

Reply to the First Referee

Thank you very much for the time, attention and care you devoted to examine my paper. I certainly shall correct the mistakes you mentioned in your note on Minor Points. Thank you for pointing this out. Regarding your main concern, I give my response to your points below. I print the passages of your report I comment on in bold and give my notes on these as normal text.

In Schlichts words "the present value of the households lifetime income has increased by switching from a pay-as-you-go regime to a debt regime ... As the value of their lifetime income stream has increased, they could have afforded higher expenditure."

The problem with this statement is that the *disposable income only increases because households are saving* (buying government bonds).

Yes. They do so because they are assumed to hold Barro expectations (that "rearrangements of the timing of taxes – as implied by budget deficits – have no first-order effect on the economy," [Barro, 1989, 51]). They therefore think that they have to buy bonds in order to use them for paying future taxes that they (wrongly) think are inevitable because the debt must be repaid.

The debt trajectory – households asset trajectory – is endogenous to the household maximization problem.

I agree, but Barro expectations rule that out. They imply no behavioral change if the government runs into debt when lowering taxes while keeping expenditure unchanged. The reason is that it is asserted that the government's budget constraint would be violated without tax increases. My example shows that this is not the case.

Thus, the constraint is not

$$\sum (1+i)^{-t} c_t \leq \sum (1+i)^{-t} (Y_t - T_t + iD_t)$$

but

$$\sum (1+i)^{-t} c_t \leq \sum (1+i)^{-t} (Y_t - T_t) \tag{1}$$

Here I disagree. The households can spent their interest income if they wish. But let us assume that this is the correct budget constraint. Consider my case that the households are not satiated and exhaust their budget, and take your c_t as my private expenditure E_t :

$$\sum_{t=0}^{\infty} (1-i)^{-t} E_t = \sum_{t=0}^{\infty} (1-i)^{-t} (Y_t - T_t)$$

As taxes are $T_t = (1 - \alpha)G_t + iD_t$ (according to my equation (11)) and government debt is $D_t = \frac{\alpha}{g} \left((1 + g)^t - 1 \right) G_0$ (according to my equation (7)), we obtain as the household's wealth

$$\omega = \sum_{t=0}^{\infty} (1 - i)^{-t} (Y_t - T_t) = \frac{1 + i}{i - g} (Y_0 - G_0). \quad (2)$$

It is independent of α . In this sense, the Barro-Ricardo equivalence would hold true. Yet who owns the government's debt? Its present value is given by my equation (11):

$$V = \frac{1}{i} \frac{1 + i}{(i - g)} \alpha G_0. \quad (3)$$

It is positive and may be considerable.

If there is a debtor there must be a creditor. As the government sells bonds to the households in order to finance its deficit, the households are the creditors. All what they additionally obtain in terms interest payments from government bonds and changes in taxation they put into their savings. Hence their wealth increases. They own the government's debt. The budget constraint (2) neglects that. Using your (correct) phrasing, the "debt trajectory" is directly related to their "asset trajectory." The budget constraint (1) disregards this aspect of the problem. It neglects that the households are creditors of the government.

Actually the difference between wealth ω as given in(2) and the present value of disposable income Q given in my equation (15) is exactly equal to the present value of the government's debt (3).

(Let me add for clarification: I have presented the argument in terms of private expenditure (consumption plus investment) rather than consumption alone, and included interest income from private investment in Y_t . Further I have assumed that the budget constraint is binding, so I would prefer equality signs instead of inequality signs in the constraints above. The reason is that the equality case is the simplest one, and I intended to simply provide an example, rather than a more general proposition, where it would not be rational to believe in the Barro-Ricardo equivalence. I will try to make this intention more explicit.)

If I am right, the problem can be illustrated with a simple two period example without government. Consider a household that receives income ω in the first period and allocates this income over two periods; the discount factor is β and the interest rate is i . Thus, the household solves

$$\max u(c_1) + \beta u(c_2) \quad (4)$$

st

$$c_1 + (1 + i)^{-1} c_2 \leq \omega \quad (5)$$

**The households "disposable income" in the two periods are ω and $(1+i)(\omega - c_1)$
But the constraint on household optimization clearly is not given by**

$$c_1 + (1+i)^{-1} c_2 \leq c_1 + (1+i)^{-1} (1+i)(\omega - c_1) = 2\omega - c_1. \quad (6)$$

I fully agree that (6) does not follow from (5). Equation (6) is actually inconsistent with equation (5) unless ω happens to be equal to c_1 . I do not see, however, which equations in my paper gave rise to the analogy (6). It is, I think, not a correct representation of my view for the two-period case without government. Rather my formulation (equation without a number after equation (11)) would simplify for that case to

$$c_1 + (1+i)^{-1} c_2 \leq \omega$$

with the understanding that wealth is given by the discounted value of income Y_t here:

$$\omega = Y_1 + (1+i)^{-1} Y_2.$$

This formulation is not uncommon and may be found in many standard textbooks like Mankiw's [1997, Section 15-2, pp408-9]. He uses there exactly the same formulation and denotes it as the intertemporal budget constraint. My formulation is simply a generalization of that expression for infinitely lived individuals and the possibility of government spending, government borrowing, and taxation. I accept Barro's argument that the case of infinitely lived individuals is, in the present context, equivalent to an overlapping generations model, and so I did not mention that distinction. I will add an appropriate explanation of the above.

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Ekkehart Schlicht

References

- Robert J. Barro. The ricardian approach to budget deficits. *The Journal of Economic Perspectives*, 3(2):37–54, Spring 1989. URL <http://www.jstor.org/pss/1942668>.
- N. Gregory Mankiw. *Macroeconomics*. Worth Publishers, New York, 3 edition, 1997. ISBN 1572591412.