The Neutrality of Money in Growth Models: A Comment

Author(s): James Tobin

Source: *Economica*, Feb., 1967, New Series, Vol. 34, No. 133 (Feb., 1967), pp. 69-72

Published by: Wiley on behalf of The London School of Economics and Political Science and The Suntory and Toyota International Centres for Economics and Related Disciplines

Stable URL: https://www.jstor.org/stable/2552515

The Neutrality of Money in Growth Models: A Comment

By JAMES TOBIN

In his valuable exposition of neo-classical aggregative growth theory,[1] Professor Harry Johnson shows how his ingenious graphical and analytical apparatus can be extended to accommodate outside money, that is, monetary debt of the government to its citizens. He begins with the "Keynesian" assumption that saving is a constant fraction of disposable income. Saving means accumulation of money or of real capital; whatever the relative amounts of the two forms of saving their total must satisfy the fixed propensity to save. However, the shares of money and capital stocks in total private wealth must satisfy asset preferences which depend *inter alia* on the real rates of return on the two assets. The money price of goods is assumed flexible, and its correctly anticipated rate of change is the negative of the real rate of return on money.

Johnson concludes that money is neutral in this model, in the following senses. (1) Unanticipated one-shot injections or withdrawals of nominal money do not alter the real development or equilibrium of the economy; they merely change the price level instantaneously in the same proportion. Neutrality in this sense is a trivial consequence of price flexibility and characterizes all models of this genre. (2) Equilibrium capital intensity, rate of return on capital, and *per capita* income are the same as in a non-monetary model with the same technology, population growth, and propensity to save. The presence of money alters only the approach to this equilibrium. (3) Likewise, the real equilibrium is independent of asset preferences and of the real rate of return on money. Thus it is not affected by the manner in which the growth in the real value of money balances is split between increasing nominal money and declining price level. The rate at which government creates new money affects only the path to the equilibrium, not the equilibrium itself.

Conclusions (2) and (3) contradict the conclusions I reached for essentially the same model.[2] Johnson notes this contradiction (footnote 1, p. 279) and suggests the reason for my "erroneous conclusion".

[1] "The Neo-Classical One-Sector Growth Model: A Geometrical Exposition and Extension to a Monetary Economy" *Economica*, vol. XXXIII (August 1966), pp. 265–87.

[2] In "Money and Economic Growth", *Econometrica*, vol. 33 (October 1965), pp. 671–84. Johnson's citation of my work is generous, but his reference to this article may convey the impression that it sticks to the assumption that asset-holders expect a constant price level. On the contrary, it considers explicitly, on pp. 680–84, the consequences of exactly the same assumption Johnson makes, i.e., that asset-holders correctly expect the actually realized rate of inflation or deflation.

The reason, he says, is that "Tobin falls into the error" of confusing *per capita* and aggregate saving functions.

Although I am quite capable of serious error, this time I am not guilty.

When saving is, as assumed, proportional to disposable income, it cannot make any difference whether the saving function is expressed as a relation between *per capita* or aggregate magnitudes. But it is essential to calculate saving and disposable income correctly, and Johnson has not done so.

He omits both from disposable income and from saving the increment in real cash balances associated with growth in population. He argues fallaciously that the growth of aggregate real cash balances is not a part of disposable income or of saving except to the extent that it exceeds the growth of population. In equilibrium *per capita* real cash balances are constant. Therefore, Johnson concludes, the growth of the real money stock absorbs no saving in equilibrium. All the saving goes into capital formation, just as in the corresponding non-monetary model. This is the basis for the conclusion that money is neutral in senses (2) and (3) above.

Johnson might just as well argue that in equilibrium *per capita* holdings of capital are constant, and that therefore there is no income or saving that corresponds to the provision of capital for the increment of population. He would then have to conclude that there is always zero net saving in long-run equilibrium! But the whole key to modern growth theory is the simple observation that with a growing population net saving is required in equilibrium just to maintain *per capita* wealth constant. This is the essential difference between the moving stationary state of modern capital and interest theory and the stationary stationary state of earlier writers.

A little algebra will clarify matters. I use Johnson's notation for *per capita* variables and let L be the labour force=population; K the aggregate capital stock and $\dot{K}=dK/dt$ its rate of increase; M/p the real value stock of money and $(\dot{M/p})=\frac{d(M/p)}{dt}$ its rate of increase; Y net national product; Y' aggregate disposable income; C aggregate consumption.

National private real saving is the increase in aggregate private wealth, that is, the increase in material capital plus the increase in the real stock of money. By assumption saving is a constant fraction s of disposable income. Therefore

$$(1) \qquad sY'=\dot{K}+(\dot{M/p}).$$

We also know that Disposable Income equals Consumption plus Saving:

$$(2) \qquad Y'=C+\dot{K}+(\dot{M/p}).$$

Likewise, Net National Product equals Consumption plus Net Investment:

(3) $Y=C+\dot{K}$.

From (2) and (3) we have:

(4) $Y'=Y+(\dot{M}/p)$.

According to Johnson $(\dot{M}/p)=bgY$, where b is the desired money/income ratio and g is $\dot{Y}/Y$. Therefore:

(5) $Y'=Y(1+bg)$.

Dividing by population L, we have:

(6) $y'=y(1+bg)$.

This is not Johnson's expression for *per capita* disposable income. His is

(6′) $y'=y[1+b(g-n)]$.

According to footnote 1, p. 283, some of his colleagues "preferred" (6). Their instincts were correct.

We can also convert (1) into *per capita* terms, making the same substitution for $(\dot{M}/p)$:

(7) $sy'=\dot{K}/L+bgy$.

$\dot{K}/L$ is what Johnson calls $s'(y)$, capital formation *per capita*. Substituting (6) into (7) gives:

(8) $s'(y)=\dot{K}/L=sy[1-bg(1/s-1)]$.

This is to be compared with Johnson's incorrect expression in his footnote on p. 281 and in Figure 8, p. 282:

(8′) $s'(y)=sy[1-b(g-n)(1/s-1)]$,

where n is the rate of growth of population. In long-run equilibrium $s'(y)$ must be equal to nk_e, where k_e is equilibrium capital-labour ratio, and g must be equal to n. From (8) we obtain the equilibrium condition:

(9) $nk_e=sy[(1-bn(1/s-1)]$,

whereas from (8′) Johnson obtains the same condition as would obtain in a non-monetary model:

(9′) $nk_e=sy$.

The correct condition (9) makes clear that in a monetary model nk_e is smaller than sy. Some saving is absorbed in accumulation of money balances. The value of k_e which solves (9) is lower than the solution of (9′). Equilibrium capital intensity is lower in the monetary model. Moreover, it is lower the higher the value of b. Since b is higher the greater the rate of deflation, equilibrium capital intensity is lower when the growth of the real money stock is achieved by deflation than

when it is engineered by expansion of the nominal supply of money. These were the conclusions of my article, and they are confirmed.

Johnson goes on to impute an income for the "utility yield of money" and to apply the saving ratio s to this additional imputed income. Finding that money is then non-neutral, he concludes that with a constant saving ratio recognition of the utility yield of money is crucial for non-neutrality. This conclusion, of course, falls as soon as it is recognized that money was already non-neutral in the model before any income was imputed to money holdings other than their real rate of return.

I agree with Johnson that the constant saving ratio is not a satisfactory assumption in growth models. However, the conclusion that outside money is non-neutral with respect to long-run equilibrium does not require so restrictive an assumption. In an equilibrium the stock of wealth *per capita* must accord with time preferences, and the composition of wealth with portfolio preferences—all at the equilibrium yields of the various assets. Aggregate wealth, in real value, and all its components must be growing at the pervasive natural rate of growth of the economy. Therefore not all saving can go into capital formation. Money can be neutral only if its availability, and the strength of the preference for it, leave unchanged the demand of wealth-owners for material capital. In the model discussed above the demand for total wealth was assumed to be invariant to its composition; money can be substituted for capital dollar for dollar. But so extreme an assumption is not necessary. If money is in any degree a substitute for material wealth in satisfying the thrift propensities of the population, then it is not neutral.

Yale University.