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Budget Model

Explainer: Capital Crowd Out Effects of Government Debt

Summary: Government spending redirects real resources in the economy and can crowd out private capital formation. An additional $1 trillion debt this year could decrease GDP by as much as 0.28 percent in 2050.

Introduction

Production of output in an economy requires labor and real capital inputs. Capital includes real items such as machines and buildings as well as proprietary intangibles such as patents and software. To create more capital, certain goods and services are allocated from total domestic output to make new capital. Capital wears out and depreciates, so capital formation to restore productive capacity of the economy is required just to maintain a given level of economic output. Growth of the economy requires even more capital in order to keep up with growth of the labor force. Therefore, some portion of economic production must always be devoted to capital production.

Broadly, when government action reduces the amount of capital investment in the economy, the long-run growth of the economy declines. This effect can be partially mitigated if new deficit-financing spending takes the form of human capital investment, public capital, and public goods such as research, which are also productive. Government actions which cause redirection of investment toward consumption may improve social welfare (by various metrics), but the economy might still be smaller than without that increased debt.

With low government borrowing rates, it might seem that government borrowing would have little cost. However, when projecting expected (likely) future outcomes due to large deficits, the economy's return to private capital investment must also be accounted, which is larger than the government borrowing rate.

Government Redirection of Resources

Government spending at any point in time can be financed with taxes or by selling more debt.

In the case of taxes, the taxed entity may reduce investment in real capital because of its smaller after-tax budget. If government expenditures do not cause an offsetting increase in capital investment elsewhere in the economy, then the government's policy reduces the total capital stock. Note that higher taxation may actually increase

investment, as can happen when corporate investment is partially expensed and tax rates rise, thereby creating a tax incentive to shift cashflow from shareholder distributions and toward investment.

In the case of debt issuance, the government collects real resources via voluntary transactions with economic agents who are willing to trade real resources today for the promise of real resources in the future. Debt buyers, including U.S. households saving for retirement, view this debt as savings, which reduces their savings in private investment. This substitution is called the 'capital crowding-out effect' from government debt issuance. National saving, therefore, is reduced more when the new government debt is used to finance more immediate consumption (e.g., social transfers) compared to longer-term public investment (e.g., roads and pre-K education).

Economic Effects of Government Debt

To examine capital crowd-out effects in the PWBM framework, we consider three stylized new deficit-financed spending programs—increasing spending in 2021 by $100 billion, $1 trillion, and $10 trillion in the year 2021—into public projects that are not productive. The focus on non-productive spending allows us to estimate the outer-bound (worst case) of the reduction in long-run GDP. We first consider the case where some of the debt is financed by foreign investors.

Partially Open Economy

Table 1 shows results for the economy with baseline level openness and varying amounts of additional unproductive spending in a partially open economy where foreign investments buy 40% of new debt, which mitigates some of the crowding-out effect.

Table 1: Economic Effects of Additional Non-Productive Government Spending, U.S. Economy

DOWNLOAD DATA

- (•) $10 billion spending scenario
- ( ) $1 trillion spending scenario
- ( ) $10 trillion spending scenario

$10 billion spending scenario

Year	Output	Capital Stock	Hourly Wage	Hours Worked	Government Debt
2031	-0.02	-0.06	-0.02	0.00	0.34
2040	-0.02	-0.07	-0.02	0.00	0.29
2050	-0.03	-0.08	-0.03	0.00	0.25

$1 trillion spending scenario

Year	Output	Capital Stock	Hourly Wage	Hours Worked	Government Debt
2031	-0.23	-0.65	-0.19	-0.04	3.43
2040	-0.24	-0.69	-0.23	-0.01	2.97
2050	-0.28	-0.78	-0.23	-0.05	2.53

$10 trillion spending scenario

Year	Output	Capital Stock	Hourly Wage	Hours Worked	Government Debt
2031	-2.44	-6.82	-2.13	-0.31	36.57
2040	-2.66	-7.45	-2.44	-0.22	31.62
2050	-3.09	-8.59	-2.73	-0.37	27.24

Households who buy government debt reduce their savings in productive private investments. As the spending is unproductive, the economy is poorer and total savings is lower due to capital crowd out. When the government spends $100 billion more in 2021 relative to the baseline economy, output goes down by 0.02 percent in 2031 and 2040, and by 0.03 percent in 2050. The decline in output is mainly due to a decrease in capital which goes down by 0.06 percent, 0.07 percent, and 0.08 percent in 2031, 2040, and 2050 respectively. Follow-on effects of lower wages are second-order in magnitude and do not significantly affect the outcome. The lower growth of the economy cumulates, so we see greater declines in capital and output as time proceeds.

When the government spends an extra $1 trillion in 2021, output goes down by 0.23 percent in 2031, 0.24 percent in 2040, and 0.28 percent in 2050. The decrease in capital in this experiment is 0.65 percent in 2031, 0.69 percent in 2040, and 0.78 percent in 2050. In this case, since spending is larger, output is also slightly affected by a decrease in hours worked. This labor effect is due to a decrease in the average wage since there is less capital per worker and hence each worker is less productive. The drop in the average wage makes households switch from working to leisure. Increasing spending by $10 trillion relative to baseline decreases output by 2.44 percent, 2.66 percent, and 3.09 percent in 2031, 2040, and 2050, respectively. Output decreases at a greater rate than the increase in the extra spending. This non-linearity stems from the economy having fewer real resources to invest into real capital over time. We can see this non-linearity in the decrease in capital as well. Capital drops by 6.82 percent in 2031, 7.45 percent in 2040, and 8.59 percent in 2050. Lower growth's cumulative effects produce the growing downward deviations from the baseline economy.

Closed Economy

Since foreign investors offset some of the resource loss and capital crowd-out in the partially open economy, we also examine a model with a fully closed economy. Results for when the economy is fully closed to new international investment are shown in Table 2.

Table 2: Economic Effects of Additional Non-Productive Government Spending, Fully Closed Economy

DOWNLOAD DATA

- (•) $10 billion spending scenario
- ( ) $1 trillion spending scenario
- ( ) $10 trillion spending scenario

$10 billion spending scenario

Year	Output	Capital Stock	Hourly Wage	Hours Worked	Government Debt
2031	-0.05	-0.16	-0.05	0.00	0.37
2040	-0.06	-0.18	-0.06	0.00	0.36
2050	-0.08	-0.21	-0.06	-0.01	0.35

$1 trillion spending scenario

Year	Output	Capital Stock	Hourly Wage	Hours Worked	Government Debt
2031	-0.54	-1.54	-0.51	-0.03	3.69
2040	-0.65	-1.83	-0.57	-0.08	3.58
2050	-0.78	-2.14	-0.69	-0.09	3.50

$10 trillion spending scenario

Year	Output	Capital Stock	Hourly Wage	Hours Worked	Government Debt
2031	-6.24	-16.78	-5.38	-0.90	41.78
2040	-8.05	-21.14	-6.97	-1.17	41.46
2050	-10.23	-25.56	-8.63	-1.75	40.41

Detrimental effects on output and capital are larger in the closed economy. Since there is even less capital in the economy in the early years, the declines in output and capital in later years are deeper. The effect on hours worked is larger due to even lower wages from lower capital stock. Hence, the effect on output of spending $1

trillion versus $10 trillion is more nonlinear than in the partially open economy. Moreover, the closed economy collapses under the debt load (as we do not allow default) during our modeling period. We therefore impose a tax on household consumption in the year 2045 in order to stabilize the debt to GDP ratio. Because of this additional policy, the partially open and closed economy runs are not directly comparable, especially for the 2050 numbers.

Openness and world trade can be reduced by higher tariffs and other barriers to trade. For net exporting economies, world trade reduction necessitates a reallocation of output from export to higher domestic consumption or to higher domestic investment. Conversely, for net importing economies such as the U.S., reduction in openness forces a reduction in consumption or a reduction in investment. Since we maintain current government policies in the model, reduction in openness primarily affects investment.

Interest Rates and Marginal Product of Capital

The PWBM dynamic model incorporates government debt as a separate asset held in model agents' portfolios and imposes debt market clearing by forcing agents to hold the asset regardless of price. In the real world, changes in asset prices (interest rates) cause agents to buy and sell assets. Government borrowing rates in the model are derived from a projected yield curve which does not respond to changes to macroeconomic factors such as capital returns. Our approach assumes that government borrowing rates are primarily set by foreign demand or by the central bank.[1]

We allocate new debt along the term structure in the same debt term pattern recently observed in U.S. Treasury debt issuance. This allocation introduces slight differences between different spending scenarios, but these differences are less than 0.05 percentage points since the yield curve is fixed across all scenarios. The real rate at which the government borrows in the baseline economy is 0.11 percent in 2031, 0.32 percent in 2040, and 0.47 percent in 2050. Despite the interest rate being negative or very close to zero, capital crowd-out still occurs as a direct result of non-productive spending.

Why should new government debt have such a large impact on the economy when the government can apparently borrow so cheaply? To be sure, the annual borrowing cost of a single dollar of new government debt is equal to the government's borrowing rate on a risk-adjusted basis. But, for large debt issuances and the reporting of expected economic performance, the crowding-out effect means that the return to private capital—measured by its marginal product of capital (MPK)[2]—should also be considered. The MPK is larger than the government borrowing rate.

Table 3 shows the marginal product of capital (MPK) net of depreciation along with the effective rate at which the government borrows in the partially open economy.

Table 3. Marginal Product of Capital and Government Borrowing Rate, U.S. Economy

DOWNLOAD DATA

- (•) Current law baseline
- ( ) $10 billion spending scenario

- ○ $1 trillion spending scenario
- ○ $10 trillion spending scenario

Current law baseline

Year	MPK	Borrowing Rate
2031	6.15	-0.11
2040	6.39	0.32
2050	6.79	0.47

$10 billion spending scenario

Year	MPK	Borrowing Rate
2031	6.16	-0.11
2040	6.40	0.32
2050	6.80	0.47

$1 trillion spending scenario

Year	MPK	Borrowing Rate
2031	6.20	-0.12
2040	6.45	0.31
2050	6.85	0.47

$10 trillion spending scenario

Year	MPK	Borrowing Rate
2031	6.71	-0.15
2040	7.01	0.29
2050	7.53	0.46

Capital crowd-out, therefore, has an expected cost that is larger than the government borrowing rate for large debt-financed projects. As capital becomes scarcer, the MPK rises as capital owners demand larger returns.

This report was written by Kent Smetters and Marcos Dinerstein. Prepared for the website by Mariko Paulson.

1. Federal Reserve purchases of U.S. Treasury debt essentially exchange the debt asset for an ultra-short term financial asset (money), but this money asset must still be held be someone in the economy until such time as it is retired. Federal Reserve debt purchases effectively lower government borrowing rates—the Fed returns most interest paid back to the U.S. Treasury. Since the government acquires real output by borrowing, reallocation effects such as capital crowd-out occur regardless. ↩

2. The MPK represents how much output increases if one more unit of capital is added to the economy. ↩