Lecture 8 - The Paradox of Thrift

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8 The Paradox of Thrift

The idea that thrift is always virtuous is very deeply ingrained in our culture. It is a matter of philosophy, morals, and sometimes even religion. For example, in the Walt Disney movie Mary Poppins, Michael is being lectured by a banker that he should not be "feeding the birds" but instead invest his tuppence "wisely in the bank" to "be part of railways through Africa; Dams across the Nile, fleets of ocean Greyhounds; Majestic, self-amortizing canals; Plantations of ripening tea" (interestingly, these capital investments are all abroad; we shall come back to this later).

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However, the model of lecture **??** implies that saving might be detrimental to the economy, at least when the economy has some slack. This phenomenon was explained by J.M. Keynes in the *General Theory*:

> For although the amount of his own saving is unlikely to have any significant influence on his own income, the reactions of the amount of his consumption on the incomes of others makes it impossible for all individuals simultaneously to save any given sums. Every such attempt to save more by reducing consumption will so affect incomes that the attempt necessarily defeats itself. It is, of course, just as impossible for the community as a whole to save less than the amount of current investment, since the attempt to do so will necessarily raise incomes to a level at which the sums which individuals choose to save add up to a figure exactly equal to the amount of investment.

In this lecture, we use the models of lecture **??** to understand that argument better. From the outset, we should note that the paradox of thrift was known before J.M. Keynes, perhaps in the Book of Proverbs:

> There is that scattereth, and yet increaseth; and there is that withholdeth more than is meet, but it tendeth to poverty. (Proverbs 11:24)

More certainly, it was present as early as in Bernard Mandeville's *The Fable of the Bees: or, Private Vices, Public Benefits* (1714):

> As this prudent economy, which some people call Saving, is in private families the most certain method to increase an estate, so some imagine that, whether a country be barren or fruitful, the same method if generally pursued (which they think practicable) will have the same effect upon a whole nation, and that, for example, the English might be much richer than they are, if they would be as frugal as some of their neighbours. This, I think, is an error.

This idea was also stated by Thomas Malthus:

> Adam Smith has stated that capitals are increased by parsimony, that every frugal man is a public benefactor, and that the increase of wealth depends upon the balance of produce above consumption. That these propositions are true to a great extent is perfectly unquestionable... But it is quite obvious that they are not true to an indefinite extent, and that the principles of saving, pushed to excess, would destroy the motive to production. If every person were satisfied with the simplest food, the poorest clothing, and the meanest houses, it is certain that no other sort of food, clothing, and lodging would be in existence.
>
> While it is quite certain that an adequate passion for consumption may fully keep up the proper proportion between supply and demand, whatever may be the powers of production, it appears to be quite as certain that a passion for accumulation must inevitably lead to a supply of commodities beyond what the structure and habits of such a society will permit to be consumed.

Thomas Malthus really was a forerunner of J.M. Keynes. He set himself out to explain why unemployment could occur, as well as to suggest steps which might be taken to eliminate it. He was inspired by events surrounding the post-Napoleonic wars period, during which time industrial depression in Britain was causing serious unemployment of labor and capital.

That this part of his thinking was not that original was in fact recognized by J.M. Keynes in Chapter 23 of the General Theory - Notes on Mercantilism, the usury laws, stamped money and theories of under-consumption, which I strongly encourage you to read (although you are not responsible for it). We will come back to it when we talk about open economy macroeconomics, starting in lecture **??**

Back to our Keynesian goods market model of lecture **??**, we shall now study the paradox of thrift in more detail. We will consider three ways in which an economy might save more, which are all relevant in practice:

1. an increase in the desire to save through a fall in autonomous consumption $\Delta c_0 < 0$.
2. an increase in public saving, also called **deficit reduction**, through a decrease in government spending $\Delta G < 0$.
3. an increase in public saving, also called **deficit reduction**, through an increase in taxes or a decrease in transfers $\Delta T > 0$.

We will show that these acts of saving have very similar detrimental effect on output, and therefore saving. We shall consider two models in which such a paradox of thrift arises:

- in the simple goods market model of lecture **??**, we will show that attempts to save more, either by private individuals or by the government, are self-defeating, in the sense that saving does not move. This is presented in section 8.1.
- in the variation on the goods market model with an accelerator effect of investment where $I = b_0 + b_1 Y$, we will even show that attemps to save more are more self-defeating: they lead to lower saving in the aggregate. The "paradox of thrift" will appear very clearly: attempts to save more lead to less saving. This is presented in section 8.2.

8.1 Simple goods market model

Let us start from the simple goods market model:

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

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 spending G are taken as given, as well as taxes T. There are several ways to show the "paradox of thrift" in this model. We investigate an increase in the desire to save, modeled as a reduction in c_0 $\Delta c_0 < 0$, as well as two attempts at deficit reduction in turn.

8.1.1 $\Delta c_0 < 0$

There are two ways to see that a fall in the desire to consume $\Delta c_0 < 0$, or equivalently an increase in the desire to save, may lead to an equal level of aggregate saving. One way is the most straightforward, but does not give much intuition for the result. The second way is more complex, but gives a very nice economic intuition.

Direct proof. The first way to see the paradox of thrift is simply to notice that investment is fixed and equal to $\bar{I}$ by assumption. Since total saving equals private saving S plus public saving $T - G$, we can express private saving as a function of only fixed variables:

$$\bar{I} = S + (T - G) \quad \Rightarrow \quad S = \bar{I} - (T - G).$$

This proves the result ! In particular, even if there is a change in consumption of $\Delta c_0 < 0$, then private saving does has to be equal to $\bar{I} - (T - G)$ always and thus cannot move. However, this proof is a little bit disappointing and does not provide much intuition.

Intuitive Proof. For the more intuitive proof, we need to write the equations from the goods market model as well as equate output to demand $Y = Z$:

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

This leads to equilibrium output:

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

This is the usual multiplier: for a given change in Δc_0, the change in output is given by the direct effect on output, but also by all the successive new rounds, which add up to $\frac{\Delta c_0}{1-c_1}$ in total. Thus, such a change in Δc_0 leads to a change in output of:

$$\Delta Y = \frac{\Delta c_0}{1 - c_1}.$$

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

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

What happens when people attempt to save more, say by lowering c_0? A change in consumption of $\Delta c_0 < 0$ clearly leads to:

- on the one hand, a *direct effect* on private saving that is given by $-\Delta c_0 > 0$ (private saving rises).
- on the other hand, an *indirect effect* going through the change in output whose magnitude was calculated above given by $\Delta\left[(1 - c_1)(Y - T)\right]$.

In other words, we may write:

$$\Delta S = \underbrace{\Delta(-c_0)}_{\text{direct effect}} + \underbrace{\Delta\left[(1 - c_1)(Y - T)\right]}_{\text{indirect effect}}.$$

Now, how large is the indirect effect? Some algebra allows to conclude that it is exactly the opposite of the direct effect:

$$\begin{aligned} \Delta\left[(1 - c_1)(Y - T)\right] &= (1 - c_1)\Delta Y \\ &= (1 - c_1)\frac{\Delta c_0}{1 - c_1} \\ \Delta\left[(1 - c_1)(Y - T)\right] &= \Delta c_0. \end{aligned}$$

Therefore, the total effect on saving is:

$$\begin{aligned}\Delta S &= \Delta(-c_0) + \Delta\left[(1-c_1)(Y-T)\right] \\ &= -\Delta c_0 + \Delta c_0 \\ \Delta S &= 0\end{aligned}$$

8.1.2 Fall in spending $\Delta G < 0$

Again, there exists both a straightforward proof which does not explain much, and a proof providing more economic intuition. We start with the direct proof.

Direct Proof. The direct proof simply uses the investment equals saving identity:

$$\bar{I} = S + (T - G)$$

This implies that a fall in expenditure $\Delta G < 0$, and resulting increase in public saving must be matched by a fall in private saving. However, this proof is again, somewhat disappointing.

Intuitive Proof. 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. Indeed, we know that:

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

which implies that 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:

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

Therefore:

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

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

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

8.1.3 Increase in net taxes $\Delta T > 0$

An increase in net taxes $\Delta T > 0$ can come both from an increase in taxes or a reduction in transfers. Again, there are two proofs. The direct proof is exactly the same as the one with $\Delta G < 0$, so we do not go over it. On the other hand, the intuitive proof is a bit different because taxes impact disposable income too.

Intuitive proof. 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:

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

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:

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

8.2 Extended goods market model

In the consumption and investment multiplier model, we get an even stronger paradox of thrift in that efforts by consumers to save more lead to declining saving. We thus start from the extended goods market model of lecture **??**:

$$C = c_0 + c_1(Y-T)$$
$$I = b_0 + b_1 Y.$$

Again, we investigate a fall in private saving first, and then two attempts at deficit reduction.

8.2.1 $\Delta c_0 < 0$

Direct proof. Again, let us write the investment = total saving identity:

$$I = S + (T-G) \quad \Rightarrow \quad S = I - (T-G).$$

We know that a fall in consumption of $\Delta c_0 < 0$ leads to a decline in output $\Delta Y < 0$, and therefore through the equation giving investment as a function of output, to a decline in investment since $\Delta I = b_1 \Delta Y$:

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

Because T and G are assumed to be fixed (so that public saving is fixed), the change in private saving is equal to the change in investment, and is therefore negative. Therefore, a fall in consumption, leads to a fall in private saving ! Again, that proof is probably not very intuitive. We now turn to the longer proof.

Intuitive proof. Again, we write that output equals demand, which allows to get an expression for output:

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

We have the usual multiplier, compounding the consumption and investment effects (it is assumed here that $c_1 + b_1 < 1$). Therefore, a given change in $\Delta c_0 < 0$ leads to decline in output of:

$$\Delta Y = \frac{\Delta c_0}{1 - c_1 - b_1}.$$

Again, one can show that $S = -c_0 + (1 - c_1)(Y - T)$ – see section 8.1:

$$\Delta S = \underbrace{\Delta(-c_0)}_{\text{direct effect}} + \underbrace{\Delta\left[(1 - c_1)(Y - T)\right]}_{\text{indirect effect}}$$

However, this time, the two effects do not exactly cancel out as the indirect effect is:

$$\begin{aligned}\Delta\left[(1 - c_1)(Y - T)\right] &= (1 - c_1)\Delta Y \\ &= (1 - c_1)\frac{\Delta c_0}{1 - c_1 - b_1} \\ \Delta\left[(1 - c_1)(Y - T)\right] &= \frac{1 - c_1}{1 - c_1 - b_1}\Delta c_0.\end{aligned}$$

Therefore, the total effect on saving is negative:

$$\begin{aligned}\Delta S &= \Delta(-c_0) + \Delta\left[(1 - c_1)(Y - T)\right] \\ &= -\Delta c_0 + \frac{1 - c_1}{1 - c_1 - b_1}\Delta c_0 \\ \Delta S &= \frac{b_1}{1 - c_1 - b_1}\Delta c_0 < 0\end{aligned}$$

8.2.2 Fall in spending $\Delta G < 0$

Direct proof. We know that a rise in public saving, arising from either a decrease in government spending, 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.

Intuitive proof. The fall in government spending $\Delta G < 0$ 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 to get, once again, that:

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

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 (see the previous sections):

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

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 negative:

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

8.2.3 Increase in net taxes $\Delta T > 0$

The direct proof is exactly similar at the one in the previous section. However, the intuitive proof is a bit difference.

Intuitive proof. 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:

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

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:

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

Overall, the effect on total saving, and therefore investment is decreasing:

$$\Delta I = \Delta S + \Delta(T-G) = -\frac{b_1c_1}{1-c_1-b_1}\Delta T < 0.$$

Readings - To go further

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