Deficit reduction and investment

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As Blanchard (2017) explains in the Focus Box on page 103, Keynes (1936) argued that deficit reduction could be bad for investment. This was thought of as a "paradox" in his time, or even as wrong, when there was resistance to Keynesian ideas. Most economists and policymakers were then thinking along the following line of argument. Investment being equal to saving, investment is also equal to the sum of private saving and public saving:

$$I = \underbrace{S}_{\text{private saving}} + \underbrace{(T-G)}_{\text{public saving}}$$

When public saving goes up, as a result of efforts at deficit reduction, this should thus mechanically increase investment. Therefore, deficit reduction raises investment. This argument is pervasive: in fact, similar arguments were made by some economists during the 2007-2009 financial crisis, when policymakers were trying to figure out an appropriate policy response.

As for the paradox of thrift, we might understand why this argument is wrong, using two models that we have learned in the lectures (Lectures 2 and 4) and in the recitation sections (Chapter 3, Problem 8).[1] We shall use:

- The **consumption multiplier model**. (Lecture 2 and 4) This model leads to ***unchanged*** investment as the government engages in deficit reduction. Section 1 reviews this model.
- The **consumption and investment multiplier model**. (Problem 3, Chapter 3) This model leads to ***declining*** investment as the government engages in deficit reduction. Section 2 reviews this model.

1 Unchanged investment

In the consumption multiplier model, we have unchanged investment as the government engages in deficit reduction. We start from the basic goods market model:

$$C = c_0 + c_1 Y_D$$
$$Y_D = Y - T$$

where c_1 is the marginal propensity to consume out of disposable income Y_D, disposable income is income minus taxes, and investment $I = \bar{I}$ and government expenditures G are

[1] Indeed, understanding why deficit reduction does not necessarily lead to more investment is very similar to understanding why more saving by individuals does not lead necessarily to more aggregate saving. The note on the paradox of thrift is available here.

taken as given, as well as taxes T. Again, there are two ways that one prove the result: the first is just to note that in this model, investment is constant by assumption and therefore cannot change. However, it really seems like it is then coming from the assumptions, and does not help understand what was wrong in the above reasoning.

The key lies of course in the behavior of private saving. Deficit reduction ($\Delta(T-G)>0$) could come either from a rise in taxes or a fall in transfers ($\Delta T>0$), or from a fall in government spending ($\Delta G<0$).

Fall in government spending. Denote the fall in government spending by $\Delta G<0$. This leads to a rise in public saving:

$$\Delta(T-G)=-\Delta G>0.$$

However, this fall also leads to a fall in output, whose magnitude is given by the government spending multiplier. We write that output equals demand, to get an expression for output:

$$\begin{aligned}Y&=Z=C+I+G\\Y&=c_0+c_1(Y-T)+\bar{I}+G\end{aligned}$$

Therefore:

$$Y=\frac{1}{1-c_1}\left(c_0-c_1T+\bar{I}+G\right)$$

So the fall in output is:

$$\Delta Y=\frac{\Delta G}{1-c_1}.$$

Private saving is given by disposable income $Y-T$ minus consumption (what is earned, not paid in taxes, nor consumed, is saved), and therefore:

$$S=Y-T-C$$

Replacing consumption C in this equation, using disposable income, allows us to write:

$$\begin{aligned}S&=Y-T-c_0-c_1\left(Y-T\right)\\S&=-c_0+\left(1-c_1\right)\left(Y-T\right).\end{aligned}$$

Therefore:

$$\Delta S=(1-c_1)\Delta Y=\Delta G.$$

Thus, we have a fall in private saving whose magnitude is exactly equal to the rise in public saving. Overall, the effect on total saving, and therefore investment is:

$$\Delta I=\Delta S+\Delta(T-G)=0.$$

Rise in taxes or reduction in transfers. If the government chooses to engage in deficit reduction through tax increases (or by reducing transfers), then denoting by $\Delta T>0$ the increase in aggregate taxes, we have a rise in public saving given by:

$$\Delta(T-G)=\Delta T>0.$$

Again, this leads to a fall in private saving through two channels: a direct channel which goes through the mechanic reduction in disposable income, and a second channel which goes through the reduction in output, which lowers income. Again, the magnitude of the second channel can be computed using the above equation for output:

$$Y = \frac{1}{1-c_1}\left(c_0 - c_1 T + \bar{I} + G\right) \quad \Rightarrow \quad \Delta Y = -\frac{c_1}{1-c_1}\Delta T.$$

Again, given the above expression for private saving:

$$S = -c_0 + (1-c_1)(Y-T)$$

we have:

$$\begin{aligned}
\Delta S &= (1-c_1)(\Delta Y - \Delta T) \\
&= (1-c_1)\left(-\frac{c_1}{1-c_1}\Delta T\right) - (1-c_1)\Delta T \\
\Delta S &= \underbrace{-c_1 \Delta T}_{\text{Effect through output}} - \underbrace{(1-c_1)\Delta T}_{\text{Reduction in disposable income}}
\end{aligned}$$

Therefore:

$$\Delta S = -\Delta T.$$

Thus, we have a fall in private saving whose magnitude is exactly equal to the rise in public saving. Overall, the effect on total saving, and therefore investment is:

$$\Delta I = \Delta S + \Delta(T - G) = 0.$$

2 Reduction in investment

In the consumption and investment multiplier model, we get that deficit reduction is even bad for investment. The consumption and investment multiplier model is presented in Chapter 3, Problem 8, where investment is allowed to depend on output. We thus start from the following goods market model:

$$\begin{aligned}
C &= c_0 + c_1 Y_D \\
Y_D &= Y - T \\
I &= b_0 + b_1 Y
\end{aligned}$$

where c_1 is the marginal propensity to consume out of disposable income Y_D, disposable income is income minus taxes, government expenditures G is taken as given, as well as taxes T.

We know that a rise in public saving, arising from either a decrease in government expenditures, or a rise in taxes, or a decrease in transfers, leads to a decline in output $\Delta Y < 0$, and therefore through the above equation giving investment as a function of output, to a decline in investment since $\Delta I = b_1 \Delta Y$:

$$I = b_0 + b_1 Y \quad \Rightarrow \quad \Delta I = b_1 \Delta Y < 0.$$

Therefore, a deficit reduction is clearly bad for investment. However, once again, this calculation does not really help understand what the above reasoning was wrong.

The key lies of course in the behavior of private saving. As in section 2, deficit reduction ($\Delta(T-G)>0$) can come either from a rise in taxes or a fall in transfers ($\Delta T>0$), or from a fall in government spending ($\Delta G<0$).

Fall in government spending. Denote the fall in government spending by $\Delta G<0$. This leads to a rise in public saving:

$$\Delta(T-G)=-\Delta G>0.$$

However, this fall also leads to a fall in output, whose magnitude is given by the government spending multiplier. We write that output equals demand, to get an expression for output:

$$\begin{aligned}Y&=Z=C+I+G\\Y&=c_0+c_1(Y-T)+b_0+b_1Y+G\end{aligned}$$

Therefore:

$$Y=\frac{1}{1-c_1-b_1}\left(c_0+b_0-c_1T+G\right)$$

So the fall in output is:

$$\Delta Y=\frac{\Delta G}{1-c_1-b_1}.$$

Once again, private saving is given by disposable income $Y-T$ minus consumption (what is earned, not paid in taxes, nor consumed, is saved), and therefore:

$$S=Y-T-C$$

Replacing consumption C in this equation, using disposable income, allows us to write:

$$\begin{aligned}S&=Y-T-c_0-c_1\left(Y-T\right)\\S&=-c_0+\left(1-c_1\right)\left(Y-T\right).\end{aligned}$$

Therefore:

$$\Delta S=(1-c_1)\Delta Y=\frac{1-c_1}{1-c_1-b_1}\Delta G.$$

Thus, we have a fall in private saving whose magnitude is larger than the rise in public saving. Overall, the effect on total saving, and therefore investment is:

$$\Delta I=\Delta S+\Delta(T-G)=\frac{1-c_1}{1-c_1-b_1}\Delta G-\Delta G=\frac{b_1}{1-c_1-b_1}\Delta G<0.$$

Rise in taxes or reduction in transfers. If the government chooses to engage in deficit reduction through tax increases (or by reducing transfers), then denoting by $\Delta T>0$ the increase in aggregate taxes, we have a rise in public saving given by:

$$\Delta(T-G)=\Delta T>0.$$

Again, this leads to a fall in private saving through two channels: a direct channel which goes through the mechanic reduction in disposable income, and a second channel which goes through the reduction in output, which lowers income. Again, the magnitude of the second channel can be computed using the above equation for output:

$$Y = \frac{1}{1-c_1-b_1}\left(c_0 + b_0 - c_1 T + G\right) \quad \Rightarrow \quad \Delta Y = -\frac{c_1}{1-c_1-b_1}\Delta T.$$

Again, given the above expression for private saving:

$$S = -c_0 + (1-c_1)(Y-T)$$

we have:

$$\begin{aligned}
\Delta S &= (1-c_1)(\Delta Y - \Delta T) \\
&= (1-c_1)\left(-\frac{c_1}{1-c_1-b_1}\Delta T\right) - (1-c_1)\Delta T \\
\Delta S &= \underbrace{-\frac{c_1(1-c_1)}{1-c_1-b_1}\Delta T}_{\text{Effect through output}} - \underbrace{(1-c_1)\Delta T}_{\text{Reduction in disposable income}}
\end{aligned}$$

Therefore:

$$\Delta S = -\frac{1-b_1-c_1+b_1c_1}{1-c_1-b_1}\Delta T.$$

Thus, we have a fall in private saving whose magnitude is exactly equal to the rise in public saving. Overall, the effect on total saving, and therefore investment is decreasing:

$$\Delta I = \Delta S + \Delta(T-G) = -\frac{b_1 c_1}{1-c_1-b_1}\Delta T < 0.$$

References

Blanchard, Olivier J., *Macroeconomics*, Pearson Education, 2017.

Keynes, John Maynard, *The General Theory of Employment, Interest, and Money* 1936.