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, $r_{t+j}^{B} = r^{B}$ for all j

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

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

- 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 $i = 0 \rightarrow \infty$

- 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}

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

- 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 Essay on the Funding System (1920)

- 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 $T = 45$, $x = 1.2$

From the Ricardian Equivalence to Expansionary Austerity

Now think of a situation in which G_1 increases to $G_1^{'} > G_1$, while G_2 does not change.
As the IGBC holds we have $(T_1 - \frac{T_2}{(1+r)})^{'} > (T_1 - \frac{T_2}{(1+r)})$.
What happens now optimal consumption ?

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

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

- 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 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)

Fiscal Policy and Aggregate 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 $\text{MPC} \in (0, 1)$ 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 in the Keynesian View.

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 $\rightarrow 1$, 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.

A Discussion of the Two views

We have illustrated two very different views of fiscal policy. These two views reached very different conclusions but the also started from different assumptions.

- In our illustration of the Neoclassical View
  - The horizon of consumers was the same horizon of the government,
  - The consumers were not subject to borrowing constraint,
  - Y did not respond to G,
  - Taxation was not proportional to income,
- In our illustration of the Keynesian View
  - Consumers were myopic,
  - Borrowing was not an issue as current consumption depended only on current income,
  - Y did respond to G,
  - Taxation was proportional to income.

Ricardo's thoughts

Ricardo himself had doubts

Ricardo's Statement

""'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 "

— D.Ricardo, *Essay on the Funding System* (1920)

The Horizon of Consumers and Government

- In our two periods description of the Ricardian Equivalence we considered the case in which both Consumers and Government had an horizon of two periods.
  - In this case the IGBC of a government that financed with bonds in period 1 and Expenditure of G_1 imposing no taxation in the first period $T_1 = 0$, implied
  - $\left\{ \begin{array}{c} T_1 = 0 \\ G_1 = B \\ G_2 = 0 \end{array} , T_2 = B(1+r) \right\}$
  - Optimal Consumption by Agents in period 1 was then $C_1 = \frac{(1+r)}{(2+r)} \left[Y_1 + \frac{Y_2}{(1+r)} - B \right]$
- Think now of the case in which the government has 3 periond horizon and waits till period 3 to to balance its books $T_2 = 0,\ T_3 = B(1+r)^2$. However, agents have a 2 period horizon what happens in period 3 is irrevelant for them.
  - In this case $C_1 = \frac{(1+r)}{(2+r)} \left[Y_1 + \frac{Y_2}{(1+r)} \right]$
  - The debt, B, is transferred to the next generation who will bear its burden and it does not matter for consumption of agents who do not care of future generations.

Liquidity Constraints.

If agents cannot borrow against their future income, than the maximum achievable level of consumption is :

- $C_1 = Y_1 - T_1$
  if
- $Y_1 - T_1 < \frac{(1+r)}{(2+r)} \left[Y_1 - T_1 + \frac{Y_2 - T_2}{(1+r)} \right]$,
  then households, not able to borrow in $t = 1$ using their future income as collateral, cannot achieve optimal consumption.

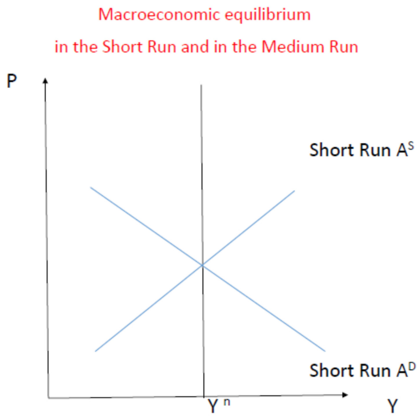
The role of Demand and Supply

- In the our exposition of the neoclassical view the output level was considered fixed, while in our exposition of the keynesian view the price level were taken as fixed
- These two views can be illustrated as two extreme views in the standard graph of aggregate demand and supply in the space of output and prices
- the neoclassical view considers the extreme case of a vertical aggregate supply, in which the level of ouptut is equal to the natural level of ouptut y_n and it is not affected by any policy, monetary or fiscal, shifting demand
- the keynesian view considers instead the extreme case of an horizontal aggregate supply, if price are fixed any policy shifting demand has an impact on the level of output.

Two different channels

- In the standard $AS - AD$ textbook model the long-run supply function is vertical and consumption depends only on current disposable income.
  - As G rises, eventually P rises, M/P falls, i rises, and *investment* and falls to make room for G.
  - G affects Y so long as prices are fixed (or not perfectly flexible), and the effect vanishes as prices adjust.
  - The response of consumption to G follows the path of disposable income along the adjustment of prices.
- under optimal intertemporal consumption smoothing it is C that adjusts because agents see that sooner or later the government debt has to be paid-back.
  - crowding out happens through the anticipation of future taxation when current government expenditure is increased with debt financing.

Aggregate Demand and Supply



Reassessing the two views

Our discussion of the different hypotheses between the two views makes clear that different theories have different predictions and eventually we should refer to the data to decide what is the more relevant theory, but this is not easy.

- The message from the data is not easily extracted,
- The Data Generating Process might not be constant over time and the most relevant model to explain the data could also change over-time.
- Finally, the views maight not be as polarized as we can initially think ...

More chances for Keynes in a neoclassical world

- Could an increase in G raise y_n ?
- In the standard AS-AD model the level of mark-ups, the generosity of unemployment benefits, and productivity
  - 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

More channels for Expansionary Austerity

An obvious criticism from the Keynesian camp to the conclusion that an increase in government expenditure could lead to a recession in consumption is that the model did not allow for the effect of G on Y and did not consider the multiplier effect on taxation. However, there might be other channels that strengthen the neoclassical argument

- Debt stabilization reduces risk of default, and therefore reduces the cost of financing the govermment debt, as all interest rate in an economy are driven by the cost of financing the debt, the cost of capital will also be reduced by restrictive fiscal policy
- In this case we have $\frac{dI}{dG} < 0$
- 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

Some Interesting Empirical Evidence: Denmark, 1983-86
(numbers are average yearly growth rates over the period indicated)

avg change over the period	1979 – 82	1983 – 86
$\%\Delta$ **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
- This is a "black swan" for the Keynesian view: cuts in G can be good news for growth !
- but this is just an episode we need to more data investigation !!!