax code (e.g., tax depreciation deductions and the deductibility of interest expenses) within a given economic climate. This measure has since been a staple of discussions on tax policy, and it is often utilized by the Congressional Budget Office (CBO), the US Department of the Treasury, and academics, among others.[1] Overall, a decrease in the user cost of capital generally leads to an increase in investment activity (Hassett and Hubbard 2002).

While refinements to this framework have been offered since 1967, a particularly notable expansion of the model comes from William Gale and Peter Orszag (2005). They point out that studies employing the user cost of capital have either implicitly or explicitly assumed tax-policy reforms as revenue-neutral reforms. Their paper then extends the traditional user cost of capital model to consider the cost of capital effects of a deficit-financed reduction of individual tax rates. Specifically, they model the cost of capital in the context of a sustained increase in the federal deficit, which raises the interest rate on government debt which, in turn, increases the after-tax rate of return investors demand on other investments.

The channel introduced by Gale and Orszag, however, can be extended beyond the context of deficit-financed tax cuts. In particular, this paper builds upon the notion that there is not necessarily a fixed opportunity cost of funds to introduce a spending and tax user cost of capital framework, or a user cost of capital framework that accounts for the spending side of the budget both in conjunction with and independently of changes in tax policy. This approach emphasizes a new avenue for evaluating the spending side of spending and tax policy reform and the quantification of its effects on a business's demand for investment independent of tax policy changes through a user cost of capital model. Such a perspective is essential for analyzing budget reform that includes changes to both revenues and outlays.

Succinctly, this paper focuses on quantifying the significance of changes in the spending component of a spending and tax user cost of capital framework. The policy simulation presented in this paper is the medium- to long-run effect of a reduction in federal government spending equivalent to the size and timing of the recent Budget Control Act of 2011 (more commonly known as "the sequester"), as specified in the Congressional

[1] For recent examples see *The President's Framework for Business Tax Reform*, a joint report by the White House and the US Department of the Treasury released in February 2012; *Simple, Fair, & Pro-Growth: Proposals to Fix America's Tax System*, a 2005 publication released during the Bush administration by the President's Advisory Panel on Federal Tax Reform; and the US Department of the Treasury's 2007 report titled *Approaches to Improve the Competitiveness of the U.S. Business Tax System for the 21st Century*.

Budget Office's (CBO) *The Budget and Economic Outlook: Fiscal Years 2013 to 2023*.[2] The short-run effects of this policy are not estimated in this model.

Specifically, the quantification of the Budget Control Act's effect is calculated through estimating a percentage change in the cost of capital for the business sector and residential sector of the US economy. This percentage change in the cost of capital is then translated to a percentage change in investment through use of an elasticity as provided in the economic literature. A dollar amount scaling the medium- to long-run result to the 2013 US economy is then computed to provide context for the size of this change. This process is repeated under a number of varying assumptions to provide a sensitivity test. It should be noted that while this approach to a change in investment is detailed, it is still a stylized approach.

Overall, the results suggest that when estimating the cost of capital for changes in a spending and tax framework, the spending component is of first-order consideration. That is, the user cost of capital estimates of this study show that—holding tax policy constant—a decrease in spending will significantly increase overall business demand for investment. In concrete terms, this study estimates that the medium- to long-run effect of a reduction in federal government spending equivalent to the size and timing of the Budget Control Act adjusted to the size of the US economy in 2013 is a $22.3 billion increase in business-sector investment and a $9.2 billion increase in residential-sector investment. This sums to a total increase in investment of $31.5 billion, or 1.5%.

The remainder of this paper is organized as follows: The next section provides an overview of the budgetary situation of the United States as well as a discussion of the Budget Control Act. Then this study reviews the user cost of capital model and the specification used for this study. The fourth section provides a discussion of the data used to parameterize the model. This is followed by a section containing the policy simulation results and a brief conclusion.

[2] In this study, medium to long run refers to the end of the current 10-year budget window, or 2023.

II. Budgetary situation of the United States and the Budget Control Act

Budget reform is a particularly salient issue at this time, given the recent controversy surrounding the Budget Control Act as well as the introduction of four distinct budgets for federal government outlays over the coming decade. Put forward by Representative Paul Ryan, Senator Patty Murray, Senator Rand Paul, and the administration, respectively, each of these budget proposals has been simultaneously criticized for going too far and for not going far enough in reducing the United States' debt and deficits.

Senator Paul's budget plan is viewed in the popular press as the most radical of the four in terms of the level of spending and taxation, with $37.6 trillion in planned outlays and $37.9 trillion in expected revenues over the coming decade. Detractors have described the budget as "out there" and in keeping with a "fringe ideology" due to its extensive decrease in spending relative to current policy (Benen).

Congressman Ryan's budget has also been criticized as extreme, with $41.5 trillion in government spending over the next 10 years offset by planned tax revenues of $40.2 trillion. Paul Krugman, for example, has recently characterized the spending in Ryan's plan as "savage cuts in aid to the needy" (Krugman). On the other hand, other critics have stated that the Ryan plan's emphasis on austerity through acceptance of the tax increases enacted under the Patient Protection and Affordable Care Act rather than through cuts to entitlement spending constitutes "a breach of faith" with fiscal conservatives (Green).

The budgets put forth by the administration and Senator Murray propose spending of $46.5 trillion and $46.3 trillion, respectively, over the next decade, paired with $41.3 trillion and $41.2 trillion in federal revenues. These plans have been cast as the proposals least geared toward spending-related austerity (Ferrara; Wasson), as they look to double current spending levels by 2023 (US Senate; Budget of the US Government).

Because policymakers are divided on the merits and deficiencies of the plans for revenue increases and spending restrictions detailed in these proposals, gaining a thorough understanding of the medium- to long-term implications for the US economy of reducing the national debt and of failing to do so is a matter of pressing importance.

According to the CBO, under current policy the federal debt held by the public is presently projected to decline briefly over the next several years but then to begin rising again, equaling 81.6% of gross domestic product (GDP) by 2023 and continuing on an upward path.[3] The CBO has identified several severe risks that would result from this fiscal outlook, including depleted capital stock and decreased total wages; loss of legislative flexibility with regard to tax and spending policy; substantial increases in federal spending on interest payments; and eventually a drastically increased risk of a fiscal crisis, which would preclude the government from borrowing at affordable rates of interest.

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[3] Current policy, as discussed later, is the alternative fiscal scenario of the CBO's *The Budget and Economic Outlook: Fiscal Years 2013 to 2023*.

One of the more notable recent events regarding the federal budget was the Budget Control Act, an outcome of the 2011 debt-ceiling debate, which put into place automatic reductions in discretionary and mandatory spending to take effect in March 2013 and last through 2021. It is often referred to as "the sequester" because the 2013 reductions canceled (i.e., "sequestered") scheduled budgetary spending. For 2014 through 2021 the Budget Control Act has placed spending caps on discretionary budget authority and implemented sequestration on selected mandatory spending, according to the CBO's *Sequestration Update Report: August 2013* (2013).

In the larger context, however, this was a rather mild event for the federal budget deficit. As depicted in figure 1, outlays and receipts since 1980 and projected to 2023 under current policy average 21.6% and 18.0% of GDP, respectively. That is, on average, there was or is projected to be an annual budget deficit equaling 3.6% of GDP. Except for the period of 1998 through 2001, where the federal government had a budget surplus, every other year had or is projected to have a budget deficit. As can be seen in figure 1, there are two major deficiencies in the Budget Control Act for controlling the federal budget deficit. First, the reductions in spending only made a minor dent in the federal budget deficit. Second, the federal budget deficit and government outlays are still growing over time, and the Budget Control Act largely ignores this longer-term trend. Specifically, the Budget Control Act almost entirely deals with discretionary spending rather than the mandatory spending (e.g., Medicare, Medicaid, and Social Security) that is the cause of this long-term upward trend in increasing federal outlays and budget deficits.

Figure 1. Historical and projected federal deficits under current policy

Note: The Budget Control Act reduces the Congressional Budget Office's current policy deficit by the highlighted amount. This is calculated from the Congressional Budget Office's *The Budget and Economic Outlook: Fiscal Years 2013 to 2023*.
Source: Congressional Budget Office and author's calculations.

In this context of fiscal imbalance and significant talk of major reforms to both spending policy and the tax code, a user cost of capital model incorporating both the spending and tax dimensions of the federal budget is necessary for a more complete analysis.

III. The user cost of capital model

The user cost of capital is a measure of the required pretax rate of return a project must earn in order to be just barely profitable (i.e., for a marginal investment). The typical presentation of the user cost of capital, ρ, is presented below in equation (1).

$$(1) \qquad \rho = \frac{(r+\delta-\pi)(1-uz)}{(1-u)}$$

In this typical presentation of the user cost of capital, r is a business's nominal after-tax discount rate, δ is an asset-specific rate of economic depreciation, and π is the rate of inflation. The effect of corporate taxation is captured by $(1 - uz)/(1 - u)$ where u is the statutory corporate income tax rate and z is the present value of tax depreciation deductions. This basic framework can be expanded to include the cost of capital for flow-through businesses (e.g., partnerships and S corporations) and owner-occupied housing as well as other features of the tax code such as investment tax credits and property taxes, among others.[4] For the purpose of this study the cost of capital is estimated for corporate business and flow-through business (collectively, the business sector) as well as for owner-occupied housing (or the residential sector) in a closed economy.[5] As discussed below, when considering the flow-through sector and the residential sector, the nominal after-tax discount rate will generally differ, and the statutory corporate income tax rate will be replaced with individual tax rates, among other adjustments.

Other features of the tax code are taken into account through a business's nominal after-tax discount rate. The deductibility of interest and investor-level taxes are taken into account through the assumption that businesses can arbitrage between debt and equity, following David Bradford and Don Fullerton (1981) and Don Fullerton, Robert Gillette, and James Mackie (1987). Because investments are typically both debt financed and equity financed this study uses a weighted-average of debt financing and equity financing. The split between debt financing and equity financing will differ for corporate business, flow-through business, and owner-occupied housing. Regarding the marginal source of corporate equity financing, this study employs the approach of Alan Auerbach and Kevin Hassett (2003) and assumes 50% old view (i.e., corporations rely on new shares for marginal financing and, consequently, dividend taxes affect investment decisions) and 50% new view (i.e., corporations rely on retained earnings as the marginal source of equity financing and, consequently, dividend taxes are capitalized into a

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[4] For a detailed discussion of expanding the model from the corporate sector to the flow-through and owner-occupied housing sectors, see the Congressional Budget Office (2006). For a discussion of incorporating features of the tax code beyond those included in equation (1), see Don Fullerton and Mervyn King (1984).

[5] Whereas a consideration of the optimal level of investment in a country is well-suited to a model of marginal costs and returns (e.g., the model used in this paper), a consideration of international investment is more suited to a focus on average costs and returns. This is because when choosing between geographic locations for international investment it is the post-tax level of profit that concerns businesses. It should be noted, however, that the marginal costs and returns still influence the choice of location in international investment because the profit-maximizing level of investment in each of the potential geographic locations is determined by marginal costs and returns. For a conceptual and empirical discussion of this issue see Michael Devereux and Rachel Griffith (1998).

corporation's value). For a comprehensive discussion of the assumptions included in the user cost of capital model, see Mackie (2002) and CBO (2006).

Departing from the traditional user cost of capital formula, this study utilizes a framework similar to that of Gale and Orszag (2005). In particular, this study specifies both the nominal rate of pretax return on equity and the nominal interest rate on Baa corporate bonds (i.e., the nominal market interest rate for the business sector in this model) as a function of the nominal interest rate on a 10-year Treasury note. The intuition, as stated previously, is that a sustained increase in the federal deficit will increase the rate of return on government bonds and, in turn, increase the rate of return investors demand on other investments. In particular,

(2) $$i_m = i_g + \alpha_d$$

(3) $$\mathrm{E} + \pi = i_g + \alpha_e$$

where i_m is the nominal market interest rate, i_g is the nominal interest rate on a 10-year Treasury note, α_d is the credit-risk premium, E is the real pretax rate of return on corporate equity, and α_e is the equity-risk premium. Note that—as in Gale and Orszag (2005)—the credit-risk premium and the equity-risk premium can be specified such that the difference between the nominal market interest rate and the nominal interest rate on a 10-year Treasury note are not constant, but endogenous to the tax rate on interest income for marginal investors and the tax rate on equity income for marginal investors, respectively. For example, by specifying α_e as $\alpha_e(1\text{-}t_e)$, where t_e is the tax rate on equity income for marginal investors, equation (3) would imply that as the tax rate on equity income for marginal investors increases, the difference between the pretax rate of return to equity and the nominal interest rate on a 10-year Treasury note decreases. Because there is no tax policy change modeled in this study, this is excluded from equations (2) and (3).

The remainder of the model is similar to the CBO (2006) user cost of capital model. First, the cost to fund a corporate and flow-through business—the nominal discount rate—needs to be specified. Because the corporate and flow-through sectors are funded by a mix of debt and equity, this mix is reflected in the formulation of their respective nominal interest rates.

(4) $$r_{\mathrm{corp}} = f_{r,d,corp}\big(\mathrm{i_m}(1-\mathrm{u})\big) + \big(1 - f_{r,d,corp}\big)(\mathrm{E}+\pi)$$

(5) $$r_{\mathrm{noncorp}} = f_{r,d,noncorp}\big(\mathrm{i_m}(1-\mathrm{t_{nc}})\big) + \big(1 - f_{r,d,noncorp}\big)(\mathrm{E_{nc}}+\pi)$$

That is, $f_{r,d,corp}$ and $f_{r,d,noncorp}$ reflect the portion of corporate and flow-through investment funded by borrowing and $(1 - f_{r,d,corp})$ and $(1 - f_{r,d,noncorp})$ reflect the portion of corporate and flow-through investment funded by equity. Regarding debt-financed investments, the deductibility of interest expenses is explicitly modeled. Notice that in equation (4) the interest expense is deducted against the statutory corporate income tax rate and in equation (5) the interest expense is deducted against t_{nc}, the tax rate on flow-through business income for marginal investors.

It is important to note the difference between E and real return paid on flow-through equity, E_{nc}. The real return paid on flow-through equity is not equal to the real return paid on corporate equity, because flow-through equity is only subject to a single layer of tax whereas corporate equity is subject to both entity- and investor-level taxation; thus, due to arbitrage between corporate and flow-through equity, the real return paid on flow-through equity is assumed to be equal to the real after-tax rate of return to investors on corporate equity.

The real after-tax rate of return on corporate equity is specified as follows:

(6) $$s_{e,corp} = f_{e,corp,ft} s_{e,corp,ft} + f_{e,corp,td} s_{e,corp,td} + f_{e,corp,nt} s_{e,corp,nt}$$

where $s_{e,corp}$ is the real after-tax rate of return on corporate equity, $f_{e,corp,ft}$ is the fraction of corporate equity that is fully taxable, $s_{e,corp,ft}$ is the real after-tax return on corporate equity that is fully taxable, $f_{e,corp,td}$ is the fraction of corporate equity that is tax deferred, $s_{e,corp,td}$ is the real after-tax rate of return on corporate equity that is tax deferred, $f_{e,corp,nt}$ is the fraction of corporate equity that is nontaxable, and $s_{e,corp,nt}$ is the real after-tax rate of return to corporate equity that is nontaxable. Stated differently, the real after-tax rate of return to corporate equity is a weighted average of the real after-tax rate of return on fully taxable corporate equity, tax-deferred corporate equity, and nontaxable corporate equity.

(7.1) $$s_{e,corp,ft} = (1-m)E(1-t_{div}) + g$$

(7.2) $$s_{e,corp,td} = \left(\frac{1}{Y_{td}}\right) ln\left((1-t_{td})e^{(E+\pi)Y_{td}} + t_{td}\right) - \pi$$

(7.3) $$s_{e,corp,nt} = E$$

In the equations above, m is the portion of after-tax profits retained in the corporate sector, t_{div} is the effective marginal tax rate on dividend income, Y_{td} is the average number of years which the tax-deferred annuities are held, t_{td} is the tax rate on annuity income for marginal investors, and g is the real after-tax rate of return on retained earnings. Note that in equation (7.2), these tax-deferred annuities are invested in corporate equity rather than debt obligations and, consequently, are calculated using the real pretax rate of return to corporate equity rather than the nominal market interest rate.

One final nuance regarding the real after-tax rate of return to the corporate sector is the taxation of capital gains. Specifically, there are different statutory tax rates for short-term and long-term capital gains, there is taxation on both the real and inflationary components of capital gains, and capital gains are taxed at realization, not accrual, and, as a result, can have a lower effective tax rate because of deferral and step-up of basis.

(8.1) $$g = f_{cg,sr} g_{tcg,sr} + f_{cg,lr} g_{tcg,lr} + f_{cg,suob} mE$$

(8.2) $$g_{cg,sr} = \left(\frac{1}{Y_{cg,sr}}\right) ln\left(\left(1 - t_{cg,sr}\right)e^{(mE+\pi)Y_{cg,sr}} + t_{cg,sr}\right) - \pi$$

(8.3) $$g_{cg,lr} = \left(\frac{1}{Y_{cg,lr}}\right) ln\left(\left(1 - t_{cg,lr}\right)e^{(mE+\pi)Y_{cg,lr}} + t_{cg,lr}\right) - \pi$$

As shown in equation (8.1), the real after-tax rate of return on retained earnings is a weighted average of short-term capital gains (i.e., corporate stock held less than one year), long-term capital gains (i.e., corporate stock that is held more than one year but not held until death), and capital stock that benefits from step-up of basis. The weights are $f_{cg,sr}$, $f_{cg,lr}$, and $f_{cg,suob}$, respectively. The parameter $t_{cg,sr}$ is the tax rate on short-term capital gain income for marginal investors and $t_{cg,sr}$ is the tax rate on long-term capital gain income for marginal investors. Capital gains benefitting from step-up of basis are only taxed at the corporate level. Short-term and long-term capital gains are held for an average $Y_{cg,sr}$ years and $Y_{cg,lr}$ years, respectively.

One final endogenously specified variable in this study's user cost of capital model for the business sector is the present value of tax depreciation deductions. For the purpose of this study, two types of tax depreciation are of concern: straight-line depreciation and declining balance with a switch to straight line.[6] Straight-line depreciation is straightforward: an equal amount of depreciation deductions will be received each year. That is, if the asset has a value of $100 and a tax life of 5 years, then $20 of tax depreciation deductions are allowable each year (i.e., $100/5 = $20). Discounting is then applied.

(9) $$z = \int_0^y \frac{1}{Y} e^{-rY} dy$$

In the equation for the present value of tax depreciation deductions under a straight-line method—equation (9)—*y* indexes the change of time from 0 to *Y*, and *Y* is the recovery period of the tax depreciation deductions. Notice, importantly, that the present value of the tax depreciation deductions is endogenous to the nominal after-tax discount rate.

Because an asset for which it is allowable to use accelerated depreciation maximizes the present value of tax depreciation deductions with a switch to straight-line depreciation at some point—the optimal point for this switch depending on the tax life of the asset—this study calculates the present value of tax depreciation deductions for an asset eligible for accelerated depreciation as declining balance with a switch to straight line.

Consider such an asset with a value of $100 using double declining balance with a tax life of 5 years. Each year under double declining balance it will receive 2/5 of the asset value minus previous tax depreciation deductions. That is, in the first year the tax depreciation deductions will be $40, in the second year they will be $24, in the third year they will be $14.40, and so forth. Notice that the tax depreciation deduction amount in the third year

[6] For a comprehensive discussion of tax depreciation, see the Internal Revenue Service's *Publication 946, How To Depreciate Property*.

is less than $20 (i.e., the amount that would be received from straight-line depreciation). The optimal switching point, Y^*, is calculated as seen in equation (10).

$$Y^* = Y\left(1 - \frac{1}{b}\right) \tag{10}$$

Thus, the present value of an asset taking tax depreciation deductions through double declining balance with a switch to straight line can be calculated as shown below.

$$z = \int_0^{Y^*} \beta e^{-(\beta+r)y} dy + \int_{Y^*}^{Y} \frac{e^{-\beta Y^*}}{(Y-Y^*)} e^{-ry} dy \tag{11}$$

For equations (10) and (11), $\beta = b/Y$ when b multiplied by the straight-line rate is the acceleration.

The taxation of capital in the residential sector, depicted in equations (12) and (13), is decidedly different than that of capital in the business sector. For this model, owner-occupied housing capital financed by equity is exempt from the individual income tax, and mortgage interest and property taxes paid are deductible. Specifically, the cost of capital in the residential sector, ρ_H, is specified as

$$\rho_H = r_H - \pi + w(1 - \lambda_H t_H) \tag{12}$$

where r_H is the nominal after-tax discount rate for owner-occupied housing, w is the property-tax rate, λ_H is portion of property tax that is deducted, and t_H is the marginal tax rate against which marginal investors take deductions in the owner-occupied housing sector.

$$r_H = f_H(i_m(1 - \lambda_H t_H) - \pi) + (1 - f_H)E_n \tag{13}$$

Similar to the nominal after-tax discount rate for corporate and flow-through business, the nominal after-tax discount rate for owner-occupied housing is a mix of debt financing and equity financing, f_H being the portion financed by debt and $(1 - f_H)$ being the portion financed by equity. Also of note is that because there is not generally a tax on returns to equity in owner-occupied housing, the return is the pretax rate of return to owner-occupied housing equity. However, because this equity can be arbitraged to corporate equity or flow-through equity, the real rate of return to owner-occupied housing equity, like the real rate of return to flow-through equity, is assumed to be equal to the real after-tax rate of return to investors on corporate equity.

IV. Data and parameters

To accurately depict the current US economy and the results of policy changes, the model utilized in this study needs to do more than account for major provisions of the US tax code in theory; the model must also be correctly parameterized. In particular, this model will, to the extent possible, draw from publicly available data sources, detail the diversity of asset types in the US economy, use the corresponding economic and tax depreciation of these assets, use the proper measure of tax rates for marginal investors regarding various sources of income, and use the proper representation of the corporate, flow-through, and owner-occupied-housing sectors.

Asset profiles

The cost of capital calculated in this model is the weighted average of 76 assets for which data is available from the US Bureau of Economic Analysis (BEA) and the US Bureau of Labor Statistics (BLS). The BEA provides data for the current-cost net capital stock of private nonresidential fixed assets for 74 types of equipment and structures in the US economy for 63 distinct industries. This measure is a dollar amount of capital stock by asset that takes into account both real changes in the volume of an asset as well as price changes. In the most recent year for which these data are available, 2011, 42 assets are included for a combined dollar amount of $5.9 trillion and 32 structures types with a combined dollar value of $11.7 trillion. Thus, the current-cost net capital stock of private nonresidential fixed assets is $17.6 trillion, according to the BEA (*Table 4.1 Current-Cost Net Stock of Private Nonresidential Fixed Assets by Industry Group and Legal Form of Organization* 2013). The BEA also provides data on the capital stock of residential capital. In 2011, all residential capital stock totaled $16.3 trillion (*Table 5.1 Current-Cost Net Stock of Residential Fixed Assets by Type of Owner, Legal Form of Organization, and Tenure Group* 2013). Capital stock is often used to calculate a weighted-average to capture the long-term trend of capital allocation by type and industry. It does, however, face some limitations such as capturing the role of technological progress in the distribution of capital by asset type.

Data from the BLS is used to add two major asset types to this list, inventories and land. In particular, the BLS annually computes a wealth stock measure of capital stock for 63 industries generally corresponding to those in the BEA data. The measure of wealth stock, similar to the measure of current-cost net capital stock, estimates the current market value of assets in use at the time. These data, however, are only available for four categories of assets: equipment, structures, inventories, and land. As such, the ratios between these assets by industry can be used in combination with the more disaggregated BEA data to estimate land and inventories for each of the 63 industries. This results in an estimate of $1.7 trillion of inventories and $6.2 trillion of land in the business sector of the US economy. A complete list of these assets is provided below in table 1.

Table 1. Asset types included in model

Equipment	Structures
Mainframes	Office
PCs	Hospitals
DASDs	Special care
Printers	Medical buildings
Terminals	Multimerchandise shopping
Tape drives	Food and beverage establishments
Storage devices	Warehouses
System integrators	Mobile structures
Prepackaged software	Other commercial
Custom software	Manufacturing
Own account software	Electric
Communications	Gas
Nonelectro medical instruments	Petroleum pipelines
Electro medical instruments	Wind and solar
Nonmedical instruments	Communication
Photocopy and related equipment	Petroleum and natural gas
Office and accounting equipment	Mining
Nuclear fuel	Religious
Other fabricated metals	Educational and vocational
Steam engines	Lodging
Internal combustion engines	Amusement and recreation
Metalworking machinery	Air transportation
Special industrial machinery	Other transportation
General industrial equipment	Other railroad
Electric transmission and distribution	Track replacement
Light trucks (including utility vehicles)	Local transit structures
Other trucks, buses and truck trailers	Other land transportation
Autos	Farm
Aircraft	Water supply
Ships and boats	Sewage and waste disposal
Railroad equipment	Public safety
Household furniture	Highway and conservation and development
Other furniture	
Other agricultural machinery	**Inventories and land**
Farm tractors	
Other construction machinery	Inventories
Construction tractors	Land
Mining and oilfield machinery	
Service industry machinery	
Household appliances	
Other electrical	
Other	

Source: US Bureau of Economic Analysis and US Bureau of Labor Statistics.

These asset types differ in cost of capital in three respects: the economic depreciation rate of the asset, the tax life of the asset, and the method in which tax depreciation of the asset is calculated. As an example, the economic and tax profiles of two assets, office buildings and nonmedical instruments, are provided below in table 2. These profiles come from data collected from a number of sources; these are the US Department of the Treasury's 2000 report entitled *Report to the Congress on Depreciation Recovery Periods and Methods* (economic depreciation and tax depreciation), the CBO's 2006 report entitled *Computing Effective Tax Rates on Capital Income* (economic depreciation and tax depreciation), the BEA's Hulten-Wykoff estimates of the rate of economic depreciation (economic depreciation), and the Internal Revenue Service's (IRS) *Publication 946*, *How To Depreciate Property* (tax depreciation).

As seen below in table 2, equipment tends to have a shorter asset life both in terms of economic depreciation and tax depreciation than structures. According to the BEA's Hulten-Wykoff estimates, nonmedical instruments have an economic service life of 12 years (i.e., an economic depreciation rate of 0.1350), and office buildings have an economic service life of 36 years (i.e., an economic depreciation rate of 0.0247). Note that there is some disconnect between economic depreciation and tax depreciation.[7] Nonmedical instruments have an economic service life that is 5 years longer than their tax life, while office buildings have an economic service life that is 3 years shorter than their tax life. Regarding the tax depreciation method for an asset, the more accelerated the depreciation is—double declining balance, for example, being accelerated relative to straight line depreciation—the more frontloaded the tax-depreciation deductions. While this does not change the dollar amount of tax depreciations received from an asset, it does mean that the tax-depreciation deductions are received sooner rather than later and, consequently, the deductions have a larger present value.[8]

Table 2. Example asset economic and tax profiles

Asset Type	Economic depreciation rate	Asset tax life	Tax depreciation method
Nonmedical instruments	0.1350	7 years	Double declining balance
Office buildings	0.0247	39 years	Straight line

Note: Double declining balance is modeled as double declining balance with a switch to straight line in order to maximize the present value of depreciation deductions.
Source: Compiled by author using the BEA's Hulten-Wykoff estimates.

[7] Economic depreciation refers to the decrease in value of an asset from the wear and tear of its use, whereas tax depreciation refers to the schedule over which depreciation deductions are received for an asset.
[8] This reflects the time value of money: a dollar today is worth more than a dollar tomorrow.

Taxation parameters

In order to model the cost of capital under current law, I estimate the tax rate faced by marginal investors for income resulting from a variety of income sources, based on individual tax-return data available from the IRS. In particular, I estimate the marginal tax rate by adjusted gross income (AGI) bracket for flow-through business income, dividend income (both from qualified and nonqualified dividend distributions), interest income, capital gains (both from short-term and long-term gains), and pensions and annuities. I treat each of these individual income sources as subject to the ordinary rate schedule (flow-through business income, nonqualified dividend income, interest income, and short-term capital gains), the qualified dividend tax-rate schedule (qualified dividend income), or the long-term capital gains tax-rate schedule (long-term capital gains income). Due to data limitations, all individual tax returns are assumed to be subject to the joint filer AGI brackets; these are displayed below in table 3.

Table 3. Current law 2013 individual income tax rates

AGI bracket	Ordinary income tax rate	Qualified dividend income tax rate	Long-term capital gains income tax rate
$0 under $17,850	10%	0%	0%
$17,850 under $72,500	15%	0%	0%
$72,500 under $146,400	25%	15%	15%
$146,400 under $233,050	28%	15%	15%
$233,050 under $398,350	33%	15%	15%
$398,350 under $450,000	35%	15%	15%
$450,000 and above	39.6%	20%	20%

Source: Internal Revenue Service.

To calculate the weighted-average marginal tax rate for each income source, I collected data regarding the distribution of income by AGI bracket from the IRS. For each of the abovementioned income sources, the amount of income from that source is disaggregated by the tax-return filer's overall AGI bracket. This is displayed below in table 4. For example, $268.0 million of the $800.1 million of flow-through business income received by tax filers in 2010 was received by tax filers in an AGI bracket of $1,000,000 or more. Therefore, I estimate that the marginal tax rate for taxpayers receiving this $268.0 million of income is 39.6% under current law. I repeated this exercise for each source of income and calculated a weighted average by source of income. Then, the weighted-average marginal tax rate by income source is calculated and used as a measure of the tax rate faced by a marginal investor receiving income from a given source.

Three additional taxes are included for this calculation. First, the Medicare surtax, a 3.8% tax rate applied to the unearned income (e.g., interest income, dividend income, and annuity income) for high-income taxpayers enacted in the Health Care and Education

Reconciliation Act of 2010, which took effect in 2013, is included. Second, the Medicare taxes—with top rates of 3.8% in 2013—for employee wages and self-employment income are included. Finally, the so-called Pease provision, a limitation on itemized deductions for high-income taxpayers, which increases the top marginal rate a taxpayer can pay in a high-tax state by approximately 1.2%, is included. Thus, the top possible ordinary tax rate is 44.6% (i.e., the sum of 39.6%, 3.8%, and 1.2%) and the top possible rate for qualified dividend income and long-term capital gains is 25% (i.e., the sum of 20%, 3.8%, and 1.2%).

In addition to these individual tax rates, I estimate a parameter for owner-occupied housing using this methodology. In particular, I calculate the marginal rate against which, on average, the home-mortgage deduction is deducted. The AGI distribution of home mortgage deductions by AGI brackets can be seen below in table 4.

It should be noted that the AGI brackets in table 3 are in 2013 dollars, whereas the IRS data in table 4, below, are in 2010 dollars; the 2010 data are the most recent available from the IRS. To adjust for this, the 2013 AGI brackets are deflated to 2010 dollars.

The final parameters important for taxation are the mix of debt-financed and equity-financed investments in the corporate, flow-through, and owner-occupied housing sectors. As in the CBO (2006) methodology, the mix of debt and equity by sector is assumed to be the same mix as that in existing financing arrangements. Specifically, the current mix of debt and equity for flow-through financial businesses, flow-through nonfinancial businesses, corporate financial businesses, corporate nonfinancial businesses, and for all of owner-occupied housing for 2012 is calculated from the Federal Reserve System's *Flow of Funds* data. The financial and nonfinancial mixes of debt and equity for the corporate and flow-through sectors are then combined through a weighted average, the weights being financial capital stock and nonfinancial capital stock. This yields a debt/equity mix of 38.5% debt and 61.5% equity for the corporate sector, 35.0% debt and 65.0% equity for the flow-through sector, and 53.4% debt and 46.6% equity for owner-occupied housing.

For a more extensive discussion of data assumptions in the user cost of capital model, see CBO (2006).

Table 4. Distribution of income by AGI bracket, 2010

$millions	**Flow-through business income**	**Qualified dividends income**	**Interest income**	**Short-term capital-gains income**	**Long-term capital-gains income**	**Income from pensions and annuities**	**Home mortgage deduction**
Taxable returns, total	$800.1	$121.2	$117.2	$43.0	$350.7	$789.2	$394.0
No adjusted gross income	1.0	0.2	0.7	0.2	3.4	0.1	n/a
$1 under $5,000	0.1	0.1	0.1	0.0	0.0	0.1	2.3
$5,000 under $10,000	0.3	0.1	0.2	0.0	0.2	0.2	2.8
$10,000 under $15,000	1.6	0.1	1.0	0.1	0.1	8.0	3.8
$15,000 under $20,000	4.5	0.3	1.3	0.1	0.2	11.9	5.0
$20,000 under $25,000	4.6	0.3	1.7	0.1	0.2	15.9	6.4
$25,000 under $30,000	5.1	0.5	1.8	0.1	0.3	19.4	7.7
$30,000 under $40,000	12.4	1.3	4.0	0.3	1.0	46.8	20.0
$40,000 under $50,000	15.0	1.9	4.1	0.5	1.1	53.2	23.9
$50,000 under $75,000	42.6	6.6	11.5	1.2	4.5	140.2	65.0
$75,000 under $100,000	47.1	7.2	9.9	1.9	6.3	130.9	65.5
$100,000 under $200,000	130.0	17.6	19.4	4.8	23.6	234.5	125.4
$200,000 under $500,000	165.9	19.3	15.8	5.7	38.9	92.5	50.7
$500,000 under $1,000,000	102.0	10.3	9.0	3.7	28.9	18.3	10.2
$1,000,000 or more	268.0	55.2	36.8	24.2	242.1	17.0	5.3

Note: Figures may not sum due to rounding.
Source: Internal Revenue Service and author's calculations.

Forecasting economic and budget parameters

The economic and budget forecasts employed in this study rely largely on the CBO's *The Budget and Economic Outlook: Fiscal Years 2013 to 2023*. This report forecasts a wide array of economic indicators as well as the federal government's revenue and outlays for the 10-year budget window indicated.

A key parameter for this model specification, the interest rate on a 10-year Treasury note in 2023, is taken directly from the CBO forecast. This interest rate in 2012 was 1.8% and is projected to increase to 3.5% by 2015 and reach and maintain a rate of 5.2% from 2018 to the end of 2023. The credit-risk premium and equity-risk premium are taken from the CBO's *Background Paper: How CBO Projects the Real Rate of Interest on Ten-Year Treasury Notes* (2006). The technical paper suggests that in the medium- to long-term, the credit-risk premium will revert to its 40-year average of 1.9%, and, based on a survey of experts, the equity-risk premium for the near future will be 3.4%. From these parameters the endogenous nominal market interest rate and real pretax rate of return to equity can be solved for under current law.

For the policy simulation, the key economic and budget parameters—such as the change in primary deficit as a percentage of GDP, the unified deficit as a percentage of GDP, and the debt held by the public as a percentage of GDP—are also taken from the CBO's *The Budget and Economic Outlook: Fiscal Years 2013 to 2023*. The primary deficit is the difference between federal government receipts and noninterest outlays and the unified deficit is the difference between federal government receipts and total spending. The federal government debt held by the public increases each year by the amount of the unified deficit.

Included in the CBO's budget projections is a current-law projection (i.e., the baseline scenario) and a current-policy projection (i.e., the alternative fiscal scenario). Because the CBO's current-policy projection assumed the automatic sequestration and spending caps of the Budget Control Act would not take effect, it provides a revenue estimate for the Budget Control Act, inclusive of both the spending reductions and the decreased interest payments due to less borrowing. From this, I calculate the change in primary deficit, unified deficit, and debt held by the public in each year through 2023. The resulting deficit and debt numbers are then divided by the CBO's GDP projection to calculate the change in primary deficit as a percentage of GDP, unified deficit as a percentage of GDP, and debt held by the public as a percentage of GDP for each year of the 10-year budget window. These data and calculations are displayed below in table 5. Because it is the medium to long run this study is concerned with, only the 2023 results are utilized.

Table 5. Projected primary deficit, unified deficit, and debt held by the public relative to GDP with and without the Budget Control Act

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Federal deficit (excl. Budget Control Act)	887	778	644	691	755	839	976	1,080	1,154	1,268	1,307
Federal revenues	2,708	2,945	3,275	3,503	3,683	3,856	3,999	4,176	4,388	4,621	4,841
Federal noninterest spending (excl. Budget Control Act)	3,371	3,478	3,646	3,860	4,005	4,142	4,335	4,529	4,737	5,006	5,187
Federal interest spending (excl. Budget Control Act)	224	245	274	333	433	553	641	727	805	884	961
Spending effect of Budget Control Act	−42	−90	−101	−108	−116	−124	−129	−136	−142	−138	−141
Noninterest effect of Budget Control Act	−42	−89	−99	−103	−104	−105	−104	−104	−104	−94	−89
Debt service effect of Budget Control Act	0	−1	−1	−5	−11	−19	−25	−31	−38	−45	−51
Federal deficit (incl. Budget Control Act)	845	688	544	583	640	715	847	944	1,012	1,130	1,166
Federal revenues	2,708	2,945	3,275	3,503	3,683	3,856	3,999	4,176	4,388	4,621	4,841
Federal noninterest spending (incl. Budget Control Act)	3,329	3,389	3,547	3,757	3,901	4,037	4,230	4,425	4,634	4,912	5,097
Federal interest spending (incl. Budget Control Act)	224	244	272	328	422	534	616	696	767	839	910
Debt held by the public (excl. Budget Control Act)											
Beginning of the year	11,280	12,271	13,141	13,881	14,658	15,496	16,403	17,446	18,592	19,811	21,149
Deficit	887	778	644	691	755	839	976	1,080	1,154	1,268	1,307
Other means of financing	104	93	95	87	82	69	66	66	65	69	64
End of the year	12,271	13,141	13,881	14,658	15,496	16,403	17,446	18,592	19,811	21,149	22,519
Debt held by the public (incl. Budget Control Act)											
Beginning of the year	11,280	12,229	13,009	13,648	14,318	15,040	15,824	16,737	17,747	18,825	20,024
Deficit	845	688	544	583	640	715	847	944	1,012	1,130	1,166
Other means of financing	104	93	95	87	82	69	66	66	65	69	64
End of the year	12,22	13,00	13,64	14,31	15,04	15,82	16,73	17,74	18,82	20,02	21,25

	9	9	8	8	0	4	7	7	5	4	4
Gross domestic product	16,034	16,646	17,632	18,792	19,959	20,943	21,890	22,854	23,842	24,858	25,910
Change in primary deficit as % of GDP	**−0.3%**	**−0.5%**	**−0.6%**	**−0.5%**	**−0.5%**	**−0.5%**	**−0.5%**	**−0.5%**	**−0.4%**	**−0.4%**	**−0.3%**
Change in unified deficit as % of GDP	**−0.3%**	**−0.5%**	**−0.6%**	**−0.6%**	**−0.6%**	**−0.6%**	**−0.6%**	**−0.6%**	**−0.6%**	**−0.6%**	**−0.5%**
Change in debt held by the public as % of GDP	**−0.3%**	**−0.8%**	**−1.3%**	**−1.8%**	**−2.3%**	**−2.8%**	**−3.2%**	**−3.7%**	**−4.1%**	**−4.5%**	**−4.9%**

Note: Figures may not sum due to rounding.
Source: Congressional Budget Office and author's calculations.

V. Results and discussion

The medium- to long-term basis-point change in the government borrowing rate is taken from elasticities reported in the economic literature with respect to changes in the primary deficit as a percentage of GDP, the unified deficit as a percentage of GDP, and the debt held by the public as a percentage of GDP.[9] In the most extensive literature review available on the subject, Gale and Orszag (2005) find the literature disputed, but with important nuance. They divide the literature into three categories: (1) studies focusing on the effect of current debt and deficits on interest rates, (2) studies involving vector autoregression dynamics, and (3) studies estimating elasticities based off of expected or unanticipated future increases in debt and deficits. While the literature is, without a doubt, disputed, studies estimating elasticities based off of expected or unanticipated future increases in debt and deficits fairly strongly point toward a positive relationship between debt and deficits as a percentage of GDP and interest rates.

In particular, the portion of the literature estimating the effect of expected future budget deficits and debt on interest rates generally argues that, because financial markets are forward-looking, it is anticipated deficits and debts that will influence interest rates. In this category, Gale and Orszag (2005) report that 13 studies provide evidence of this positive relationship, 4 provide mixed evidence, and 1 finds the link insignificant. In contrast, the other two strains of the literature include 16 studies providing evidence of this linkage, 5 that provide mixed results, and 18 that find no significant relationship.

In a similar manner to Gale and Orszag (2005), this paper relies on the range of elasticities found to be reasonable within the context of the literature for anticipated deficits and debt. Specifically, this paper utilizes a minimum and maximum elasticity from the combined estimates reported by Thomas Laubach (2009), Eric Engen and R. Glenn Hubbard (2004), and Gale and Orszag (2004) for the change in primary deficit as a percentage of GDP, the unified deficit as a percentage of GDP, and the debt held by the public as a percentage of GDP. In addition to a maximum and minimum elasticity, a central elasticity—the simple mean of the minimum and maximum—is also used. These can be found below in the top of table 6.

Also reported in table 6 is each of these elasticities applied to the 0.3 percentage-point decrease in the primary deficit as a percentage of GDP, the 0.5 percentage-point decrease in the unified deficit as a percentage of GDP, and the 4.9 percentage-point decrease in the debt held by the public as a percentage of GDP in 2023. The basis-point changes range from a 0.10 basis-point decrease resulting from the minimum elasticity for the unified deficit as a percentage of GDP to a 0.27 basis-point decrease yielded from the maximum elasticity of the debt held by the public as a percentage of GDP.

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[9] While standard relationships may not hold in the short run (i.e., a postcrisis, zero-bound interest rate environment), short-term deficits do add to the long-run crowding-out problem when the economy returns to "normal" (i.e., the medium to long run). Moreover, the CBO projections used in this study report that the economy will fully recover by the end of 2017, substantially before the end of the 10-year budget window, this study's definition of the medium to long run.

Table 6. Basis-point change in government borrowing rate from an anticipated 1 percentage-point increase in the primary deficit, unified deficit, and debt held by the public as a percentage of GDP

	Central	Maximum	Minimum
Elasticity			
Primary deficit	39	46	32
Unified deficit	28.5	39	18
Debt held by the public	4.2	5.6	2.8
Basis-point change			
Primary deficit	−0.13	−0.16	−0.11
Unified deficit	−0.16	−0.21	−0.10
Debt held by the public	−0.21	−0.27	−0.14

Source: Laubach (2003), Engen and Hubbard (2004), Gale and Orszag (2004), and author's calculations.

Applying these basis-point changes to the user cost of capital model yields the results displayed in table 7 and table 8. In the baseline scenario, the cost of capital is 13.0% for corporate business, 12.5% for flow-through business, and 4.5% for owner-occupied housing. The cost of capital decreases in the corporate sector from 13.0% to between 12.7% and 12.9%. In the flow-through sector, the cost of capital reduces from 12.5% to between 12.2% and 12.4%. For owner-occupied housing, the cost of capital has a minimum change of remaining at 4.5% and a maximum change of reducing to 4.3%. The percentage change in the cost of capital is more varied. The percentage change in the cost of capital ranges from −0.9% to −2.5% for the corporate sector, −0.9% to −2.5% for the flow-through sector, and −1.8% to −5.1% for owner-occupied housing.

Table 7. Estimated cost of capital by sector and policy simulation

	Central	Maximum	Minimum
Baseline			
Corporate business	13.0%		
Flow-through business	12.5%		
Owner-occupied housing	4.5%		
Primary deficit			
Corporate business	12.9%	12.8%	12.9%
Flow-through business	12.3%	12.3%	12.4%
Owner-occupied housing	4.4%	4.4%	4.5%

Unified deficit			
Corporate business	12.8%	12.8%	12.9%
Flow-through business	12.3%	12.2%	12.4%
Owner-occupied housing	4.4%	4.4%	4.5%
Debt held by public			
Corporate business	12.8%	12.7%	12.9%
Flow-through business	12.3%	12.2%	12.3%
Owner-occupied housing	4.4%	4.3%	4.4%

Note: The baseline cost of capital is the cost of capital without any policy change.
Source: Author's calculations.

Table 8. Percent change in cost of capital by sector and policy simulation

	Central	Maximum	Minimum
Primary deficit			
Corporate business	−1.2%	−1.5%	−1.0%
Flow-through business	−1.2%	−1.4%	−1.0%
Owner-occupied housing	−2.5%	−2.9%	−2.0%
Unified deficit			
Corporate business	−1.4%	−2.0%	−0.9%
Flow-through business	−1.4%	−1.9%	−0.9%
Owner-occupied housing	−2.9%	−3.9%	−1.8%
Debt held by public			
Corporate business	−1.9%	−2.5%	−1.3%
Flow-through business	−1.9%	−2.5%	−1.2%
Owner-occupied housing	−3.8%	−5.1%	−2.5%

Source: Author's calculations.

The general consensus in recent empirical papers for the elasticity between investment and the tax-adjusted cost of capital is a range of −0.5 to −1.0 (Hassett and Hubbard 2002). That is, for a 1% decrease in the cost of capital, investment is predicted to increase by between 0.5% and 1%.

This study uses the elasticity of −0.835 reported by Simeon Djankov et al. (2010), which is nearly equal to the simple average of the consensus range. Djankov et al. use a novel dataset assembled jointly by Harvard University, PricewaterhouseCoopers, and the World Bank, including all relevant taxes standardized across 85 countries to estimate this elasticity. This elasticity between investment and the tax-adjusted cost of capital is then applied to the percentage changes in the cost of capital presented above, yielding percentage changes in investment.

Some caution should be taken with the use of this approach. This partial-equilibrium approach, by definition, only considers demand for investment; it is a ceteris paribus simulation. A more complete simulation would require use of a general-equilibrium model and could consider effects beyond the size of annual US investment, such as the efficiency of the allocation of investment. A smaller, but more efficiently allocated capital stock, for example, could lead to increased output.

For context, these medium- to long-run effects are scaled to the 2013 US economy. The latest BEA annual data reports that in 2012 there was $2.1 trillion of gross private domestic investment. Disaggregated, this is $1.6 trillion of nonresidential fixed investment, $0.4 trillion of residential fixed investment, and $0.1 trillion of changes in inventory.[10] To provide an estimate of the 2013 US economy, each of these numbers is grossed up by 2.9%, the CBO's projected increase in GDP between 2012 and 2013.

Applying the weighted-average percentage change in investment for the business sector—the weight being capital stock—to the sum of nonresidential fixed investment and changes in inventory and the percentage change in investment for the residential sector to residential fixed capital yields the results in table 9. Overall, gross private domestic investment is estimated to increase by between $18.7 billion and $52.3 billion, with the medium- to long-term results scaled to the 2013 US economy; this corresponds to a 1.0% to 2.5% increase in investment. A conservative estimate—the simple mean of the 9 policy simulation results—is $31.5 billion increase in investment, or a 1.5% increase. Disaggregated, this is a $22.3 billion increase in business-sector investment and a $9.2 billion increase in residential-sector investment.

Table 9. Estimated change in investment by sector and policy simulation

$billions	**Central**	**Maximum**	**Minimum**
Primary deficit			
Corporate business	11.7	13.8	9.6
Flow-through business	6.5	7.7	5.3
Owner-occupied housing	7.5	8.9	6.2

[10] The BEA reports that, in 2011, approximately 8% of residential investment was for tenant-occupied structures in the corporate and flow-through sectors. As such, 8% of the $0.4 trillion of residential fixed investment is allocated to these sectors (*Table 5.1 Current-Cost Net Stock of Residential Fixed Assets by Type of Owner, Legal Form of Organization, and Tenure Group* 2013).

Total:	**$25.7**	**$30.4**	**$21.1**
Unified deficit			
Corporate business	13.5	18.5	8.5
Flow-through business	7.5	10.2	4.7
Owner-occupied housing	8.6	11.8	5.5
Total:	**$29.6**	**$40.6**	**$18.7**
Debt held by public			
Corporate business	17.9	23.8	11.9
Flow-through business	9.9	13.2	6.6
Owner-occupied housing	11.4	15.3	7.6
Total:	**$39.2**	**$52.3**	**$26.2**

Note: Figures may not sum due to rounding.
Source: Author's calculations.

Overall, these results suggest that the spending component of a spending and tax user cost of capital framework is of first-order consideration. That is, the cost of capital estimates of this study show that—holding tax policy constant—a decrease in spending will significantly increase overall business demand for investment.

VI. Conclusion

This study's policy simulation provides a fuller picture of the medium- to long-term implications for the US economy of reducing the national deficits and debt. The traditional result of the user cost of capital model is that lowering tax rates decreases the cost of capital and generally leads to an increase in investment activity. However, as Gale and Orszag (2005) point out, the traditional result either implicitly or explicitly assumes a reform is revenue neutral. As such, they illustrate a number of instances when a deficit-financed reduction in individual rates can increase the cost of capital in the medium to long run.

This study, by introducing an explicit focus on the spending side of the federal budget, quantifies the significance of the impact of using a decrease in the federal budget deficit through spending reductions as a policy tool to encourage investment in the medium to long run and its importance in the greater context of budget reform.

A number of extensions can be made from the spending and tax user cost of capital framework presented in this study. Further policy simulations reexamining historical and prospective budget reforms that include changes in both the spending and tax sides of the budget could be performed to provide more context and nuance to the importance of considering spending reform in conjunction with tax reform. A number of additional dynamics could also be explored, such as whether it makes a difference if the spending reductions come from discretionary or nondiscretionary funds, and how the results of the framework differ in an open versus closed economy. Ultimately, a policy simulation of such a significant change to the US economy should be modeled in a general-equilibrium model. Such an approach would allow a more detailed simulation taking into account multiple markets (e.g., factor and good markets), behavioral responses, and policy impact variations specific to different consumer types and industries, among other dynamics.

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