Two very different views on fiscal policy

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The Neoclassical View

References

- David Ricardo, *Essay on the Funding System, 1820*
- Robert Barro, *Are Government Bonds Net Wealth?* Journal of Political Economy, 1974

The intertemporal dimension is a the heart of the neo-classical view. This dimension affects both the government sector and the private sector.

The Intertemporal Dimension of Fiscal Policy

When discussing Fiscal Policy we must start by recognizing that countries (and governments) are in for the long term

- governments don't need to balance their books year-by-year
- they can spend in excess of tax revenue today (running up debt)
- provided they will be able to pay back their debt in the future thanks to tax revenues in excess of spending (otherwise households will not buy government bonds)

The Intertemporal Dimension of Consumption

Also consumers face an intertemporal choice

- consumers can save and accumulate wealth
- wealth evolves as a function of savings and the returns they provide
- optimal decisions on consumption should reflect not only current income but also lifetime wealth

The value of streams of income that will arrive sometime in the future

- In order to understand Fiscal Policy we thus need to be able to value streams of income that will arrive at some time in the future
- The Present Value of a stream of income is the value today (time t_0) of a stream of income that will flow between t_0 and some future date, say $t_0 + T$

The value today of goods that will be received tomorrow

- Assume the economy has a technology to transfer goods from today (period t) to tomorrow (period $t+1$). For instance one unit of corn used as seed and planted today yields $(1+r)$ units of corn tomorrow

$$y_{t+1} = (1+r)\, y_t$$

- Then the price of a unit of good at time $t+1$ relative to a unit of good at time t (*i.e.* the number of units of t good required to obtain 1 unit of $t+1$ good)

$$\frac{[\text{units of goods at time } t]}{[\text{units of goods at time } t+1]} = \frac{1}{(1+r)}$$

- Thus if one wants to add up the two goods at time t, the way to do it is

$$y_t + \frac{y_{t+1}}{(1+r)}$$

Solving Forward The Intertemporal Gov Budget Constraint

Assume, for the sake of simplicity, that the interest rate on government bonds is constant, $r^B_{t+j} = r^B$ for all j

- The evolution over time of government debt, B_t in this simple case is therefore (for all t)

$$B_{t+1} \quad = \quad (1 + r^B)B_t + (G_{t+1} - T_{t+1})$$

- The above equation is useful to describe how debt B accumulated in the past – because iterating the equation backward you can express B_t as a function of $(G(t-i) - T(t-i))$ for $i = 0 \to \infty$

- Investors, however, when they buy government bonds, are interested at what will happen to debt in the future. To see this, invert the above equation expressing B_t as a function of B_{t+1}

$$B_t \quad = \quad \frac{1}{1 + r^B} B_{t+1} + \frac{1}{1 + r^B} (T_{t+1} - G_{t+1})$$

- Iterating this equation forward the for m periods, we have:

$$B_t = \sum_{j=1}^{m-1} \frac{(T_{t+j} - G_{t+j})}{(1 + r^B)^j} + \frac{B_{t+m}}{(1 + r^B)^m}$$

Public Debt Sustainability

- Debt is defined to be sustainable when the following condition, known as the *transversality condition*, is satisfied (this means excluding *debt bubbles*):

$$\lim_{m \to \infty} \frac{1}{(1+r^B)^m} B_{t+m} = 0 \tag{1}$$

- So debt sustainability requires that current debt is compensated by the NPV (Net Present Value) of future budget surpluses:

$$B_t = \sum_{j=1}^{m-1} \frac{(T_{t+j} - G_{t+j})}{(1+r^B)^j}$$

Private Wealth: The Intertemporal Consumers' Budget Constraint

Think, for the sake of simplicity, at a situation in which the interest rate on wealth, is constant $r_t^W = r^W$

- The dynamics of consumer's wealth, W_t, in this case can be represented as follows:

$$W_t = (1 + r^W) W_{t-1} + (Y_t - T_t - C_t)$$

- Wealth today is equal to yesterday's wealth plus the returns on wealth, plus savings, i.e. (labour income - taxes - consumption)
- Solving forward this budget constraint (adopting the same approach as we just did for public debt) we obtain:

$$\sum_{j=1}^{m-1} (1 + r^W)^{-j} (C_{t+j}) = \sum_{j=1}^{m-1} (1 + r^W)^{-j} (Y_{t+j} - T_{t+j}) + W_t - \frac{1}{(1 + r^w)^m} W_{t+m}$$

- Now assume consumers do not want to leave any bequest. Then, when m is large, $\frac{1}{(1+R^w)^m} W_{t+m} = 0$ and therefore

$$\sum_{j=1}^{m-1} (1 + r^W)^{-j} (C_{t+j}) = \sum_{j=1}^{m-1} (1 + r^W)^{-j} (Y_{t+j} - T_{t+j}) + W_t$$

- so the NPV of life-time consumption is equal to the NPV of life time net income + current wealth

The Consumption Function

- To understand how consumers choose consumption over time, we derive the **Consumption Function** from the **intertemporal budget constraint**.
- A reasonable assumption is that optimal consumption remains **constant over time**.
  - Consumers compare utility across periods using the **discount factor** β.
  - The discount factor **is not a market price** but reflects **individual preferences**.
  - Along the optimal consumption path:

$$u'(c_t) = \beta(1+r)u'(c_{t+1})$$

    This equation means:
    - saving one unit today allows consumption of $(1+r)$ units tomorrow.
    - however, future utility must be **discounted** using β. If $\beta(1+r) \approx 1$ (a reasonable assumption), then **optimal consumption remains constant over time**.
- *You can ask ChatGPT to help you derive this condition asking "Can you help me derive the condition for an optimal intertemporal path of consumption when the interest rate is r?"*. ChapGPT will do this for you solving a Bellman Equation
- Setting $C_{t+i} = C_t \quad \forall i$, and considering the case in which m is large, we have

$$C_t = r\left(\sum_{j=1}^{m-1} \frac{Y_{t+j} - T_{t+j}}{(1+r^W)^j} + W_t\right)$$

The Consumption Function

- This consumption function – which was derived consistently with the intertemporal budget constraint under the hypothesis of optimization – is different from the macro textbook you used in the past, (e.g. Blanchard et al, *Macroeconomics*), in which only current disposable income determines consumption
- The consumption function now depends on the NPV of lifetime net income and the returns on wealth
- Remember that diposable income is equal to labour income plus the return on wealth, so the main difference between what we have here, compared with respect to the basic textbook analysis, is that the NPV of lifetime current net income substitutes current labour income in the textbook consumption function.
- This of course requires that – if for instance you attend an MBA – you can go to the bank and ask for a loan anticipating you will land a job on Wall Street (we shall see in a moment why the bank might refuse to lend you the money)

How can Fiscal Policy Affect Consumption ?

- The fact that consumption depends on wealth is essential to understand how Fiscal Policy affects consumption
- To see why this is the case, we return to the Government's intertemporal budget constraint (IGBC)

Does it matter how a government finances G ?

- Assume there are only two periods.
  - The IGBC becomes:

$$B_1 = T_1 + \frac{T_2}{(1+r)} - G_1 - \frac{G_2}{(1+r)} + \frac{B_2}{1+r}$$

  - The IHBC becomes:

$$W_1 = (Y_1 - T_1) + \frac{(Y_2 - T_2)}{(1+r)} - C_1 - \frac{C_2}{(1+r)} + \frac{W_2}{1+r}$$

- The Government commits to sustainability by equating the present value of debt at time $t+2$ to the current value of debt, $B_1 = \frac{B_2}{1+r}$. The government's *intertemporal budget constraint*, that is the budget constraint over the two periods, is:

$$T_1 + \frac{T_2}{(1+r)} = G_1 + \frac{G_2}{(1+r)}$$

- Households want to preserve their wealth and set the NPV of wealth at end of the two periods equal to the current value of wealth, $W_1 = \frac{W_2}{1+r}$. The households' intertemporal budget constraint over the two periods is:

$$C_1 + \frac{C_2}{(1+r)} = (Y_1 - T_1) + \frac{(Y_2 - T_2)}{(1+r)}$$

From the ICBC to consumption

Given the ICBC:

$$C_1 + \frac{C_2}{(1+r)} = (Y_1 - T_1) + \frac{(Y_2 - T_2)}{(1+r)}$$

Consumer optimization, under our assumption that $u'(c_t) = \beta(1+r)u'(c_{t+1})$ implies that $C_1 = C_2$, we then have

$$C_1 + \frac{C_1}{(1+r)} = (Y_1 - T_1) + \frac{(Y_2 - T_2)}{(1+r)}$$

and

$$C_1 = C_2 = \frac{(1+r)}{(2+r)} \left[(Y_1 - T_1) + \frac{(Y_2 - T_2)}{(1+r)} \right]$$

The irrelevance of the government's decision whether to tax today or tomorrow

Assume that households realize that the government is subject to an intertemporal budget constraint and consider two cases:

- The government budget is balanced in each period

$$T_1 = G_1, \quad T_2 = G_2$$

then

$$\begin{aligned} C_1 = C_2 &= \frac{(1+r)}{(2+r)}\left[(Y_1 - T_1) + \frac{(Y_2 - T_2)}{(1+r)}\right] \\ &= \frac{(1+r)}{(2+r)}\left[(Y_1 - G_1) + \frac{(Y_2 - G_2)}{(1+r)}\right] \end{aligned}$$

- The government taxes only in period 2

$$T_1 = 0, \quad G_1 = B, \quad T_2 = G_2 + B\,(1+r)$$

substituting we still get

$$\begin{aligned} C_1 &= \frac{(1+r)}{(2+r)}\left[(Y_1 - 0) + \frac{(Y_2 - G_2 - G_1(1+r))}{(1+r)}\right] \\ &= \frac{(1+r)}{(2+r)}\left[(Y_1 - G_1) + \frac{(Y_2 - G_2)}{(1+r)}\right] \end{aligned}$$

Ricardian Equivalence

- The way a government finances a given level of spending makes no difference. The irrelevance of the timing of taxation for the intertemporal budget constraint implies that a forward looking consumer will make the same consumption choice independently from the way in which the government finances G.
- This result is known as *Ricardian Equivalence* from David Ricardo the British economist who first noted this

Ricardian Equivalence

- In his *Essay on the Funding System* (1820) Ricardo studied whether it makes a difference to finance a war that costs £20 million with £20 million in current taxes, or to issue government bonds with infinite maturity (consols) and annual interest payment of £1 million in all following years, financed by future taxes
- At the assumed interest rate of 5%, Ricardo concluded that there is no difference between the three modes: 20 millions £ in one payment made in year 1, 1 million £ per annum forever starting in year 1, or £1,2 million for 45 years yield all precisely of the same value
- If the horizon is infinite, $\sum_{1}^{\infty} \frac{1}{(1+r)}^{i} = \frac{1}{(1+r)} + \frac{1}{(1+r)^2} + \frac{1}{(1+r)^3} + \ldots = \frac{1}{r}$ so that if $\frac{1}{r} = 20$, then $r = \frac{1}{20} = 5\%$
- If the horizon is not infinite, for instance only T years, then compute x so that $\frac{x}{(1+r)} + \frac{x}{(1+r)^2} + \frac{x}{(1+r)^3} + \ \ldots \ + \frac{x}{(1+r)^T} = \ 20$ for $T = 45$, $x = 1.2$

The possibility of an "expansionary fiscal contraction"

Now assume G_1 increases to $G_1^{'} > G_1$, while G_2 does not change.

$$\frac{(1+r)}{(2+r)}[Y_1 - G_1^{'} + \frac{Y_2 - G_2}{(1+r)}] < \frac{(1+r)}{(2+r)}[Y_1 - G_1 + \frac{Y_2 - G_2}{(1+r)}]$$

- Then $C_1^{'} < C_1$, $\frac{dC_1}{dG_1} < 0$: this is sometimes referred to as an "expansionary fiscal contraction" (or a contractionary fiscal expansion)
- the *opposite sign* compared with what you have learned so far in your *Macro* textbook !

Expansionary fiscal contractions: Denmark, 1983-86

(numbers are average yearly growth rates over the period indicated)

	1979 – 82	1983 – 86
avg change over the period		
$\%\Delta$ **G**	**+ 4.0**	**0.0**
$\%\Delta$ **T**	- 0.03	+ 1.3
$\Delta(G-T)/Y$	+ 1.8	- 1.8
$\Delta\ (debt/Y)$	+10.2	0.0
$\%\Delta\ Y^{disposable}$	+ 2.6	- 0.3
$\%\Delta$ **C**	- **0.8**	**+ 3.7**
$\%\Delta\ I$	- 2.9	+12.7
$\%\Delta\ real\ GDP$	+ 1.3	+ 3.2

Source: Giavazzi, F. and M. Pagano 1990 "Can Severe Fiscal Contractions Be Expansionary?"

- This means that a cut in G can be expansionary: if consumption increases enough to more than compensate the reduction in G
- Contrary to what you learned in your underg textbook, cuts in G can be good news for the economy !

Expansionary contractions: How can this be possible ?

- if Ricardian Equivalence holds
- $\frac{dC_1}{dG_1} < 0$
- since $Y = C + G \qquad$ (forgetting I)
- $\frac{dY_1}{dG_1}$?
- but you could make the argument also for I, $\frac{dI}{dG} < 0$
- I is a function of $= (PDV(NetProfits) - cost \quad of \quad capital)$
  - $G \downarrow \ PDV(NetProfits) \mid_{cost \ of \ capital} \uparrow \quad I \uparrow$
- then $\frac{dY_1}{dG_1} < 0$ is even more likely

The limits to Ricardian Equivalence

- We will now show that the result that the government's financial policy is irrelevant (or Ricardian Equivalence) depends on a few strong assumptions
- Ricardo himself had doubts. In the same essay he writes: *"But the people who paid the taxes never so estimate them, and therefore do not manage their private affairs accordingly. We are too apt to think that the war is burdensome only in proportion to what we are at the moment called to pay for it in taxes, without reflecting on the probable duration of such taxes. Moreover it would be difficult to convince a man who possessed £20,000 that a perpetual payment of £50 per annum was equally burdensome as a single tax of £1000"*
- In other words, only if people are rational, and expect to live as long as the government, they would be indifferent as to when they pay taxes

The limits of Ricardian Equivalence (cont.)

- Two assumptions are needed for Ricardian Equivalence to hold
  - The horizon of households corresponds to that of the government. In other words, people think they will pay all the taxes the government will eventually have to levy, *i.e.* they will not leave debts (future taxes to pay) to their children
  - People can freely borrow against the *PDV* of their future income

The limits of Ricardian Equivalence (cont.)

- We now consider what happens if these conditions fail, namely if
  - Households' horizon is shorter than that of the government
  - Households cannot freely borrow against their expected future income

1. Households' horizon is shorter than that of the government

- if people plan to be around in period 2
  - $\left\{ \begin{array}{l} T_1 = 0 \\ G_1 = B \quad , \; T_2 = B\,(1+r) \\ G_2 = 0 \end{array} \right\}$
  - $C_1 = \frac{(1+r)}{(2+r)} \left[(Y_1 - G_1) + \frac{(Y_2 - G_2)}{(1+r)} \right]$
- if people anticipate that the government will wait period 3 to balance its books $T_2 = 0, \; T_3 = B(1+r)^2$ and think they will not be around in period 3, then
  - $C_1 = \frac{(1+r)}{(2+r)} \left[Y_1 + \frac{Y_2}{(1+r)} \right]$
- In this case
$$\frac{dC_1}{dG_1} = 0 \quad \text{not} \quad < 0 \quad !$$
- the debt, B, is transferred to the next generation who will bear its burden: if did not, nobody would buy B in period 1

2. Liquidity constraints: people cannot borrow on the expectation of future income

- To keep the algebra simple, let

$$\begin{cases} G_1 = G_2 = G \\ r = 0 \\ Y_1 = Y_2 = Y \end{cases}$$

- and always $C_1 = C_2 = C$
- Then the max achievable level of consumption is

$$C = Y - G$$

- If households cannot borrow in $t = 1$, the optimal path of consumption cannot be achieved.

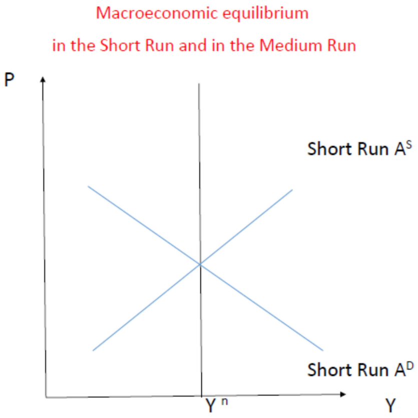
Discussion: remember the "Medium Run" in your macro text book

- So far we have assumed Y_1 and Y_2 to be exogenous
- In particular we have assumed that the level of output does not respond to G: this is a BIG assumption
- In other words, we have studied the effects of G in the *medium run*
- Remember the distinction between *short-run, medium-run and long-run* in the macro textbook
- In the medium-run y_n (the level of output) is fixed, in particular it is independent of M, G and T

How do these results compare with what you learned in your macro textbook?

- If $y = y_n$, it is obvious that private sector demand $(C + I)$ must fall as G rises.
- But the channel through which this happens is different in this (medium run) model compared to the (short run) $AS - AD$ model.
- In the $AS - AD$ model, as G rises, P rises, M/P falls, i rises, and *investment* falls to make room for G.
- Here, C falls, but the fall in C has nothing to do with i (there is no money market in the model we have studied). C falls because of the expectation of higher T in the future.
- In the $AS - AD$ model, crowding out happens mostly via interest rates. G affects Y so long as prices are fixed (or not perfectly flexible), and the effect vanishes as prices adjust.
- Here instead, crowding out happens through the anticipation of future taxes.

How do these results compare with what you learned in your macro text book?



Discussion (cont)

- We have assumed that the level of output does not respond to G. But could an increase in G raise y_n ? Remember what determines y_n
  - the level of mark-ups and the generosity of unemployment benefits
    - nothing G can do about mark-ups
    - but higher G could mean more generous unemployment benefits: these lower the response of wages to unemployment (Remember that y_n depends on the parameter describing the generosity of u benefits)
  - y_n also depends on the production function: $Y = AN$, where A is labor productivity. If G is spent, for instance, on *public infrastructure*, it could improve the efficiency of private sector firms, A, and thus raise Y for any level of labor input N. In this case higher G would raise y_n

Discussion (cont)

- Here we have studied one special channel that allows G to affect C and Y: crowding out via expected future taxes – a channel you probably had not seen before
- This channel relied on the assumption that the economy was in the medium run with a given level of output y_n. This was possible because prices and wages were assumed to be perfectly flexible
- As we have discussed, in a model that looks at the short-run, there would be other channels that allow the changes in G to affect output and consumption – for example if prices and wages are not perfectly flexible
- Let's consider an extreme case: fixed prices and myopic consumers, i.e. a static model, as in your undergraduate textbook

The Keynesian View

Keynes's Statement

"If the Treasury were to fill old bottles with banknotes, bury them at suitable depths in disused coal mines which are then filled up to the surface with earth, and leave it to private enterprise on well-tried principles of laissez-faire to dig the notes up again, there need be no more unemployment and, with the help of the repercussions, the real income of the community, and its capital wealth also, would probably become a good deal greater than it actually is. It would, indeed, be more sensible to build houses and the like; but if there are political and practical difficulties in the way of this, the above would be better than nothing."

— J.M. Keynes, *The General Theory of Employment, Interest and Money* (1936)

Allowing Fiscal Policy to Affect Demand

The following illustrative example is taken from Angeletos, Yian and Wolf (2023)

- Consider a two-period economy in which the government pays out a transfer ε to households at $t = 0$, generates automatic tax revenue $t_y y$ for every dollar of output, and taxes households to return debt to trend at $t = 1$ (as necessary).
- Prices are fully rigid, so output at $t = 0$ is fully demand-determined.
- Consumer demand, income and disposable income in period 0 are given as follows:

$$\begin{aligned} c &= \text{MPC} \cdot y_{\text{disp}} \\ y_{\text{disp}} &= (1 - t_y) y + \varepsilon \\ y &= c \end{aligned}$$

  where MPC $\in (0, 1)$ is the marginal propensity to consume and y_{disp} is disposable income. Total demand consists solely of private consumption, as the economy in this simplified case is closed, there is no private investment, and the government neither invests nor consumes; it only collects taxes and distributes transfers.
- Note that this set-up embeds a myopia assumption: date-0 consumption is invariant to date-1 outcomes, thus allowing us to characterize the date-0 equilibrium without reference to what happens later.

Partial Equilibrium and General Equilibrium Results

- Using market clearing ($y = c$), we immediately see that the date-0 equilibrium level of income is given by

$$y = \frac{\text{MPC}}{1 - (1 - t_y)\text{MPC}} \cdot \varepsilon$$

- This equation is just the solution of the familiar, static Keynesian cross;
- MPC is the **partial equilibrium** effect of a unit transfer;
- $(1 - t_y)\text{MPC}$ is the slope of the Keynesian cross;
- $\frac{1}{1-(1-t_y)\text{MPC}}$ is the **general equilibrium** multiplier.

The Government budget constraint and the extent of self-financing

Consider now the government's budget constraint.

- Since the government hands out the transfer ε and collects taxes $t_y y$, the net deficit at the end of date 0 is $\varepsilon - t_y y$. The amount of public debt inherited at date 1 is thus given by

$$\begin{aligned} \text{debt tomorrow} &= (1+R)(\varepsilon - t_y y) \\ &= (1+R)(1-\nu)\varepsilon \\ \nu &= \frac{t_y y}{\varepsilon} = \frac{t_y \text{MPC}}{1-(1-t_y)\text{MPC}} \end{aligned}$$

where ν **is the degree of self-financing**.

- This result reveals two important insights:
  - First, we see that **a higher MPC maps both to a larger partial equilibrium effect (numerator) and to a higher general equilibrium multiplier (denominator)**, and therefore overall to a larger degree of self-financing ν;
  - Second, as **MPC $\to 1$, the partial equilibrium effect converges to 1, the multiplier converges to $\frac{1}{t_y}$, and ν converges to 1**: there is complete self-financing.