Lecture 10: The Effects of Government Debt on Capital and Saving

Dr. Lei Pan
School of Accounting, Economics and Finance

Curtin University

Outline

- 10.1 Introduction
- 10.2 Environment
- 10.3 Case 1: The Crowding Out of Capital
- 10.4 Case 2: Neutral Government Debt
- 10.5 Summary

Required reading: Champ, Freeman and Haslag (2011), Part III–Chapter 16

Introduction (1 of 2)

- Recall that whenever a government has a budget deficit, it must borrow from the private sector to finance the deficit. Government debt at a given point in time is the total amount the government has borrowed up by that time.
- As governments frequently run budget deficits and rely on debt financing, the economic impact of issuing government debt has received significant attention from the media, politicians, and economists.
- The public is often confused by the wide variety of opinions on this topic. This lecture aims to clarify the relevant issues.

Introduction (2 of 2)

- We will use a simple overlapping-generations model with capital and government bonds to examine how the presence of government debt affects decisions regarding consumption, saving, and investment.
- We will address this question by looking at two cases:
  - In one case, budget deficits cause a reduction in capital investment—**crowding out of capital**;
  - In another case, the deficits have no effect on capital—**Ricardian equivalence**.
- These two cases differ only in a single assumption about the timing of debt retirement.

The Environment (1 of 4)

- We consider the effects of government debt in an economy populated with two-period-lived individuals.
- There is no population growth (constant population).
- Each individual is endowed with y_1 goods when young and y_2 goods when old (no production, no firm sector).
- Individuals save by holding capital or government bonds.
  - The one-period real return to capital is $1 + r$ (constant).
  - There is no money. The government may issue one-period bonds that pay the same return as capital.
- In period t, each young individual pays a lump-sum tax $\tau_{1,t}$ goods, and each old individual pays a lump-sum tax $\tau_{2,t}$ goods to the government.

The Environment (2 of 4)

- In period t, the government has an expenditure G_t goods. Let $g_t = \frac{G_t}{L_t}$, denote government expenditure per young person.
- The lifetime budget constraint of an individual: Recall that it states that the present value of lifetime consumption equals the present value of lifetime income. So it is given by:

$$c_{1,t} + \frac{c_{2,t+1}}{1+r} = y_1 - \tau_{1,t} + \frac{y_2 - \tau_{2,t+1}}{1+r} \equiv w_t. \quad (1)$$

- The government budget constraint for this economy:

$$L_t g_t + (1+r) L_{t-1} b_{t-1} = L_t \tau_{1,t} + L_{t-1} \tau_{2,t} + L_t b_t. \quad (2)$$

where b_t denote government bonds issued *per young person* in period t.

The Environment (3 of 4)

- Government spending in period t includes two parts: current government expenditure and repayment of previous debt plus interest due this period.
- Government spending can be financed through tax revenues and by debt financing (issuance of government bonds); Notice that the amount of debt issued in period t, $(L_t B_t)$ equals the budget deficit in period t.
- Since $L_t \equiv L$ for all t, dividing both sides by the population size yields the G.B.C. in per capita terms:

$$g_t + (1 + r)\, b_{t-1} = \tau_{1,t} + \tau_{2,t} + b_t \tag{3}$$

The Environment (4 of 4)

- Consider now the effect of a tax cut of 100 units of goods per young person in period t with no change in government expenditure in every period, i.e.,

$$\tau_{1,t}^{N} = \tau_{1,t} - 100.$$

- This implies that the budget deficit increases by 100 units of goods in period t. From the G.B.C. (2), this can be accomplished only with an increase of 100 units of goods in government debt per young person, i.e., the government must issue 100 more units of government bonds in period t. That is

$$b_t^N = b_t + 100.$$

- We'll examine the impact of this increase in government debt on capital and savings in two cases. These two cases differ only by a single assumption about the timing of debt retirement.

Case 1: The Crowding out of Capital (1 of 7)

- In case 1, the **critical assumption** is that the increased debt (100 goods) will be paid off at some future date by a **tax increase** imposed on some other generations.
  - Before the retirement date, the debt is financed by issuing new debt in each period, i.e., there will be no changes in taxes.
  - Notice that to pay off the issued debt of 100 goods in period t plus interests, the government has to issue a new debt of $100(1+r)$ in period $t+1$. This can be seen from the G.B.C. in period $t+1$.
  - without the tax cut in period t:

$$g_{t+1} + (1+r)\, b_t \;=\; \tau_{1,t+1} + \tau_{2,t+1} + b_{t+1}$$

with the tax cut in period t:

$$g_{t+1} + (1+r)\, b_t^N \;=\; \tau_{1,t+1} + \tau_{2,t+1} + b_{t+1}^N$$

so

$$b_{t+1}^N - b_{t+1} \;=\; (1+r)\big(b_t^N - b_t\big) \;=\; 100(1+r).$$

Case 1: The Crowding out of Capital (2 of 7)

- Similarly, the government has to issue a new debt of $100(1+r)^2$ in period $t+2$ to pay off the issued debt in period $t+1$ plus interests, and so on.
- This is called rolling over the debt.
- Such debt issuance process won't be ended until finally the issued debt is paid off by an increase in tax imposed on some future generation.
- Policy implication: A government may rationally choose to run deficit in wartime and recessions, but due to the interests burden of government debt, it cannot always run deficits. The government budget constraint then requires surpluses in peacetime and prosperous times.

Case 1: The Crowding out of Capital (3 of 7)

- Under this scenario, how will generation t people change their lifetime **consumption plan** ($c_{1,t}$ and $c_{2,t+1}$) in response to the tax cut in period t?
  - These people receive a tax cut with no later increase in taxes, so they have an increase in their (after tax) wealth.
  - If we assume both $c_{1,t}$ and $c_{2,t+1}$ are normal goods, both will rise with the increase in wealth.

Case 1: The Crowding out of Capital (4 of 7)

- How does this affect the **savings** of a member of this generation?
  - Intuitively, since her consumption in old age $c_{2,t+1}$ rises, her savings when young must rise to provide more consumption when old. To see this, look at her budget constraint when old:

$$c_{2,t+1} = y_2 + (1+r)s_t - \tau_{2,t+1}.$$

$$\Rightarrow c^N_{2,t+1} = y_2 + (1+r)s^N_t - \tau_{2,t+1}.$$

  - Since $c^N_{2,t+1} > c_{2,t+1}$, we have $s^N_t > s_t$.

Case 1: The Crowding out of Capital (5 of 7)

- However, to consume more when young, her savings will rise by a number less than the tax cut, 100. To see this, look at the budget constraint when young

$$c_{1,t} = y_1 - \tau_{1,t} - s_t \;\rightarrow\; c_{1,t}^N = y_1 - (\tau_{1,t} - 100) - s_t^N$$

$$\Rightarrow\; s_t^N - s_t = 100 - (c_{1,t}^N - c_{1,t})$$

Since $c_{1,t}^N > c_{1,t}$, $s_t^N - s_t < 100$.

Case 1: The Crowding out of Capital (6 of 7)

- What happen to **capital**?
  - There are two assets with which one can save in this economy—capital and government bonds. Therefore

$$s_t = k_t + b_t.$$

  - Use "Δ" to denote changes in a variable. Then it follows that

$$\Delta s_t = \Delta k_t + \Delta b_t.$$

- To finance the tax cut, government bonds have risen by 100, i.e., $\Delta b_t = 100$, but saving has risen by some number less than 100, i.e. $\Delta s_t < 100$. So

$$\Delta k_t = \Delta s_t - \Delta b_t < 0.$$

  i.e. capital must have fallen.

Case 1: The Crowding out of Capital (7 of 7)

- The reduction of capital because of the increase in government debt is often called the crowding out of capital because capital is substituted for bonds in personal saving.
- Policy implication:
  - In this case, a **deficit** or **debt-financed tax cut** reduces capital investment by the private sector,
  - If government expenditure g_t is not used for public investment in capital, then such policy would decrease total capital formation in the economy and therefore may hurt long run growth.

Case 2: Neutral Government Debt (1 of 4)

- **Critical assumption:** Assume now that the debt newly created at t will not be repaid by taxing generations in the future, but by taxing the old at $t+1$.
  - Under the assumption, the tax to repay the debt falls on the same generation that enjoys the tax reduction.
- How much τ_{2t+1} will have to increase to repay the debt newly created at t ?
  - Without the tax cut in t, G.B.C in period $t+1$ given by:

$$g_{t+1} + (1+r)b_t = \tau_{1,t+1} + \tau_{2,t+1} + b_{t+1}.$$

With the tax cut in t (financed by a govt. debt of 100 goods), the G.B.C. in period $t+1$ is given by:

$$g_{t+1} + (1+r)b_t^N = \tau_{1,t+1} + \tau_{2,t+1}^N + b_{t+1}$$

$$\tau_{2,t+1}^N - \tau_{2,t+1} = (1+r)\left(b_t^N - b_t\right) = 100(1+r).$$

Case 2: Neutral Government Debt (2 of 4)

- How will people change their lifetime consumption plan, $c_{1,t}$ and $c_{2,t+1}$? Note that individual's lifetime income is now:

$$y_1 - \tau_{1,t}^N + \frac{y_2 - \tau_{2,t+1}^N}{1+r}$$

$$= y_1 - [\tau_{1,t} - 100] + \frac{y_2 - [\tau_{2t+1} + (1+r)100]}{1+r}$$

$$= y_1 - \tau_{1,t} + \frac{y_2 - \tau_{2t+1}}{1+r},$$

which is **the same as before.** So people will not change their lifetime consumption plan!

Case 2: Neutral Government Debt (3 of 4)

- What is the effect on shock of capital?
  - people do not consume any part of their tax cut when young; they save the entire tax cut in anticipation of the forthcoming tax hike that will be required to pay off the debt. That is

$$\Delta s_t = 100.$$

- Recall that $\Delta b_t = 100$, so $\Delta s_t = \Delta b_t$ (all increase in saving is to hold the new issued govt. debt). Therefore,

$$\Delta k_t = \Delta s_t - \Delta b_t = 0$$

There is no crowding out of capital ! Government debt is neutral!

Case 2: Neutral Government Debt (4 of 4)

- We see that a deficit-financed tax cut has no effect on real variables such as consumption and capital formation in this case.
- This result is known as the **Ricardian Equivalence Theorem** after David Ricardo (1792-1823), who was the first to consider the neutrality of government debt.
- Policy implication: Governments often cut taxes during downturns to stimulate real economic activities, while issue government bonds to finance government expenditure. But if Ricardian Equivalence holds, these efforts are futile.

Summary (1 of 2)

- We have looked at two cases that have led to two quite different results regarding the real effects of government debt. In the first case, the deficit-financed tax cut leads to altered consumption, savings, and capital holdings. In the second case, no such effects are found.
- What is the crucial difference between these two cases?
  - In the first case, the tax cut alters real variables because the individuals who benefit from the tax cut do not have to pay the tax increase that retires the debt. So these individuals experience an increase in their wealth which leads them to higher consumption.
  - In the second case , individuals pay a higher tax in the second period of life in order to retire the debt. These individuals experience no change in their wealth and thus do not alter their consumption.

Summary (2 of 2)

- Clearly, the effects of debt-financed tax cuts depend upon whether the people who receive the tax cut will pay the increase in taxes that will retire the resulting debt.
- Ricardian Equivalence in practice
- Theoretically, if the permanent income hypothesis holds, and if people have strong bequest motive (i.e., people leave wealth to their descendants), then the generation who enjoy the tax cut will take into account the tax burden that will be imposed on their descendants such that the Recardian Equivalence holds.
- Actually, an overlapping-generations model with bequests works like a representative agent model (Barro (1974)): A finitely lived person with strong bequest motive would behave like she is infinitely lived.