

Endogenous Money: What it is and Why it Matters

Abstract

Endogenous money is widespread in economic theory. The Post Keynesian contribution is identification of a causal link between bank lending and the money supply. Though driven by macroeconomic concerns, the Post Keynesian debate has reduced to a microeconomic debate over the role of financial intermediaries in the accommodation process. In the ISLM model endogenous money flattens the LM. This misses its substantive significance which is discrediting of monetarist money supply policy rules and monetarist critiques of central banking, its identification of the key role of credit, and its provision of a credit driven theory of the business cycle.

Key words: Endogenous money, bank lending, credit, business cycle.
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INTRODUCTION

Endogenous Money occupies a central place in Post Keynesian economics. Within the Post Keynesian schema, the money supply is endogenously determined via the demand for bank credit. For the last decade, the Post Keynesian approach to endogenous money has become bogged down in a debate between what have become labelled the "accommodationist" and "structuralist" approaches (Pollin, 1991). Accommodationists argue that the money supply is exclusively credit driven, with the monetary authority setting the interest rate and being forced to accommodate any increase in demand for reserves caused by increased bank lending. Structuralists also maintain that the money supply is influenced by the demand for credit and the reaction of the monetary authorities, but they argue that the money supply also depends on the asset and liability management practices of banks (Palley, 1987, 1994a). Even if the monetary authority refused to accommodate any increase in the demand for reserves, banks would still be able to partially accommodate an increase in loan demand through their own initiatives.

Paradoxically, though the initial impulse for developing a theory of endogenous money came from macroeconomics, the Post Keynesian debate has become centered on the microeconomic behavior of the banking firm and its response to changed credit market conditions. This paper seeks to restore a macroeconomic focus to the debate by exploring the question of why endogenous money matters.

The paper begins with an examination of different forms of money endogeneity. There are many forms of money endogeneity, and conventional neo-classical monetary theory already incorporates certain forms. Thereafter, the paper examines macroeconomic representations of endogenous money, and argues that endogeneity of money matters for both short run comparative static macroeconomics and longer run macro dynamics. The critical significance of endogenous money lies in the non-neutrality of money, which means that financial arrangements are central to real macroeconomic outcomes.

Acceptance of Post Keynesian endogenous money theory implies that fluctuations in monetary aggregates can be driven endogenously. This has a number of implications. First, observation of a correlation between macroeconomic failure and contraction of monetary aggregates proves nothing about policy as cause, which challenges monetarist claims that macroeconomic failures are largely due to poorly executed central bank control of the money supply (Palley, 1993).¹ Second, the endogeneity of money means that attempts to control the economy through monetarist styled money supply rules and targets are likely fail.² This suggests that policy authorities should look to other means of control. Interest rate policy is one instrument of control, but there may also be a place for

¹. The monetarist claim that central banks are responsible for macroeconomic stability can be illustrated through the Fisher equation, $MV = PY$. According to monetarism the money supply (M) is exogenous, money demand ($1/V$) is stable, and movements in the money supply temporally precede movements in nominal income (PY). Putting the pieces together, this implies that central bank changes in the exogenous money supply are the principal cause of macroeconomic fluctuations. The importance of Friedman and Schwartz's (1963a, 1963b) work on the monetary history of the U.S. and the Great Depression is that it aimed to empirically verify this claim.

². The failure of monetarist policy rules is empirically confirmed by the episode of monetarist policy dominance in the U.K. and U.S. in the late 1970s and early 1980s. This was a period characterized by enormous interest rate and real output volatility. Goodhart's law (attributable to Charles Goodhart), that any stable relationship between a monetary aggregate and economic activity will break down if the monetary authority tries to control that aggregate, is the cynic's version of the Post Keynesian claim that it is impossible to control the money supply.

quantitative regulation. Third, endogenously driven fluctuations of the money supply play an important role in the business cycle and can contribute to instability. Regrettably, the dynamic implications of Post Keynesian monetary theory have remained relatively undeveloped. So too have its policy prescriptions, and this has diminished the Post Keynesian contribution to the debate over operational monetary policy.

COMPETING FORMS OF ENDOGENOUS MONEY

Post Keynesian monetary theory rejects the notion of exogenous money, and maintains that both neo-Keynesian and classical macroeconomics assume that the money supply is exogenous. This section argues that such a claim is overstated, and that there exist a range of distinct approaches to endogenous money. Thus, the Post Keynesian innovation is not the distinction between exogenous and endogenous money, but rather the construction of endogenous money in terms of bank lending.

(a) Evolutionary (Mengerian) endogenous money.

Neo-classical competitive general equilibrium (GE) theory is frequently represented as paradigmatic of the exogenous money approach. However, GE theory has its own theory of endogenous money.³ Within the GE perspective, money endogeneity can be approached in two different ways. The first concerns the selection of a money, the focus here being money as a medium of exchange and money's ability to reduce transaction ("shoe leather") costs associated with exchange. This approach begins with Menger's (1892) examination of the origins of money whereby the adoption of a particular commodity as money is explained by the characteristic of "saleability". A commodity gets adopted as money because it economizes on resources used in effecting exchange, thereby making agents better off. Niehans (1971) presents a general equilibrium model in

³. An anonymous referee noted that though money can be introduced into the GE model, doing so requires the introduction of frictions. Such frictions are a somewhat arbitrary procedure considered by the standards of pure theory of the Arrow - Debreu model of perfect markets. Moreover, these approaches only work for limited aspects of money - principally, the medium of exchange function.

this spirit in which different commodities have different transactions costs, and the commodity with the lowest transactions costs is adopted as money. King and Plosser (1986) present a similar model in which money lowers the cost of trade, thereby enabling agents to enjoy the benefits of specialization in production. In effect, the gains from specialization underwrite the costs of trade. The selection of a commodity as money involves balancing the commodities ability to facilitate low cost transacting against the opportunity cost of having the commodity tied up as money rather than being used for consumption or production. Finally, Kiyotaki and Wright (1992) present a search theoretic account of the adoption of money in which money lowers the costs of searching out trading partners, and different commodities have different search characteristics. The important feature of these competitive general equilibrium accounts of money is that a commodity is endogenously selected as money on the basis of its ability to facilitate exchange at low cost. What constitutes money is therefore endogenous.

Selgin and White (1987) extend this neo-classical choice theoretic approach to a dynamic context, and show how money endogenously evolves from commodity money to fiat money and inside money. The force behind this evolution is the profit motive, which sets up incentives to economize on the amount of money sitting in idle stores. Money evolves endogenously, and the adoption of commodity money is just the first step in an on-going process of financial innovation. Thus, monetization of an economy is endogenous, as is the changing form of money.

(b) Neo-classical quantitative endogenous money

The selection of the form of money is one source of endogeneity in the competitive general equilibrium model. The determination of the quantity of money is a second source of endogeneity. This can be illustrated by reference to a gold standard economy in which the total stock of gold is given at any moment in time, but its allocation between monetary and non-monetary uses is endogenously determined by balancing the

opportunity cost of having gold tied up as money against the interest rate that can be earned by placing gold on deposit with a bank.

This process of endogenously determining the allocation of the gold stock can be described by the following three equation system:

$$\begin{aligned}
 (1) \quad G &= G^N(i, y, 1/P) + G^M(i, y, 1/P) && \text{[Allocation of gold stock]} \\
 (2) \quad G^M(i, y) &= G^B && \text{[Banking sector equilibrium]} \\
 (3) \quad G^B &= kPL(i, y) && \text{[Bank demand for gold]}
 \end{aligned}$$

where G = total stock of gold G^N = non-monetary demand for gold
 G^M = gold deposits with the banking system
 G^B = banking systems demand for gold i = interest rate
 y = level of income P = general price level
 k = fiduciary ratio L = demand for money balances

Signs above functional arguments represent signs of partial derivatives. Equation (1) ensures that the total gold stock is allocated between monetary and non-monetary uses. Equation (2) ensures that the banking system's demand for gold equals the supply of gold available to the banking system. Equation (3) determines the banking systems demand for gold which is proportional to the demand for inside money. The non-monetary demand for gold depends negatively on the interest rate, positively on income, and negatively on the relative price of gold compared to commodities. The price of gold is fixed at unity.

Substituting (2) and (3) into (1) then yields a gold standard LM schedule given by
(4) $G = G^N(i, y, 1/P) + kPL(i, y)$

The gold standard exhibits "static endogeneity". Changes in variables affecting either the level of income or interest rates will affect the allocation of gold between monetary and non-monetary uses, thereby affecting the money supply.⁴ This allocational endogeneity has parallels with Keynesian - circuit monetary theory which is examined below.⁵

⁴.This model is capable of explaining the famous Gibson paradox which links interest rates to the price level. This can be done by adding an IS schedule and a positively sloped marginal cost curve given by

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In addition to exhibiting static monetary endogeneity, the gold standard exhibits dynamic monetary endogeneity. This is because the supply of gold can respond endogenously over time. Such dynamic endogeneity can be incorporated by adding the following equation

$$(5) MC(dG) = 1/P$$

where MC_G = real marginal cost of producing gold, and dG = within period addition to the gold supply. Gold producers mine new gold until the marginal cost of production equals the price of gold. This ability to "produce" new money has a parallel in contemporary new classical real business cycle theory which is examined below.

In sum, the neo-classical general equilibrium paradigm is normally viewed as having exogenous money. In fact, it has its own forms of endogenous money. First, what serves as money is endogenously determined. Second, the allocation of the commodity serving as money (e.g. gold) between monetary and non-monetary uses is endogenously determined. Third, the quantity of the commodity serving as money is subject to endogenous influence.

(c) Fusions of evolutionary and neo-classical quantitative endogeneity

Neo-classical New Monetary Economics (NME) can be interpreted as fusing evolutionary and quantitative endogeneity.⁶ According to NME, existing monetary arrangements are predicated on the artefact of legal restrictions regarding the medium of

$$(4') y = y(i, G)$$

+

$$(4'') P = MC(y)$$

Positive IS shocks now cause a rightward shift along the LM which raises interest rates and output. At the same time prices rise.

⁵. This gold standard model can also be rendered compatible with Post Keynesian credit driven endogenous money by allowing the money supply to be determined by bank lending. In this event, increases in loan demand would increase the supply of deposits which would increase banks' demand for monetary gold, thereby causing interest rates to rise.

⁶. The legal restrictions theory of money is developed by Bryant and Wallace (1980).

payment for taxes. Absent this legal privileging of government issued money, competitive markets would generate pure private monetary arrangements under which both the means of payment and its quantity would be endogenous. For instance, Black (1970) and Fama (1980) consider the economics of a completely unregulated banking system in which banks are a form of mutual fund providing deposits backed by holdings of real assets. This leads to the notion of mutual fund money. The standard of value is shared by all, but the means of payment is title to real claims, and bank settlements involve transfers of titles between banks.

Such competitive unregulated banking systems resemble Wicksell's (1898) pure credit economy, and they seem to suffer from many of the same problems (Trautwein, 1997). The essential problem is that the price level can be explosive owing to unlimited bank lending that expands the nominal money supply. Wicksell (1898) dealt with this by recourse to the assumption of cash drains, but this re-equilibrating tendency is not based on the properties of a pure credit economy since cash is not used. In NME models, prevention of an exploding price level seems to require 100% reserve requirements whereby all deposits are always fully backed by real assets, thereby precluding bank expansion of credit. However, even this may not be enough since an asset bubble driven by expectations could drive up the value of mutual fund money, thereby driving up the price of output and reinforcing the bubble.

Hicks (1989) also developed a theory of endogenous money embedding evolutionary and quantitative endogeneity. He envisages monetary arrangements as evolving toward Wicksell's pure credit economy, with non-interest bearing money ceasing to be a reserve asset and all money becoming just a debt. His resolution of the excessive lending - price indeterminacy problem rests on lack of sufficient trustworthy borrowers. This means that there could even be a shortage of investment relative to savings - the exact opposite of the Wicksell's problem. Such a shortage could result in deflationary pressures, which in a credit economy would generate instability through Fisher (1933) style debt deflations.

These speculations about the operation and stability of endogenous money pure credit economies suggest the possibility of a convergence with the Post Keynesian approach. However, there are significant impediments to such a convergence. First, Post Keynesians (Davidson, 1978), emphasize the demand for liquid stable value assets, and this feature is absent in pure credit economies which raises doubts about their analytic relevance.⁷ Second, within Wicksell - NME pure credit economies the equilibrium real interest rate is determined by the fundamentals of tastes, technologies, and endowments. Amongst Post Keynesians the issue is more open. Accommodationists maintain that the real interest rate is determined by central banks and behavioral conventions. Structuralists see it as being influenced by both of these factors, and also impacted by structural factors including the state of the real economy and the state of financial intermediary balance sheets. Third, in Wicksell - NME pure credit economies the level and growth of equilibrium output are again determined by fundamentals (tastes, technologies, and endowments), whereas Post Keynesians see an independent place for the level and growth of aggregate demand - both of which may be impacted by monetary arrangements.

(d) Central bank endogeneity

The behavior of central banks in response to economic developments generates a completely different form of endogeneity. Within macro models this form of endogeneity is captured in the central bank's policy response function. There is a substantial literature on this subject, initiated by Poole (1970), examining the question of optimal monetary stabilization policy.⁸ The core question is whether the monetary authority should target interest rates, the money supply, or some combination of the two. Poole's (1970) model

⁷. Palley (2000) examines the implications of the e-money revolution which may open the way to a financial system that more closely resembles a pure credit economy. In such an economy there stands to be greatly heightened financial instability owing to the increased elasticity of private credit money production, combined with periodic liquidity crises generated by runs out of bank e-mutual fund money into central bank money.

⁸. This literature is surveyed in Friedman (1990).

has the monetary authority directly controlling the money supply. In more sophisticated models (Friedman, 1974) the monetary authority lacks direct control over the money supply, and instead influences it indirectly through control over the monetary base.

Central bank reactions fuse concerns of "endogeneity" with those of "controllability". The money supply may be endogenous through the central banks response function **and** perfectly controllable. Alternatively, it may be endogenous **and** imperfectly controllable. In the former case, endogeneity is exclusively the product of the central bank's response function. In the latter case, endogeneity is partly autonomous, reflecting money supply disturbances generated from within the economy and outside of central bank control.

The Post Keynesian theory of credit driven endogeneity is not intended to be a theory of central bank endogeneity. Yet paradoxically, in accommodationist accounts it is the central bank's response function (i.e. the willingness to accommodate increased demand for reserves at an unchanged interest rate) that is the mechanism enabling the banking system to support expanded bank lending. This contrasts with the structuralist account in which the key mechanism is banks' asset and liability management activities, and the central bank's response function serves as an additional enabling mechanism.⁹

Why does the central bank accommodate monetary disturbances? Neo-Keynesian optimal stabilization theory maintains that it does so voluntarily for purposes of optimally stabilizing the economy. Post Keynesian accommodationists argue that accommodation is "institutionally" forced by the existence of loan commitments. However, the existence of such commitments does not mean that they are necessarily exercised. Though banks make promises to lend, the rate at which they lend remains variable and market determined. Interest rates can therefore rise and induce agents not to exercise their loan commitments, so that higher interest rates represents a means of *de facto* extinguishing loan commitments. Consequently, lines of credit do not imply a horizontal money supply.

⁹. The significance of the central bank's reaction function for the process of accommodation is explored in Palley (199a).

Another explanation of central bank accommodation can be labelled "political endogeneity". Here, the reasoning is that central banks must accommodate the increase in deposits caused by increased bank lending, or else the banking system will be rendered insolvent and collapse as banks will be unable to obtain the needed reserves. This claim introduces issues of expectations about policy, time consistency, and credibility. The extent to which central banks have no choice will depend on the policy regime, and on the expectations of financial institutions (FIs). If FIs believe that the existing regime is lax, then they will structure their lending behaviors and balance sheets on the basis that the central bank will accommodate. Under these conditions, refusal to accommodate could lead to collapse. However, if FIs believe the regime is tight, they will structure their activities accordingly and maintain access to liquidity. Consequently, the system will be less vulnerable to non-accommodation. In sum, central banks do have a choice, but that choice depends on signals sent about the policy regime and the degree to which these signals are credible.

(e) Fiscal endogeneity

Another form of endogeneity can be labelled "fiscal endogeneity". It emphasizes the government budget constraint and the fact that government deficits/surpluses have implications for asset stocks. These features are emphasized by Christ (1968) and Blinder and Solow (1973). The government budget constraint is given by

$$(6) D = G - T + iB = dB + dM$$

where D = deficit or surplus, G = government spending, T = tax revenues, i = interest rate, B = national debt, dB = change in national debt, and dM = change in monetary base. To the extent that deficits are money financed, they increase the money supply.

Kaldor (1970) emphasized this fiscal endogeneity in his initial critique of monetarism.¹⁰ Monetarists argue that money is all that matters, and that fiscal policy is

¹⁰. Kaldor (1980, footnote p.307) distanced himself from the idea that the government budget constraint was important for explaining money supply endogeneity.

irrelevant. Kaldor argued that the apparent statistical significance of money reflected the operation of the government budget constraint, with increased money supplies being the result of money financed government spending. Tobin (1970) also emphasized the role of the government budget constraint in rejecting monetarist claims about the importance of money predicated on leads and lags in money growth.

Consideration of the link between the government budget constraint and the money supply also compels consideration of central bank governance. To the extent that central banks are independent, governments lack direct control over the money supply and must in the first instance finance deficits exclusively with bonds. Thereafter, the money supply changes only if the central bank decides to accommodate the deficit, but this is a matter of central bank policy.

(f) The money multiplier and portfolio endogeneity

Conventional textbook accounts of money supply determination rest on money multiplier theory. The money multiplier approach embodies "portfolio endogeneity" whereby the money supply depends on agents' portfolio preferences for money relative to other assets. The magnitude of the multiplier depends on the mix of assets held, and the multiplier is endogenous to the extent that asset demands vary in response to interest rate and income changes. Thus, higher interest rates induce agents to economize on liquidity, causing both the money multiplier and the money supply increase.

Changes in the money multiplier arise from changes in the composition of portfolios. In this regard there are two sets of portfolios -- those of the non-bank public and those of banks. The non-bank public consists of households and non-bank firms, both of which demand cash, checkable deposits, and time deposits. Variations in these demands are the traditional focus of money multiplier analysis. Banks also demand liquidity in the form of excess reserves, so that changes in bank preferences also affect the money multiplier.

These portfolio composition effects are an integral part of the Post Keynesian structuralist approach to the money supply. They provide a mechanism whereby banks

are able to generate additional liquidity to support deposits created by increased bank lending. Bank asset and liability management activities are central. Banks vary their own portfolio demands (asset management), and induce variations in the portfolio demands of the non-bank public (liability management). Together, these variations allow banks to accommodate increased lending independent of the monetary authority's stance.

(g) Post Keynesian endogenous credit money

The neo-Keynesian money multiplier emphasizes changes in the composition of agents' portfolios, but makes no mention of the lending activities of banks. Contrastingly, emphasis on bank lending is the distinguishing hallmark of the Post Keynesian approach to endogenous money. Post Keynesians maintain that bank lending creates deposits once loans are credited to borrowers' accounts, and this shifts attention toward the asset side of bank balance sheets. This credit driven approach to the money supply is captured in Coghlan's (1978) reformulation of the money multiplier in terms of a loan multiplier.¹¹

However, having identified the significance of bank lending for the money supply, Post Keynesians divide over the process by which deposits created by lending are supported. Accommodationists assert that bank asset and liability management is irrelevant, and the central bank automatically provides whatever liquidity is provided (Moore, 1988).¹² Structuralists maintain that bank asset and liability management is important, that there is no necessary requirement for the central bank to provide liquidity, and the process by which the central bank injects liquidity into the system also matters

¹¹. A simplified banking sector balance sheet is given by
Loans (L) + Excess Reserves (eD) + Required Reserves (kD) = Deposits.
Collecting terms yields $D = L/[1 - e - k]$. The quantity of deposits is therefore a multiple of the level of bank lending.

¹². In recent years there seems to have been a blurring of this distinction with accommodationists claiming that bank asset and liability management is part of their understanding of the accommodation process. Yet, as Tobin (1963) makes clear, agents have limited demands for the liabilities offered by banks. This means that banks will have to pay agents more to induce them to increase their holdings, and loan rates will therefore rise as banks asset and liability management to accommodate increased lending.

(Palley, 1996b). Though not the original intent of the theory of endogenous money, these differences have contributed to making the microeconomics of the banking firm the focus of the Post Keynesian debate.

(h) Financial intermediary supply-side endogeneity.

The emphasis on the asset and liability management of the banking firm means that banks are important for understanding the endogeneity of money. Both the neo-Keynesian money multiplier and the Post Keynesian credit money approaches emphasize the banking firm. In both instances, the focus is on bank balance sheets. The former emphasizes the liabilities side, while the latter also takes account of the asset side.

Modern neo-classical real business cycle models with inside money (King and Plosser, 1984) also allow for endogenous money, and they too emphasize the banking firm. However, these models focus on the banking firm's production function rather than its balance sheet. Real business cycle models emphasize production and supply-side considerations. Banking firms produce financial intermediation, and in doing so create inside money balances. Banking firms use resources to accomplish intermediation, and they have convex cost functions which limit the extent of intermediation. Positive business cycle shocks induce them to undertake more intermediation, and this causes the money supply to move pro-cyclically. The money supply is again endogenous, but now it depends on factors affecting the demand for and supply of banking firm intermediation services. Of particular import is the degree of convexity of the banking firm's marginal cost function, and a sharply rising cost function limits the extent of endogeneity.

(i) Endogenous money and the sectoral distribution of money.

Another take on the endogeneity of money focuses on the distribution of money holdings within the economy. In his Treatise on Money, Keynes (1930) distinguished between the real and financial circuits of money. In the former, money circulates in the course of paying for purchases of goods and services: in the latter, money circulates in the course of paying for asset purchases, as well as sitting as an idle store of wealth.

Within Keynes' twin circuit economy, the total supply of money was fixed but its allocation to sectors was endogenous. This construction resembles the model of the gold standard described earlier. There, the gold stock was allocated between monetary and non-monetary uses: now, the money stock is allocated between the real and financial circuit.

This twin circuit construction of the economy becomes important when merged with the notion of demand determined output. In the Treatise on Money the level of output was fixed, so that the allocation of the money stock merely affected the price level and asset prices. However, when output is endogenous as in The General Theory, the allocation of the money stock affects the capacity of the system to support economic activity. Increases in the level of output in the real sector can be supported by re-allocating money from the financial sector, and this re-allocation is brought about by increases in interest rates (Rousseas, 1994; Palley, 1998). Such a twin circuits model can be described as follows

$$(7.1) L^d(i, y) = L_F(i, y) + L_R(y)$$

where L_F = financial sector money demand, and L_R = real sector money demand. Increased income raises money demand and interest rates, and higher interest rates release money from the financial circuit. Consequently, higher real activity can be supported even if the money supply is fixed.

In The General Theory, Keynes (1936) discarded the twin circuits approach of The Treatise. In its place, he introduced distinctions between the income motive, the business motive, the precautionary motive, and the speculative motive (GT, p.195-6). Denoting transactions - precautionary demands as L_1 , and the speculative demand as L_2 , total money demand is given by

$$(7.2) L^d(i, y) = L_1(y) + L_2(i)$$

where y = income and i = the nominal interest rate. Now, money is allocated by type of money demand. Analytically, the economic implications remain the same, only now it is changes in the portfolio composition of money that allows the system to support increased real economic activity. This portfolio story of The General Theory constitutes the beginning of money multiplier endogeneity. Modern accounts have introduced multiple margins of portfolio shift, as well as a distinction between portfolios of banks and the non-bank public.

(j) Open economy endogeneity

A final source of endogenous money is the open economy. The earliest form of open economy endogenous money is Hume's specie flow account of the gold standard which has gold flowing out of a countries with trade deficits to countries with trade surpluses. This lowers the money supply and price level in countries losing gold, and raises the money supply and price level in countries gaining gold. These relative price adjustments then restore balance of payments equilibrium. This economic logic is also at the foundation of what has become known as global monetarism (see Whitman, 1975).

A second approach to open economy endogenous money is the ISLM Fleming (1962) - Mundell (1968) model with fixed exchange rates. Departures of the domestic interest rate from the world interest rate result in international capital flows that the domestic monetary authority must offset to maintain the fixed exchange rate. Consequently the domestic money supply is endogenous. Consider a positive shock to consumption spending which shifts the IS right, causing incipient upward pressure on domestic interest rates. This attracts foreign capital inflows that put upward pressure on the exchange rate. To maintain the fixed exchange rate, the monetary authority is forced to sell domestic currency, thereby increasing the domestic money supply.

In flexible exchange rate regimes there is no need for intervention. Consequently, open economy influences on the money supply work through standard Post Keynesian private sector lending channels. Thus, a positive shock to export demand improves the

investment climate in export-oriented industries. Exporting firms increase borrowing to finance investment, which increases the domestic money supply.

THE MACROECONOMICS OF ENDOGENOUS MONEY

The previous section described the wide range of approaches to endogenous money. This included evolutionary endogeneity, central bank endogeneity, fiscal endogeneity, money multiplier portfolio endogeneity, credit money endogeneity, financial intermediary supply-side endogeneity, monetary circuit endogeneity, and open economy endogeneity. This section addresses the macroeconomic implications.

Post Keynesian endogenous money and ISLM old Keynesianism

The ISLM model has long served as the canonical model of macroeconomic analysis. Classical monetarism is identified most closely with the doctrine of exogenous money. In an ISLM framework, it is described by the following equations:

$$(8) \quad y = D(i, y) \quad \text{[IS schedule]}$$

$$(9) \quad L^s = ky \quad k > 0 \quad \text{[LM schedule]}$$

where y = income, D = aggregate demand, i = interest rate, and L^s = real money supply. Signs above functional arguments represent signs of partial derivatives. Figure 1 shows this system of equations in $[y, i]$ space. The IS is negatively sloped, while the LM is vertical. The important feature is that the money supply is fixed, and there is no substitutability regarding money demand. Consequently, there is a binding monetary constraint on economic activity which cannot be escaped.¹³

Replacing equation (9) with Keynes' General Theory construction of money demand yields the following system:

$$(8) \quad y = D(i, y) \quad \text{[IS schedule]}$$

$$(9.1) \quad L^s = L_1(y) + L_2(i) = L^d(i, y) \quad \text{[LM schedule]}$$

¹³. Price deflation which expands the real money supply provides the one avenue for the system to endogenously escape the monetary constraint. However, this avenue is predicated on the absence of negative debt effects. This issue is discussed subsequently.

Figure 2 shows this system of equations in $[y, i]$ space. The only change from Figure 1 is that the LM schedule is positively sloped. The significance of this is that the financial system can accommodate an increase in the demand for money caused by an increase in the level of economic activity. Expansionary shifts of the IS are no longer fully crowded-out. In effect, speculative balances serve as a form of quasi-endogenous money. When transactions needs rise, rising interest rates induce wealth holders to release part of their speculative balances to meet these needs. Note exactly the same outcome holds if money demand is described in terms of a twin circuits approach, as described by equation (7.1).

If the money supply is allowed to respond endogenously to the level of interest rates as per the money multiplier story, the benchmark model becomes

$$(8) \begin{matrix} - & + \\ y = D(i, y) & \end{matrix} \quad \text{[IS schedule]}$$

$$(9.2) \begin{matrix} + \\ L^s(i) = ky & \end{matrix} \quad \text{[LM schedule]}$$

Once again the LM schedule is positively sloped in $[y, i]$ space, and the graphical representation of the model is exactly as in Figure 2. The qualitative properties of this model are identical to those of the standard model. This is because an increase in the money supply is isomorphic with a decrease in money demand: having the money supply increase in response to rising interest rates has the same qualitative effects as having money demand decrease.

If (9.1) and (9.2) are combined, the benchmark model becomes

$$(8) \begin{matrix} - & + \\ y = D(i, y) & \end{matrix} \quad \text{[IS schedule]}$$

$$(9.3) \begin{matrix} + & - & + \\ L^s(i) = L^d(i, y) & \end{matrix} \quad \text{[LM schedule]}$$

The money supply function and Keynesian money demand function both serve to flatten the LM schedule. Were this the sum contribution of endogenous money, it would add little to the analytics of the benchmark neo-Keynesian macro model.

Thus far, endogenous money has been characterized as flattening the LM schedule, but the IS and LM schedules have remained independent of each other. In a monetary economy transactions in the real sector always have a financial counterpart, which means that the IS and LM schedules will tend to co-move. Davidson (1965) presents an ISLM model that has this feature. The important innovation is that money demand is now scaled by consumption and investment spending rather than income, reflecting a

$$(9.4) L^s = L^d(i, C, I) \quad \text{[LM schedule]}$$

$$(10) C = C(i, y, A_1) \quad \text{[Consumption function]}$$

$$(11) I = I(i, A_2) \quad \text{[Investment function]}$$

where C = consumption spending, I = investment spending, A_1 = shock to consumption, and A_2 = shock to investment. The IS and LM schedules have the conventional slopes in $[y, i]$ space, but shocks to consumption and investment spending which shift the IS schedule also impact money demand and shift the LM schedule. Positive expenditure shocks therefore shift the IS right, and the LM left. Interest rates rise unambiguously, but the effect on income is ambiguous.

The significant contribution of Davidson's model is that it structurally links movements in the IS and LM schedules. In doing so, it addresses Robertson's (1940) loanable funds critique of the liquidity preference theory of interest rate determination. Now, decreases in thrift and increases in the marginal efficiency of investment both have an immediate positive effect on interest rates. However, Davidson's model also increases the extent of crowding-out, and increases in consumption and investment spending can lower output if the induced increase in money demand is sufficiently large.

Analytically, Davidson's finance motive construction represents an early middle ground between the ISLM neo-Keynesian approach to money which emphasized a "money to hold" perspective and the new credit approach which emphasizes a "money to

spend” perspective.¹⁴ This bridge can be further improved by making the money supply endogenous, thereby reflecting the impact on the money supply of bank lending to finance spending. This can be done by having the money supply depend on consumption and investment, and the model becomes:

$$\begin{array}{ll}
 \begin{array}{c} - \quad + \\ (8) \quad y = D(i, y) \end{array} & \text{[IS schedule]} \\
 \begin{array}{c} + \quad + \quad + \quad - \quad + \quad + \\ (9.5) \quad L^s(i, C, I) = L^d(i, C, I) \end{array} & \text{[LM schedule]} \\
 \begin{array}{c} - \quad + \quad - \\ (10) \quad C = C(i, y, A_1) \end{array} & \text{[Consumption function]} \\
 \begin{array}{c} - \quad + \\ (11) \quad I = I(i, A_2) \end{array} & \text{[Investment function]}
 \end{array}$$

The slope of the IS schedule is unchanged, but the LM is flatter. Moreover, the comparative statics are also altered. In the Davidson model, positive shocks to consumption and investment spending increase money demand, and cause the LM to shift upward. Now, such shocks also cause the money supply to increase. Thus, the upward shift of the LM schedule is diminished.¹⁵

The macro model suggests that the LM schedule could even shift down if the increase in the money supply were sufficiently large. However, this would be inconsistent with the microeconomic account of endogenous money. According to that account, increased bank lending to finance consumption and investment spending leads to the creation of deposits. The banking system needs liquidity to back these deposits, and must engage in asset and liability management to accomplish this. These measures rely on higher interest rates, which means that the LM cannot shift down. Thus, the microeconomic logic of endogenous money constrains the macroeconomic possibilities.

¹⁴. The distinction between “money to hold” and “money to spend” is drawn from Trautwein (2000).

¹⁵. This augmented version of Davidson’s (1965) model has resemblances with Bernanke and Blinder’s (1988) new Keynesian model of the credit transmission framework. The endogeneity of the money supply reflects the effects of lending on the money supply, and lending is also assumed to positively impact the IS. In the Bernanke and Blinder model the effects of lending are restricted to the credit market.

The link between Post Keynesian endogenous money and new Keynesian economics

Attempts to place endogenous money within the old Keynesian ISLM framework involve tinkering with the specification of the LM schedule. However, the heart of endogenous money - at least for Post Keynesians - involves recognizing the link with bank lending. This suggests explicitly modeling the credit market.

Bernanke and Blinder (1988) do this, and provide a tractable macro model in which the IS schedule is replaced by a CC schedule (commodities and credit) which embeds equilibrium in both the goods and credit markets. This model has become labeled as “new Keynesian,” but analytically it parallels Post Keynesian structuralist models as developed by Palley (1987, 1994a).¹⁶ The big representational difference is that Bernanke and Blinder rely on the “black box” of the money and loan multipliers to endogenize the money supply, whereas structuralist models open the black box and explain it in terms of the profit maximizing asset and liability management actions of banks.

The financial side of the Bernanke - Blinder (1988) model is given by

$$(12.a) \overset{-}{D}(i_B, y) = \overset{+}{m_D}(i_B)R$$

$$(12.b) \overset{-}{L}(i_L, i_B, y) = \overset{++}{m_L}(i_L, i_B)\overset{-}{D}(i_B, y)[1 - k]$$

where $D(\cdot)$ = demand for bank deposits, $L(\cdot)$ = demand for loans, m_D = money multiplier, m_L = loan multiplier, R = monetary base, i_B = bond interest rate, i_L = loan interest rate, and k = reserve requirement ratio. Equation (12.a) is the money market equilibrium condition, while (12.b) is the credit market equilibrium condition. Substituting (12.a) into (12.b) yields

¹⁶. The analytic equivalence of the models can be seen through the number of market equilibrium conditions. Both have a goods market, a money market, a credit market, and a bond market. Walras’ law allows for dropping one market equilibrium condition, and both drop the bond market. The Bernanke and Blinder (1988) commodities - credit (CC) schedule is obtained by substituting the credit market equilibrium condition into the goods market equilibrium condition. Palley (1987) also allows for credit market shocks to directly impact the goods market in the spirit of Davidson (1965).

$$(12.c) L(.) = m_L(.)m_D(.)R[1 - k]$$

The amount of bank lending is therefore determined by multiplicative interaction of the loan and money multipliers. Higher interest rates raise both multipliers, thereby increasing the quantity of bank liabilities and assets. Increased loan demand is accommodated by a rise in interest rates, which increases the loan and money multipliers, thereby enabling financial intermediaries to meet higher loan demand.

This process is identical to that described in micro-founded Post Keynesian structuralist models. In effect, the money multiplier (m_D) performs the role of bank “liability” management, while the loan multiplier (m_L) performs the role of bank “asset” management. The benefit of a micro-founded approach is that it explicitly accounts for these multiplier responses in terms of maximizing behavior by financial intermediaries.¹⁷ A rise in loan demand drives up loan market interest rates, inducing financial firms to shift out of bonds into loans (asset management), which drives up bond rates. Firms also raise rates paid on deposits to attract funds (liability management). These adjustments to the asset and liability positions of financial firms are connected by first order conditions requiring that the marginal cost of funds equal the marginal return to funds, that the marginal cost of different sources of funds be equal, and that the marginal return to different applications of funds also be equal.¹⁸ Profit maximizing behavior drives financial firms to equalize marginal costs and returns across different financial markets. It

¹⁷. Trautwein (2000) speculates whether it is banks or financial intermediaries that matter for endogenous money, and comes to the conclusion that it is financial intermediaries - - “Banks should rather serve as a metaphor for all financial institutions that have the power to create assets of a high degree of liquidity (liabilities on their balance sheets. (P.181)”. This is a conclusion that I strongly agree with. The important analytic insight of endogenous money is it reveals how financial intermediaries can circumvent financial constraints on economic activity imposed by monetary authorities. With the decline of traditional banking it is time to move beyond endogenous money and start talking of endogenous finance (Palley, 1996c).

¹⁸. In a sense, banks and financial firms are multi-input - multi-output firms. On the input side they can draw funds from different sources - demand deposits, time deposits, commercial paper issues, etc. On the output side they can allocate their funds through loans to different types of borrower or they can hold government bonds, etc.

is this behavior that enables the financial sector to accommodate increases in credit demand, explains the movement of loan and deposit multipliers, and explains why the inside money supply responds positively to loan demand shocks. The bottom line is that the Bernanke - Blinder (1988) new Keynesian construction of the money - credit nexus is the same as the Post Keynesian structuralist perspective.¹⁹

Implications for dynamic macroeconomics

Viewed from the vantage of static old Keynesian macroeconomics, the debate over endogenous money has a tendency to reduce to a debate over the slope of the LM.²⁰ However, endogenous money also has implications for dynamic macroeconomics, and this stands to be a fruitful area for future research.

Recall the ISLM construction of classical monetarism given by equations (8) and (9). Under that construction the only way for real economic activity to escape the monetary constraint is through price deflation. This raises the real money supply and shifts the LM schedule right. However, the view that price deflation can loosen the financial constraint is predicated on exogenous money and the absence of negative debt effects. Once money is viewed as endogenous and created through the process of lending - as is the case for the Post Keynesian approach - then deflation can lower economic activity through its impact on debt burdens. Endogenous money, with its concomitant recognition of debt, therefore provides an answer to the long standing debate in macroeconomics as to whether market economies are self-equilibrating and Keynesian unemployment is just a special case predicated on downward nominal wage rigidity.

¹⁹. New Keynesian microeconomic models of credit rationing (for instance Stiglitz and Weiss, 1981) appear perfectly compatible with the Post Keynesian perspective on endogenous money. Within existing Post Keynesian models bank lending is limited by the demand for loans at the market equilibrium interest rate. Given imperfect information, lending could be further restricted by banks' willingness to lend for fear of defaults, and loan rates would also be altered so as to reflect costs associated with default.

²⁰. This renders the issue of endogenous money reminiscent of the earlier debate between neo-Keynesians and monetarists (Tobin, 1974).

For Post Keynesians, endogenous money inevitably leads to the Fisher debt effect (Fisher, 1933) which explains why price and nominal wage reductions cannot remedy a deficiency of aggregate demand. There are several reasons why price deflation may reduce output and employment. First, price deflation makes creditors wealthier at the expense of debtors by raising the real value of nominal debts and debt service burdens, and this reduces aggregate demand if creditors have a lower propensity to consume than debtors (Tobin, 1980; Caskey and Fazzari, 1987, Palley, 1999). Second, deflationary price expectations lower investment by giving agents an incentive to switch into money away from real capital (Tobin, 1975). Third, deflation may also raise real interest rates owing to the existence of nominal interest rates floors (Krugman, 2000), and owing to increased risk of bankruptcy which raises credit risk (Palley, 2000). Fourth, in a world where production takes time and firms incur costs before they realize revenues, deflation may make it impossible for firms to recover their costs so that they reduce production (Palley, 1997b). Fifth, deflation may push highly leveraged firms into bankruptcy. Not only does this lower output immediately, it also destroys borrower - lender information which restricts productive lending (Bernanke, 1983; Stiglitz, 1992; Calomiris, 1993).

The Post Keynesian construction of endogenous money helps explain how debt gets into the economic system. The theory of endogenous money also contributes to providing a financial theory of the business cycle. The Fisher debt effect is a “stock” effect. When it comes to explaining the business cycle, it is changing "flows" of inside debt that matter. These flows matter for the determination of AD, and it is here that the theory of endogenous money makes an original contribution to macroeconomics. Palley (1994b) presents a credit driven model of the business cycle in which debt is a two edged sword. Increases in debt initially raise aggregate demand, but subsequent debt service payments lower aggregate demand. A business cycle emerges because loan expenditures raise income, which in turn generates fresh borrowing that further stimulates the economy. However, debt service payments are contractionary and eventually come to dominate the

expansionary impact of new lending flows. This causes the cycle to turn, triggering a period of contraction in which income falls and borrowings are repaid.²¹

This debt driven model of the business cycle can be expanded to include the effects of endogenous money (Palley, 1997b). The key extension is the recognition that bank lending creates money. The newly created money balances circulate as part of the flow of money income and raise aggregate demand as long as the loans remain in circulation. The fact that bank lending creates new money distinguishes it from bond market lending (loanable funds lending). The latter involves a transfer of money balances from lender to borrower, whereas the former involves the creation of new money balances. For this reason, bank lending is more expansionary than bond market lending.

The above Post Keynesian models of the business cycle can be compared to new Keynesian credit-driven business cycle models as developed by Kiyotaki and Moore (1997) and Bernanke, Gertler, and Gilchrist (1996). There are similarities and differences. Within new Keynesian models collateral requirements play a critical role, protecting lenders against asymmetric information and moral hazard. This re-focuses the monetary transmission mechanism away from the traditional cost of capital channel to asset prices and collateral values. Changes in interest rates or productivity shocks both impact asset prices and collateral values, which then affect firms' abilities to borrow to finance production.

In these new Keynesian models credit impacts economic activity through the supply-side.²² Output is supply determined, and credit matters because it allows firms to finance increased supply. In the Kiyotaki and Moore model lower asset prices tighten credit constraints, which lowers capital investment and next period production, which then

²¹. The model can be given Minskyian (Minsky, 1982) features by having the allowable debt to income ratio fluctuate with the cycle. Thus, lenders raise debt ceilings when income is growing, and they lower them when income is falling. This lengthens the cycle and increases its amplitude.

²². This feature of new Keynesianism has led Davidson (1992) to question whether Keynes would have been a new Keynesian.

tightens next period's credit constraint. When placed in a context with capital depreciation, this can generate cycles. Borrowing to finance investment raises debt burdens which restricts ability to invest, and if depreciation outweighs gross investment, the capital stock falls. This then lowers next period production and borrowing capacity, thereby triggering a period of contraction.

The similarity between Post Keynesian and new Keynesian models concerns the two edged nature of debt. Borrowing finances economic expansion, but it also generates debt burdens that contract activity. The big difference between the two approaches concerns output determination. In new Keynesian models output is supply-driven. In Post Keynesian models it is demand driven. This difference has implications for how debt burdens cause cyclical expansions to end. In the Kiyotaki - Moore (1997) model capital depreciation is critical, and the cycle peaks when depreciation comes to outweigh the debt constrained level of investment. In Palley (1994, 1997) it is differences in the marginal propensity to consume between creditors and debtors. Debt burdens are contractionary because they transfer income from debtors to creditors, and the expansion ends because the growing transfer of income outweighs the expansionary impact of new borrowing.

Another difference is the new Keynesian emphasis on the asset price - collateral - investment channel. However, this channel can be readily and sensibly incorporated in the Post Keynesian framework. Thus, let investment spending be the minimum of desired spending and unused borrowing plus free cash flow

$$(13) I_t = \text{Min}[I_t^*, D_t^* - D_{t-1} + FC_t]$$

where I_t = actual investment spending, I_t^* = desired investment spending, D_t^* = firms' debt ceiling, D_{t-1} = firms' last period debt, and FC_t = free cash flow. Free cash flow is given by

$$(14) FC_t = y_{t-1} - iD_{t-1}$$

Corporate debt ceilings can then be specified as multiple of business collateral

$$(15) D_t^* = aW_t \quad a > 0$$

where W_t = value of firms' collateral. Lastly, the value of collateral can be made a function of lagged, current, or expected output. Given this, the new Keynesian financial accelerator can be readily incorporated in the Post Keynesian multiplier-accelerator model of credit driven business cycles. If asset prices are a function of expected output, this allows for Minsky (1982) style asset bubbles and manias that have real effects.

Finally, the theory of endogenous money may also prove relevant for the theory of economic growth - though this is a conjecture. Keynesian growth theory emphasizes the interaction of demand growth and supply growth, with the rate of demand growth exercising an independent influence on the rate of growth of supply (Palley, 1996a). If the rate of growth of demand depends on the rate of growth of lending, then credit and endogenous money become relevant to the theory of economic growth. Faster loan growth leads to faster demand growth, which leads to greater investment and faster output growth. It is the endogeneity of money - the means of payment - that enables demand to lead output. Not only does this provide an incentive to invest, but it also avoids the damaging effects of deflation (discussed earlier) which would ensue if productivity grew but nominal demand were fixed.

This suggested role of endogenous money in the growth process contrasts with existing constructions of the role of money and finance in growth. It is different from Tobin's (1965) neo-classical monetary growth models which emphasizes the impact of money on inflation, and the incentive inflation generates for portfolio substitutions toward capital. It also differs from Schumpeter's (1911) construction of finance and growth which emphasizes the allocative role of financial intermediaries in getting resources to entrepreneurs.

CONCLUSION

This paper has catalogued the many sources of endogenous money. The Post Keynesian approach focuses on lending by financial intermediaries, which has some

similarities with neo-classical constructions of pure credit economies. However, in those models money and credit exhibit long run neutrality, whereas in Post Keynesian models money and credit are non-neutral.²³

The Post Keynesian theory of endogenous money has both positive and normative implications. It describes the critical role of lending in the creation of money, and it shows how increased lending is supported by the portfolio choices of households and the asset and liability management decisions of financial intermediaries. This is a position that has been adopted by new Keynesians. It also elevates the role of credit in the macroeconomic process. Credit is central to Post Keynesian economics, whereas it is strikingly absent (as can be seen from inspection of standard macroeconomics textbooks) in both neo-Keynesian and new classical macroeconomics. The presence of debt in a monetary economy challenges claims about the capacity of price adjustment to restore full employment equilibrium, which refutes charges that Keynesian unemployment is a special case predicated on downward nominal wage rigidity. Lastly, the Post Keynesian approach to endogenous money can be extended to the business cycle, and it illuminates both the critical role of debt in the cycle and why the money supply moves pro-cyclically. New Keynesian models of the business cycle also emphasize debt, but they have output being supply- rather than demand-determined. These new Keynesian models also lack an explicit role for money.

At a normative level, the Post Keynesian approach challenges monetarist claims that macroeconomic fluctuations are the product of misguided monetary control by central banks. It also challenges the efficacy of monetarist prescriptions recommending targeting of monetary aggregates. Instead, it recommends interest rate policy and regulatory controls - such as asset based reserve requirements - that automatically restrict the ability of the financial sector to expand lending. Finally, rather than being a source of

²³. Trautwein (2000) also emphasizes the long run neutrality of credit as a critical dividing line in his survey the economics of credit.

inefficiency, in a credit money economy downward nominal wage rigidity is a source of economic stability that guards against deflation.

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