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IS DEBT NEUTRAL IN
THE LIFE CYCLE MODEL?

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ABSTRACT

This paper questions the widely accepted view that deficits have real effects in the life cycle model. Standard analyses of deficits within life cycle models treat the government as a dictatorial entity that can effect any intergenerational redistribution it desires. In contrast, this paper drops the assumption of compulsion and models the government as a coalition of self-interested young and old generations whose bargaining determines government decisions. Since each generation is selfish, no generation will voluntarily absorb the debts of another except as a quid pro quo for receiving particular goods or services. Hence, redistribution per se between generations will not arise. Because each generation is ultimately responsible for its own liabilities, deficit finance, while altering the timing of tax receipts, has no economic impact.

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This paper questions the widely accepted view that deficits have real effects in the life cycle model. The standard analysis of deficit policies within life cycle models treats the government as a dictatorial entity that can effect any intergenerational redistribution it desires. In contrast, if one drops the assumption of compulsion and models the government as a coalition of self interested parties whose bargaining determines government decisions, then redistribution per se among these parties will not arise, and any transfers between these parties will simply represent payment for particular goods or services.

The self interested parties comprising the government in the present analysis are the young and the old. The young and old share a common interest in a public good, and their representatives bargain over the amount of financing to be provided by each generation. Given this decision, the method by which these funds are raised, whether by issuing debt or levying (lump sum) taxes, is immaterial, since each generation is responsible for its own obligations. In addition, while one selfish generation may absorb the debt of another, such absorption will always be a quid pro quo for another payment received or relieved.

The fact that each generation must pay its obligations either immediately or in the future means that a current cut in taxes paid by a particular generation will trigger a future increase in that generations' taxes of equal present value. As in Barro's (1974) altruism model in which the timing of taxes of effectively

infinitely lived households doesn't matter, the timing per se of the taxes paid by specific generations has no real effects.

The next section presents a two period life cycle overlapping generations model in which debt is neutral. The second section discusses the model's implications. The third section considers whether the paper's economic view of government is consistent with existing political institutions. The fourth section briefly summarizes and concludes the paper.

I. A Life Cycle Model with Debt Neutrality

In this two period model, as in Kotlikoff, Perrson, and Svensson (1986), the members of each generation are identical, and each generation elects a single representative. The ratio of the young population to the old population is $1+\eta$, and the size of the old population is normalized to unity. The technology determining the production of the model's single good is linear. Hence, if the two generations did not share a desire to consume a public good, they would be economically independent.

Let C_{yt} and C_{ot} stand for consumption of the young and old at time t , respectively. Assuming utility is separable at a point in time and over time in consumption and public goods, utility of the young at time t , U_{yt} , and utility of the old, U_{ot} , are given by:

$$(1) \quad U_{yt} = U(C_{yt}) + U(G_t) + \beta U(C_{ot+1}) + \beta(G_{t+1})$$

$$(2) \quad U_{ot} = U(C_{ot}) + \beta(G_t),$$

where G_t stands for consumption of the public good at time t , and β is one divided by one plus the rate of time preference.

The lifetime budget constraint confronting the young at time t is:

$$(3) \quad C_{yt} + RC_{ot+1} = E_y + RE_o - T_{yt} - RT_{ot+1},$$

where R is one divided by one plus the rate of interest, E_y and E_o are full-time earnings when young and old, and T_{yt} and T_{ot+1} are lump sum taxes imposed on generation t when young and old. The budget constraint of the elderly at time t is:

$$(4) \quad C_{ot} = A_t/R + E_o - T_{ot},$$

where A_t stands for assets of the elderly at time t , and T_{ot} is the lump sum tax on the elderly at time t .

The time t indirect utilities of the young, V_{yt} , and the old, V_{ot} , are given by:

$$(5) \quad V_{yt} = V_y(E_y + RE_o - T_{yt} - RT_{ot+1}) + U(G_t) + \beta U(G_{t+1})$$

$$(6) \quad V_{ot} = V_o(A_t/R + E_o - T_{ot}) + U(G_{t+1})$$

The government at any time t consists of a representative of the young and a representative of the old. They bargain over the level of G_t , the amount of G_t to be financed by the young, F_{yt} , and the amount of G_t to be financed by the old, F_{ot} . The budget constraining their negotiation is:

$$(7) \quad G_t = (1+\eta)F_{yt} + F_{ot}$$

In addition to financing the amount F_{yt} of G_t , the young of time t can anticipate providing financing of F_{ot+1} at time $t+1$ to help pay for G_{t+1} . These financing commitments must be paid, in present value, with taxes. Hence,

$$(8) \quad T_{yt} + RT_{ot+1} = F_{yt} + RF_{ot+1}$$

Generation t 's commitment to pay F_{yt} can be met either with tax receipts or receipts from the sale of bonds. Denoting by D_t the debt issued by generation t , we have:

$$(9) \quad D_t = F_{yt} - T_{yt}$$

For the old at time t taxes must be sufficient to cover both the payment, F_{ot} , for G_t , and the retirement with interest of their period $t-1$ issue of debt. Thus:

$$(10) \quad T_{ot} = F_{ot} + D_{t-1}/R$$

Using (8) and (9) one can eliminate the tax terms appearing in the budget constraints of the young and old:

$$(3') \quad C_{yt} + RC_{ot+1} = H - F_{yt} - RF_{ot+1}$$

$$(4') \quad C_{ot} = W_t/R + E_o - F_{ot}$$

where H stands for the present value of full-time labor earnings and W_t , the real wealth of the old at time t , is given by:

$$(11) \quad W_t = E_y - C_{yt-1} - F_{yt-1}$$

The indirect utilities of the young and the old at time t can be rewritten using (3'), (4'), and (7).

$$(5') \quad V_{yt}(F_{yt}, F_{ot+1}, F_{ot}, F_{yt+1}) = V_y(H - F_{yt} - RF_{ot+1}) + \\ U((1+\eta)F_{yt} + F_{ot}) + \\ \beta U((1+\eta)F_{yt+1} + F_{ot+1})$$

$$(6') \quad V_{ot}(F_{ot}, F_{yt}, W_t) = V_o(W_t/R + E_o - F_{ot}) + U((1+\eta)F_{yt} + F_{ot})$$

Note that given W_t , the sequence of F_{ys} and F_{os} for $s \geq t$ fully determines the evolution of the economy.

Next consider unique stationary solutions to this sequential bargaining problem arising under different bargaining processes. Given the bargaining process and a unique stationary bargaining

solution, the economy can differ from one period to the next only in terms of the level of W_t . Hence, each unique stationary solution can be characterized by two single valued functions :

$$(12) \quad F_{yt} = f_y(W_t)$$

$$(13) \quad F_{ot} = f_o(W_t)$$

where the forms of $f_y()$ and $f_o()$ depend on the bargaining process.

To clarify the determination of $f_y()$ and $f_o()$ take as an example a cooperative bargaining solution in which the two representatives maximize a weighted average of the utility of the young and the utility of the old, where the weight ϕ applied to the utility of the young and the weight $1-\phi$ applied to the utility of the old depend on the level of W_t ; i.e., $\phi = \phi(W_t)$. Letting J_t given in (14) stand for this weighted average, the bargaining solution involves the maximization at time t of J_t with respect to F_{yt} and F_{ot} .

$$(14) \quad J_t = \phi(W_t) (1+\eta) V_{yt}(F_{yt}, f_o(W_{t+1}(F_{yt})), F_{ot}, f_y(W_{t+1}(F_{yt}))) + (1-\phi(W_t)) V_{ot}(F_{ot}, F_{yt}, W_t)$$

Note that the representative of the young at time t will anticipate the impact of the choice of F_{yt} on W_{t+1} and, according to (12) and (13), on F_{ot+1} and F_{yt+1} . Hence, $f_o(W_{t+1}(F_{yt}))$ and $f_y(W_{t+1}(F_{yt}))$ are substituted for F_{ot+1} and F_{yt+1} respectively in V_{yt} .

Expressing the optimal choices of F_{yt} and F_{ot} as functions $m_y(W_t)$ and $m_o(W_t)$, these functions must satisfy the fixed point mappings:

$$(15) \quad m_y(\psi) = f_y(\psi)$$

$$(16) \quad m_o(\psi) = f_o(\psi)$$

Clearly, noncooperative stationary bargaining solutions will also feature fixed point mappings. Current decisions about F_{yt} and F_{ot} given W_t are always made with the knowledge that future bargaining outcomes depend on W_{t+1} , and stationarity requires that the choices of F_{yt} and F_{ot} when $W_t = \psi$ be identical to the period $t+1$ choices of F_{yt+1} and F_{ot+1} when $W_{t+1} = \psi$.

II. Implications of the Model

The neutrality of debt is implied by the fact that the sequence of F_{yt} and F_{ot} depends only on W_t and is independent of the sequence of D_t . Stated differently, since the solutions to F_{yt} and F_{ot} can be determined prior to knowing the sequence of T_{yt} and T_{ot} , any reduction in T_{yt} , according to (8), necessitates an increase in T_{ot+1} of equal present value. Deficits may arise, but they are not associated with intergenerational redistribution. In this model since the young at time t pay F_{yt} regardless of the size of D_t , the choice of D_t is essentially an accounting decision to label a portion of F_{yt} "taxes" and a portion "borrowing."

In Kotlikoff (1984) and (1986) I argue (1) that in neoclassical models the labelling of government receipts and payments as "taxes", "spending", "borrowing", and "debt repayment" is arbitrary and (2) that with judicious relabelling governments can maintain their same real policies while reporting essentially any size deficit or surplus to the public. The point of those discussions was to stress that one may mistake deficit accounting policies for real intergenerational redistribution. The current

model has the property that deficits always reflect accounting policies and are never associated with intergenerational redistribution.

Since each generation is responsible for its own debt one might wonder whether any generation would voluntarily absorb (pay off) the debt of another. The answer is that given F_{yt} and F_{ot} , the young at time t are equally well off if all or part of their payment of F_{yt} is spent to retire D_{t-1} provided the old at time t reciprocate and spend on G_t the funds they would otherwise have spent retiring D_{t-1} . In other words, (7) can be rewritten as:

$$(7') \quad G_t = ((1+\eta)F_{yt} - D_{t-1}/R) + (F_{ot} + D_{t-1}/R),$$

where the first term in brackets on the right hand side represents the payment of the young spent on G_t and the second bracketed term represents the payment of the old spent on G_t .

A related question is whether this model admits long term debt that is not retired over a large number of time periods. Again the answer is yes. Take the case of consuls. Suppose (1) that each old generation sells its consuls to the young generation on the private market and (2) that the representative of the old transfers to the representative of the young an amount equal to the value of these consuls including interest.

III. Is this Economic Model of Government Consistent with Observed Political Institutions?

In the model of government offered here government decisions are determined by economic, rather than political factors with each

group's power emanating from its option to operate independently. Provided that power is not circumscribed, it appears that a wide range of political institutions could be established that would affirm and conduct policies determined by economic fundamentals.

Even if political institutions that simply ratify economic bargains are not established, economic factors may still underlie political decisions. Suppose, for example, that the government in power, be it a collection of individuals or a single individual, is interested in selling political decisions to the highest bidder. Also assume that the government has the power to choose any values of F_{yt} and F_{ot} provided the utility levels of the young and old are not reduced below some minimum threat point values. Each age group will, if necessary, bid up to the point that it is indifferent between winning the bidding and receiving its minimum utility value. The age group winning the bidding will instruct the government to choose those levels of F_{yt} and F_{ot} that maximize the group's own utility subject to the other age group receiving its threat point utility. Hence, the rent seeking activity of the government leads to efficient provision of the public good and determines precisely the shares of the public good to be financed by the young and old. As argued above, given these shares, deficits are neutral.

Of course we don't commonly observe political parties or politicians representing distinct age groups. In addition to age differences there are a large number of other differentiating factors that provide a basis for political groupings. Nevertheless, in making decisions affecting the interests of the young as a group

and the old as a group governments may either (1) effectively act as if they consist of young and old representatives who bargain with each other or (2) sell their decisions to the age group offering to pay the highest price.

In contrast to positing an economic view of government, the standard life cycle model appears to assume that the government is free to engage in any intergenerational policy that it desires, including, in the limit, totally impoverishing one generation to the benefit of another. Or, stated differently, the standard model of government assumes that the economic positions of old and young generations place no constraints whatsoever on intergenerational redistribution. While a purely economic model of government may not be fully realistic, it may more closely approximate reality than a purely political model in which economic decisions are made irrespective of economic circumstances and economic desires.

IV. Conclusion

Given the critical assumption of generational selfishness in the life cycle model, no generation will accept the debts of another unless it is compensated in one form or another or unless it is coerced. If coercion is ruled out the issue of government debt is neutral with each generation having to pay off, in one form or another, its own liabilities. Thus the issue of debt causes a change in the timing (labelling) of tax payments, but no change in their present value.

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