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(Continued on inside back cover)
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By Allan H. Meltzer

Professor of Economics and Industrial Administration, Carnegie-Mellon University, Pittsburgh. I am indebted as always to Karl Brunner for his helpful discussion that saves me from my worst mistakes, to Milton Friedman and Alvin L. Marty for finding many weak points and suggesting improvements, to each of them for pointing out an error in an earlier draft, and to the National Science Foundation for its support.

Monetary theory has been a very active field, and the pace of development has probably accelerated in the few years since Johnson [31], Shackle [56], and Bronfenbrenner and Holzman [4] surveyed the theories of money, interest rates, and inflation. In any field, new developments generally build on results and conclusions reached earlier, and recent work in monetary economics is no exception. Although all of the principal topics of current or recent interest in monetary economics are mentioned in the earlier surveys, and some are discussed at length, new results have forced major revisions or added new strength to older conclusions.

Disregarding topics that are most often assigned to international economics, such as capital movements, exchange rates, or balance of payments, and the larger than usual outpouring of papers on monetary policy, much of the recent interest has been in four main areas: (1) the effects of expectations on the interaction of monetary and real phenomena, (2) the role of intermediaries and intermediation, (3) the effects of inflation on growth, and (4) empirical estimation and testing. A common thread connecting the four categories is the attempt to incorporate wealth and expectations into monetary theory and thus to continue the redevelopment of monetary theory started by Keynes [36]. Recent empirical work provides an example. Two kinds of work have been predominant, large-scale econometric models of Keynesian-type systems and single-equation estimates of particular relations, such as the term structure of interest rates or the demand function for money. Since the time of previous surveys, many writers have replicated Meiselman's [44] findings on the effect of expectations on the term structure but, unlike Meiselman, claim to have found evidence supporting Keynes' notion of liquidity preference, as Telser [60] reports in his survey of the term structure literature. Studies of the demand for money have generally supported Keynes' proposition that the quantity of money demanded depends on interest rates, while rejecting his separation of the demand function into two components, his emphasis on current income, and his neglect of wealth. On the other hand, much

1 Recent examples are the Brookings-SSRC model [15] and the Federal Reserve-MIT model [13] [55]. Both of these large-scale estimations are designed for use by policymakers. Most of the contributors do not claim to have developed or tested monetary theory.

2 See Brunner and Meltzer [6] [7], B. Friedman [19], Hamburger [28], Laidler [38], and Meltzer [46]. These references are not intended to be exhaustive but to suggest that support for the proposition in the text has been obtained using a number of different frameworks. I have omitted all references to writers who have used nominal rather than real balances in their empirical work.

Although he did not test for the effect of interest rates, Friedman's important contribution [20] stimulated much of the subsequent empirical research and reopened the question of the de-
of the active empirical work on financial institutions, that six years ago seemed to promise a richer analysis of financial markets than Keynes the speculator was able to slip into the published works of Keynes the economist, has been relegated to the policy literature where activity waxes and wanes with decisions of the regulators to favor one set of financial institutions or another. A few important exceptions are discussed in a later section.

Fruitful work on financial institutions and the role of banks and financial assets in monetary theory has continued, however, and most recently has revived interest in the properties of money, the services rendered by banks, and the definition of money. The emphasis in this work is not primarily on the narrow aspects of intermediation that have occupied regulators and economists alike, but on the role of money and financial institutions in economic development and the effect of substituting one type of money for another. One important development is the work of Pesek and Saving [51] challenging the so-called "new view" developed by Gurley and Shaw [27] and carried forward by others. Much of my survey concentrates on recent discussions of the effects of intermediation on money and of money and intermediation on growth. Although I mention empirical work where it is relevant, my main attention is on theory.3

A useful starting point for any survey of intermediation and growth is Lloyd Metzler's paper [49] showing that where saving depends on real wealth, the latter composed of real money balances and claims against real capital, an exchange by the government of one form of wealth for another affects the community's saving and the rate of interest. Metzler pointed out that his conclusion depends on the change in amount of privately held securities and not on the change in quantity of money, although he noted that the effect of the operation on the price level depends on the method the government uses to acquire the securities. Both a capital levy and an open market exchange of money for securities change the securities held by the public and shift the saving-wealth relation; a change in the quantity of money raises or lowers the price level but affects neither the interest rate nor the saving-wealth relation.

Metzler did not distinguish between the effects of money issued by the government and money issued by privately owned institutions. In his analysis, money includes the output of both types of issuers; neither type bears interest, and both are included as part of the community's wealth. Moreover, operations in the financial markets play almost no part in his discussion. His purpose was to demonstrate that once the saving-wealth relation is included in the model of an exchange economy, an open market operation or a capital levy affects relative

3 Readers interested in several parts of monetary theory that I do not survey can find summaries in the papers by Fand [16], Johnson [32], Meltzer [48], and Telser [60] presented to the American Bankers Association's annual Conference of University Professors.
prices and, by changing interest rates, raises or lowers the growth rate of output.

Two of the issues Metzler ignored became important later. One, the effect of changes in the composition of the money stock between gold or other types of base money—"money" produced by the central bank—and deposits—"money" produced by the banking or financial system—has led to a lively and not always clarifying discussion in several branches of monetary economics.4 Among the more interesting issues here are the consequences for monetary theory and policy of choosing broader or narrower definitions of money, but the discussion has ranged widely and now includes the effects of banking monopoly and payment of interest on deposits. In Section I, I relate these issues to the discussion of intermediation and the neutrality of money and discuss their implications for the definition of money in a stationary economy.

The second issue, the effect on saving and growth of changes in the rate of inflation, has given rise to a burgeoning literature on the optimal rate of change of money, the appropriate definition of income, and the role of monetary policy in economic development. In Section II, I survey some of the recent contributions to the theory of money and growth, point out some reasons for differences in conclusions, and indicate some conditions under which monetary policy affects growth.

4 One source of confusion in monetary theory is the use of different terminology to refer to the same or very similar magnitudes. Outside money is called government demand debt or deadweight debt by Tobin, high-powered money by Friedman, Schwartz, and Cagan, the monetary base by Brunner and myself, the source base by Anderson, Jordan, and others at the Federal Reserve Bank of St. Louis, and money by Irving Fisher. Outside money plus inside money is called the circulating media by Irving Fisher, and inside money is called deposits by most monetary economists. At times there are minor differences, such as the inclusion or exclusion of member bank borrowing, but these differences have little or no analytic importance for the issues discussed here.

I. The Definition of Money and the Role of Intermediaries

Discussion of the definition of money brings to mind that there is a well-established school in economics that traditionally blurs the distinction between money and credit and denies that it is useful to define money. One modern form of this tradition can be found in the writings of the "flow of funds" school which attempts to relate changes in particular types of lending and borrowing, i.e., changes in various kinds of "credit," to changes in the level and composition of output. This school took comfort, incorrectly I believe, from the emphasis that Gurley and Shaw placed on financial structure and revived the view that the definition of money is not only arbitrary but of limited importance since all assets have some "moneyness." Others have since accepted this position, although not always for the reasons advanced by the flow-of-funds school [65].

Both Gurley [26] and Shaw [57] reject this position, and the analysis most fully developed in their joint book [27] is much less concerned with the very short-term consequences of restricting the output of particular types of credit than many of the papers that pledge allegiance to their framework. Their main concern is the long-run consequences of changes in the stock of money when the financial system is more fully developed than in the models analyzed in Metzler's article [49] or Patinkin's [50] first edition. Gurley and Shaw divide money into two components, inside and outside money,4 and argue that this division alters the conclusion about the neutrality of monetary changes reached in the earlier analyses of a stationary economy. Their argument can be appreciated by tracing the effects of a change in outside money along the lines they suggest. As an example, I consider the effect of a currency "reform" that requires the central bank to reduce the nominal stock of outside money.
If the nominal stock of inside money remains unchanged (or falls less than proportionately), the ratio of outside to inside money rises. The reduction in nominal money lowers the price level, raising real wealth, the real value of the stock of money, and the real value of the debt that the financial system acquires in the process of issuing inside (deposit) money. If the demand function for inside and outside money are homogeneous to the same degree in prices and wealth, the fall in prices and the rise in wealth cannot restore the ratio of inside to outside money that prevailed before the "reform."

From arguments of this kind, Gurley and Shaw conclude that a currency "reform" of the type considered raises the interest rate. More generally, they conclude that changes in the ratio of inside to outside money affect the real rate of interest, the choice between present and future consumption, and the growth rate of output. The so-called "new view" of monetary theory [61] builds on this foundation.

Gurley and Shaw's analysis rests on the propositions (1) that the government can change the stock of outside money without inducing an equi-proportionate change in the stock of inside money and (2) that changes in the inside-outside money ratio cause changes in relative prices and particularly in the real rate of interest. Subsequent writers have pursued the analysis of "intermediation" in different ways, some emphasizing the effects of wealth and substitution on the demand for money and velocity, others concentrating on the effects on the financial or monetary system and the stock of money. Although I do not attempt to make my survey of the literature exhaustive, in the remainder of this section I consider both sides of the market, discussing, first, the effects on the stock of money of substitution between money and other assets, then the effects on wealth of changes in the stock of money, and finally the effects of "intermediation" on the demand for money.

### Money Substitutes and the Effectiveness of Policy

A main issue raised by the discussion of intermediation is the ability of the government to control the particular stock that is called "money" when the financial system can produce an endless array of substitutes. Tobin and Brainard, who develop this line of argument [61] [64] and suggest its importance for the definition of money and for monetary control, view the development as a continuation of the historical process by which commercial banking developed and checkable deposits came to be counted as "money." At times the argument [61] has the comforting ring summarized in the familiar phrase, "the line between money and other assets is arbitrary."

Tobin argues that the public can adjust the volume of deposits held at banks and other financial institutions, but the banks and the public must hold the nominal stock of outside or base money. If the banks and the public as a group have an excess supply of base money, their only recourse is to force a rise in the price level that reduces the real value of the base to the point at which desired and actual holdings are equal. On the other hand, if the public wishes to reduce deposits, they can repay loans, thereby forcing the banks to add to excess reserves or reduce loan rates and income. In this case the "burden of adaptation is not placed entirely on the rest of the economy." This is the Gurley and Shaw argument, and Tobin has constructed a case in which the ratio of inside to outside (or base) money changes.

Expressions of doubt about the effectiveness of central bank operations are not new. However, the new arguments are more developed and more sophisticated than earlier

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Tobin [61, p. 415].
versions that give rise to the metaphor about "pushing on strings." For example, in Tobin and Brainard's [64] argument that substitution weakens the effectiveness of monetary policy, lack of "effectiveness" does not mean that central bank actions have no effect on the economy, but only that the central bank has to issue a larger volume of base money to obtain a given effect.

There are two reasons why the problem of "effectiveness" should not delay us. First, the social cost of producing additions to the monetary base, bank reserves and currency, is so small that economists generally set these costs at zero. If base money is produced at zero social cost, less "effectiveness" per dollar means only that the central bank must print larger numbers on the units of base money issued or withdraw larger units to achieve a particular position of the economy. Second, the proposition about the effectiveness of central bank control of money is relatively weak. Authors who build on this framework have shown only that the relation between the monetary base and the stock of money may be weakened because of substitution between money and other financial assets. None of the authors who reach this conclusion present evidence showing that the base and the money stock are unrelated or, as Brunner [5] has noted, challenge the empirical work showing a close relation.

Moreover, there are two reasons for believing that the analysis of the consequences of a change in the ratio of inside to outside money has not been pursued far enough. One is the absence of a full analysis of the effect of the change on the monetary system, particularly the determination of the inside-outside money ratio; the other is failure to consider the full effects of a change in the profits of the banking system. In the case just considered, after the reduction in loans and deposits, the public holds a smaller stock of nominal money balances, both absolutely and relative to real capital or wealth, and the return to assets invested in banking is lower, both absolutely and relative to the returns available on alternative assets. Hence, we can be certain that the conditions for a full equilibrium have not been met.

Within the monetary sector, the decline in the demand for loans and the reduction in deposits leaves the sector with a higher ratio of currency to deposits and of money (currency and deposits) to bank earning assets. The Tobin [61] or Tobin and Brainard [64] analysis provides no means of tracing the adjustment within the monetary sector to these changes in stocks. Yet, we know from other analyses [9] that, in the type of monetary system for which the analysis of intermediation is said to be relevant, both the reduction in the demand for bank loans and the change in the ratio of deposits to currency disturbs the equilibrium of the monetary sector, causing changes in market interest rates and in prices. These changes, in turn, disturb the equilibrium of the real sector, causing still other changes in prices, in interest rates, and in expenditures for goods and services that feed back to the monetary sector causing additional changes in money and in bank loans.

There is no need to trace the effects of each of these changes separately. We can reach some conclusions about the effects of the stock-flow interaction on long-run equilibrium by starting with two extreme cases. First, let the stock-supply of loans be completely elastic with respect to interest rates so that for a reserve requirement ratio, \( r \), the demand for loans and deposits raises the banks excess reserves by \( 1 - r \) dollars per
dollar of reduction in the demand for deposits. Second, let the stock-supply of loans be completely interest inelastic. Now, despite the decline in the demand for loans and deposits, there is no reduction in any of the nominal values on the consolidated balance sheet of the banking system. However, in both cases, the (real) profits of the banks fall; in one, because the banks receive no return from idle excess reserves and incur a positive opportunity cost; in the other, on the usual assumptions about the relatively low cost of maintaining deposits, because revenues fall more than costs, the value of bank capital declines, and aggregate wealth is reduced.

Those who wished to reduce their loans and deposits now hold the nominal stocks they desire. Either they have managed to force a reduction in the two stocks or, at lower rates of interest on loans, they are willing to hold an unchanged nominal amount. Unless owners of bank capital participate in the posited reduction in demand for deposits and loans in proportion to their wealth, they now hold a stock of real balances that they regard as excessive in relation to their reduced wealth or expected income. They attempt to exchange money balances for claims to real capital—to give up money and current consumption and acquire streams of income or rights to future consumption. Since real resources and technology have not changed, the prices of capital assets rise and the rate of return on real capital falls. Since expected income is lower, the demand for real consumption and the price level fall until a new equilibrium is reached.

Whether the new equilibrium differs from the old depends on the assumptions we make, not on the consequences of "intermediation." If the decline in the demand for loans is a temporary change, the system eventually returns to the previous equilibrium. If the decline in demand is permanent, the real rate of interest and the price level are lower in the terminal than in the initial equilibrium. Neither of these conclusions depends on "intermediation" or on differences in the effectiveness of monetary policy in countries with or without intermediaries. Identical conclusions are obtained from a standard neoclassical model, such as the Metzler model [49], that makes no mention of intermediation, provided we start by assuming a permanent change in preferences (or productivity) that changes the demand for real money balances. A similar assumption must be made to obtain a permanent real effect on interest rates in the Tobin [61] or Tobin and Brainard [64] frameworks. Since a more complete analysis of the assumed change requires analysis of the demand for real money balances and its components, I defer further discussion to the later section on the demand for money.

Wealth and the Definition of Money

The ability of the financial system to produce "money substitutes" is said to have consequences not only for the effectiveness of monetary policy but for the usefulness of defining money and for the particular definition that is chosen. If, in fact, the monetary base is closely related to most of the monetary or financial magnitudes that have been called "money," the evidence on the supply side does not discriminate sharply between narrower and broader totals, and the choice between one of the several frequently suggested definitions of money is less important for control of the stock than is often alleged. Or, to put the point another way, if the substitution between broader and narrower totals is sufficiently

*The same or a similar argument is often stated in terms of velocity or the demand for money, as in the Radcliffe report [65]. Although I consider these arguments only briefly in a later section, there are now numerous empirical studies of the demand for money that reject this conclusion, and I cite several of these studies in footnotes throughout the paper.
regular and reliable, the effectiveness of monetary control is not greatly altered by including or excluding time and/or savings deposits from the definition of money.\textsuperscript{9,10}

On the other hand, there are clear costs, and as yet no evidence of equivalent benefits, from the use of a definition of money that includes deposits at nonbank financial institutions.

Until recently, the discussion continued along these lines, one group relying mainly

\textsuperscript{9} The argument, of course, ignores the effect of interest rate regulations that force most adjustments to be made by shifting balances rather than through a combination of price and portfolio changes. Short-run disturbances of this kind have no important bearing for the discussion of the long-run consequences of the development of financial institutions.

The statement in the text should not suggest that the definition of money is unimportant. First, I have limited discussion to assets with similar characteristics such as deposits, time deposits, and possibly savings and loan shares. Second, the point discussed is the ability of the central bank to control the nominal stock. The central bank's ability to predict the demand for real balances, variously defined, is not discussed here. My views on the latter point and some of the evidence on which they are based are put forward in a paper with Brunner [6].

\textsuperscript{10} One suggestion that, so far as I know, has not been made, is to test the proposition that substitution between inside and outside money weakens the central bank's control of money and makes it useless to define "money" using data from a currency reform, such as the one described earlier in the text, or possibly from a large change in the desired ratio of currency to deposits—a run on the banks. For evidence of the effect of a currency reform, see [45]; evidence on the effect of changes in the demand for currency is given by Cagan [11], by Friedman and Schwartz [24], and by Brunner [5]. Note, however, that the evidence I have cited pertains to the "effectiveness." The evidence does not show whether the effects of changes in the currency ratio are non-neutral. A second source of evidence is a change in the reserve requirement ratios. On the Gurley-Shaw and Tobin analyses, I believe a reduction in reserve requirement ratios should raise the nominal value of the stocks of deposits and earning assets of the banks but not the nominal stock of currency. A rise in prices that restores the real value of deposits and bank earning assets lowers the ratio of currency to deposits. Hence, on their analyses, this is a nonneutral change.

Additional evidence is cited in footnote 16.

on empirical evidence, the other on theoretical demonstrations generally conducted at a rarefied level of abstraction. An exception is Alvin Marty's review [42] of the Gurley and Shaw book [27]. Marty criticized several of the main conclusions and noted that a shift from currency (outside money) to deposits (inside money) does not imply that changes in money lose importance or that the central bank loses control. A recent and more far-reaching criticism of the distinction between inside and outside money is found in a new book by Pesek and Sav-
crease in real balances minus the opportunity cost of holding reserves [51, p. 88].

The Pesek and Saving analysis has important implications for monetary theory. The authors also claim that their analysis shows that only currency, demand deposits, and travellers checks are used as a medium of exchange and can be called "money." They argue that if banks paid interest on deposits, deposits would be held as income-yielding assets, and their use as a medium of exchange would cease. This is an error that arises in part because the authors mistake their proposition—that money adds to the net wealth of the producer an amount equal to the capitalized value of the profits from production—with the much stronger (and incorrect) proposition that the profits from the production of money are destroyed if interest is paid on demand deposits. Pesek and Saving confuse the issue further by arguing that competition and unregulated entry in the banking industry would also eliminate the use of deposits as money. The source of their error becomes clear when we analyze the effects of eliminating monopoly and the prohibition of interest payments on the returns received by holders and users of currency and deposits.

Monopoly, Interest Payments, and Money

Of the two restrictions—monopoly and the prohibition of interest payments—monopoly is probably the more important. Once the monopoly is broken, payment of interest is a secondary, although not wholly unimportant, matter. To see why, let the restriction on entry be removed while the prohibition of interest payments on deposits remains. The competing banks expand by offering services until the marginal cost of the services offered by banks again equals the marginal return to the banks from earning assets. Profits have been eliminated, or more accurately, transferred to the public in the form of services. If the elimination of monopoly is the only change, the value of aggregate wealth at market prices declines because the monopoly profits previously received by owners of bank capital are now distributed as nonpecuniary services to owners of bank deposits. The public captures the value of the banks' monopoly rent in the form of services, many of which cannot be resold.

If the law permits banks to pay interest in money rather than in kind, the public benefits from the wider range of choices of consumption services or the smaller cost of searching for a preferred combination of banking services and nonpecuniary receipts. Some of this gain occurs even where the monopoly remains, if the banks are permitted and elect to make payments in money rather than in auxiliary services. Indeed, consideration of the gains to the public from receiving interest in money rather than in kind, points out a main reason why money is productive and suggests that one source of the productivity of money is the reduction in costs of search and of acquiring information that the use of money permits. Nothing in the argument, however, suggests that payment of interest eliminates the monopoly or destroys the use of deposits as a medium of exchange.

Competition in banking has many of the same effects as competition in other industries; bankers are forced to compete for inputs, one of which is base money. As in any

11 If there is a positive marginal factor cost of producing banking services, the profits previously received by the owners of the monopoly banks are distributed as factor payments to bank employees. In this case, a change in the ratio of human to nonhuman wealth accompanies the elimination of monopoly. Real wealth measured at factor prices does not decline.

12 Here, I treat the industry as a single monopolist rather than as a case of restricted entry with numerous separate producers. Milton Friedman reminds me that while a single monopolist would not pay interest unless it is profitable to him to do so, in an industry with restricted entry and numerous firms, profits may fall.
other competitive industry, the elimination of profits does not mean that the industry adds nothing to wealth. If wealth is measured by the capitalized value of the income paid for the use of productive factors, the gain to society is the value added by the more productive use of resources after the industry develops. However, if part of the return to money holders and/or to users of money takes the form of nonpecuniary services, wealth valued at market prices does not fully reflect the benefits resulting from the industry’s use of resources. Where the factor or resource cost of producing money is arbitrarily set at zero, neither wealth at factor nor at market prices includes the full benefit society receives from using money or the costs of producing and maintaining money.

The assumption that base money is produced at approximately zero social cost has no consequence that prevents us from analyzing changes affecting banking just as we analyze similar changes in other industries. Elimination of monopoly in banking does not change the total amount of base money or other resources available to the banks and the public. Control of base money remains the responsibility of the government or of a chartered monopolist, and this monopoly must continue in order to assure that society retains the benefit of producing money at lowest cost. Profits from exchanging base money for income-yielding assets cannot be left to entice private producers to increase the base and the stock of money. To do so would cause prices to rise, forcing society to give up the advantages of paper money and return to specie, raising the resource cost of producing money. This is the standard argument for monopoly in the production of base money, and Pesek and Saving repeat it. The argument neither requires monopoly in the production of deposits if the base remains limited, nor implies that a state of private monopoly should retain the profit from producing money instead of reducing taxes or offering interest on money.

Replacing monopoly with competition cannot force the banks to pay deposit holders a real return greater than the prevailing rate of interest on real assets, and generally the banks must pay less. The difference in rates is set by the amount that the public receives, and the banks pay, in the form of real services that the use of deposits provides, such as safety or lower cost of making particular types of transactions, and by the opportunity cost to the banks of holding reserves.\(^{18}\) The size of interest payments depends on the value of the banks’ monopoly position. If the value of the monopoly was small, there is little in the way of rent for the competing banks to distribute to depositors when the monopoly ends.

By offering interest on deposits the banks are able to obtain a larger fraction of the unchanged nominal amount of base money, and they desire to do so as long as the cost of maintaining a dollar of deposits and holding some addition to reserves does not exceed the return from an additional dollar of earning assets. The higher return on deposits induces the public to hold more deposits and forego the convenience yield obtained from some units of currency. The currency-deposit ratio falls and the inside-outside money ratio rises. For the banks,

\(^{18}\) If there are two types of money—currency and deposits—that are not perfect substitutes in all uses and if exchanges of deposits for currency occur randomly, bankers will choose to hold some base money as a reserve.

If the only services of the banking industry are the maintenance of the payments mechanism, producing one type of money and paying interest on (or charging fees for the use of) two types of deposits—time and demand—provides a measure of the price the public pays to use deposits as a medium of exchange.

The point that Pesek and Saving have in mind may be no more than an extension of this line of reasoning. If, in equilibrium, banks pay the pecuniary market rate of interest on deposits, deposits cannot provide additional nonpecuniary services unless other income yielding assets provide equivalent nonpecuniary services.
the size of the shift of currency into bank reserves depends on the factors just mentioned. For the public, the size of the shift depends on the marginal cost of making payments with relatively less currency and more deposits and on the rate of interest the banks pay per dollar of deposits. Unless the banking monopoly were very lucrative, the interest return per dollar of deposits is very small even after eliminating the monopoly. But a small increase in the return on deposits is all that is required to induce the public to part with most of its currency, if currency and deposits are very close substitutes in providing money services in the transactions where currency had been used. Judging from the coexistence of currency and deposits, both over time and across countries, a large change in the currency-deposit ratio seems unlikely, but some change occurs.

At the new equilibrium ratio of currency to deposits, the nominal stock of money is large*. The reason is that the fall in the currency ratio raises the "money multiplier," m, and with an unchanged base, B the stock of money, M, increases since \( M = mB \). Where the change in the currency ratio is a permanent change, the money multiplier remains at the higher value, and each subsequent change in the monetary base has a larger effect on the stocks of money and bank credit (bank earning assets).

In countries with developed financial systems where banks hold reserves of base money and issue more than one type of deposit, changes in the monetary base have unequal effects on money and bank credit, and changes in the currency ratio have unequal effects on the size of the responses or multipliers for money and bank credit. A decline in the ratio of currency to deposits causes a larger percentage increase in bank credit than in money (currency plus demand or total bank deposits) [9]. Prices rise and the nominal cost of borrowing falls. If the public's demand functions for money and bank credit are homogeneous of the same degree in prices and wealth, the real stock of bank credit rises relative to real money balances; the real cost of bank credit falls. Within the framework developed in [9], permitting banks to pay interest on deposits disturbs neutrality.

**Intermediation and the Demand for Money**

In the usual or standard treatment of monetary theory, there is no mention of response in money and bank credit to a change in the currency ratio. The effect of paying interest on demand deposits is analyzed by considering the effects on the demand functions for money and other assets, the degree to which money is a substitute for other assets and to which the components of money are close or poor substitutes. In this section, I take the more customary approach and consider the effects on the demand for money and consumption of the increased demand for deposits and decreased demand for currency, resulting, as before, from the elimination of restrictions on entry in banking and the payment of interest.

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*The hypothetical change mentioned in the text is a once-and-for-all reduction in the money multiplier. In a growing economy, the equation given in the text changes to

\[
\frac{dM}{dt} \cdot \frac{1}{M} = \frac{dm}{dt} \cdot \frac{1}{m} + \frac{dB}{dt} \cdot \frac{1}{B}
\]

where the variables are now rates of change. The fall in the currency ratio reduces the growth of m.

For further discussion of the effect of competition and monopoly in the monetary system, see Meltzer [48].

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*This conclusion has been shown in several papers. For references see Brunner [5].

15 Tobin and Brainard [64] discuss the case in which currency and deposits are complements and conclude that if the two are extreme complements, the economic system is "unstable." Friedman and Schwartz [25], on the other hand, argue that assuming perfect complementarity in demand and fixed exchange rates in supply gives the same results as assuming perfect substitution in demand. I believe that my discussion of substitution below explains why the two analyses reach different conclusions.
me interest on deposits. Then, I discuss other changes in the ratio of currency to deposits (or of inside to outside money), such as those considered by Tobin and Brainard [64] and analyzed partially in an earlier section.

As before, the public responds to the payment of interest on deposits by substituting deposits for currency, and the nominal stock of money increases until at the new equilibrium ratio of currency to deposits, each individual is indifferent when offered the choice of additional services obtained from a dollar of currency and a dollar of deposits. The marginal productivity of a unit of currency rises with the reduction in currency holdings, and the marginal net return individuals receive from money balances, in pecuniary and non-pecuniary form, is higher in the new equilibrium than in the old. Since individuals were willing to exchange a dollar (unit) of real balances—currency or deposits—for either a dollar (unit) of real consumption or for a dollar (unit) of real capital representing the right to future consumption, they must now regard a unit of real balances as worth more than a unit of real capital or a unit of real consumption. Equilibrium cannot be restored if the price level rises in proportion to the change in the nominal stock of money and relative prices remain unchanged. Since a dollar of real balances now provides more services, the amount of real balances demanded at each real rate of interest is higher than before; the demand for money rises until the new equilibrium is reached. At the new equilibrium, the real rate of interest is higher.

Permitting the banks to pay interest on deposits disturbs the neutrality of the system. The same is true of a change in regulations that removes restrictions on entry in banking if, after the change, holders of deposits receive more services per dollar of real balances and, therefore, desire to hold more real balances relative to real capital. These conclusions do not depend on intermediation or on the presence or absence of intermediaries, but on the change in opportunities and in utility that results from eliminating restrictions that prevented individuals or firms from reaching an optimum. Like any change in resources, tastes, opportunities, or productivity that changes the return to real money balances relative to the return to other real assets, removing restrictions on banking changes relative demands for real assets and disturbs neutrality.

Suppose the government disturbs the equilibrium of a competitive banking system by instituting a currency "reform" that reduces the stock of currency. If the pecuniary and nonpecuniary returns received from currency and deposits were equal before the reform, the returns are now unequal. Unless currency and deposits are perfect substitutes, it is more costly to use deposits in the transactions where currency was used. To avoid the higher cost, holders of money withdraw deposits, further reducing the stock of money. For a time, the decline in the stock of money generates a fall in expenditures and in economic activity. However, the latter are temporary effects that occur because the fall in prices required to restore real money balances to their equilibrium value was unforeseen or unanticipated. Since productive opportunities and real resources are unchanged, the economy returns to equilibrium at a lower price level, unchanged real rate of interest, and unchanged real money balances. In this case, real resources and opportunities do not change, so there is no permanent effect on real variables.

As a further example, one that reaches the conclusion obtained by Tobin and Brainard [64], I consider a government edict reducing the nominal rate of interest paid on bank deposits. Like the reduction in currency, the reduction in the deposit rate encourages a substitution of cur-
rency for bank deposits. The nominal stock of money and the price level fall, partially restoring the real return received by holders of deposits. However, unless currency and deposits are perfect substitutes in demand or the monetary base is reduced in proportion, there is no change in the price level that restores all of the initial real values. The return from a dollar of real money balances—currency and deposits—is lower than the return from a dollar of real capital or of real consumption. The real demand for money falls, lowering the real rate of return on capital.

The effect of the change in the deposit rate on the equilibrium stock of real balances in this case depends entirely on the change in opportunities and extent to which various assets are close or very poor substitutes. The government is able, somehow, to change real opportunities by changing the nominal rate of interest banks pay to depositors.

A final comparison places the conclusion about the effect on neutrality of changes in deposit rates in perspective. First, let currency and deposits be very close substitutes in portfolios and let their sum, money (currency and deposits), be a substitute for real capital and other forms of wealth. An equilibrium rate of interest is paid on deposits, and the equilibrium rate may be negative if nonpecuniary returns are sufficiently great. In this case, the payment of slightly more or slightly less nominal interest on deposits and the induced changes in the currency ratio, resulting from changes in the proportion of the return to deposits paid in pecuniary and nonpecuniary form, have little effect on the equilibrium of the system: the interest payments approximately compensate the public for the inconvenience of using deposits where currency was used previously. In practice, the effect of the change would be hard to distinguish from the many random changes affecting the relative demands for currency and deposits.

Second, let currency, deposits and real capital be substitutes and make no assumption about the extent to which various assets are substitutes and no distinction between real and nominal returns to deposits. In this case, higher or lower payments of interest on deposits induce changes in the amounts of currency and deposits held, in the ratio of currency to deposits, in the ratio of real money balances to real capital, in current and future consumption, and in the return earned by units of real capital. Now, the suggestion is created that the payment of interest on deposits has a large effect on real rates of return and equilibrium values of stocks.

The crucial difference in these two cases is not in the framework used for the analysis or in the direction of initial effects, but in the assumptions. In the one case wealth owners distinguish between real and nominal rates of return, regard currency and deposits as component parts of an asset called money and largely ignore the composition of money balances when deciding on the distribution of their portfolios between monetary and nonmonetary wealth. What matters is the fraction of their wealth that is held in main categories of assets. The composition of money balances between currency and deposits is no more relevant than the composition of their security portfolio between shares of Ford and General Motors or perhaps the composition of currency between five- and fifty-dollar bills. On the alternative assumptions, changes in the nominal rate of return and in the composition of money balances are relevant and important in a way that the composition of the security portfolio or the composition of the stock of currency is not.

Which view is more useful for policy or more nearly correct cannot be settled solely by theoretical analyses. To the partisans, each must seem plausible, so as always we must rely on observations. The evidence to which I referred earlier as showing a reliable and close relation between the monetary
base and both broader and narrower definitions of money, and between the demand for money and its determinants, suggests that the stock of money is a reliable concept on which to build a theory of prices and output. Certainly, it does not follow solely from theoretical arguments of this kind that money is an unreliable or meaningless concept or that money is an inadequate indicator of monetary policy [8]. Again, evidence is required, but on this point, most of the evidence we have suggests that major errors in the interpretation of monetary policy result from a failure to rely on money as an indicator of monetary policy.

Conclusions on Intermediation

My discussion of the definition of money and the inside-outside money controversy leads me to six main conclusions. First, Pesek and Saving's [51] argument does not establish a unique definition of money. Payment of interest does not prevent the public from using deposits as a "medium of exchange," so payment of interest cannot be used to exclude some types of deposits from money. Second, the fact that there are difficulties in determining the appropriate or most useful definition of money does not make the concept useless. Few main results of economic analysis or interpretations of past events depend on the definition of money selected, as long as the choice is confined within the narrow range of assets to which economists assign the name. On balance, I believe, empirical evidence favors the narrower definition—currency and demand deposits—rather than a broader definition, and both evidence and the principle of parsimony suggest that there is no reason to look beyond the balance sheets of commercial banks. Third, neither analysis nor evidence suggests that the existence of banks and other financial institutions have an important effect on the real rate of interest or on the demand for real money balances relative to real capital. The contrary conclusions reached by Tobin and others depend on the particular assumptions that they make or on the failure to analyze fully the effect on prices resulting from the interaction of stocks and flows. Fourth, nothing in the analysis of intermediation suggests that changes in money are unreliable indicators of monetary policy. That conclusion results most often from neglect of the distinction between real and nominal values or the failure to specify the extent to which it is the sum, money, rather than the components, currency and deposits, that is a substitute for real capital. Fifth, money is an ambiguous concept. The ambiguity arises from the use of the same concept—money—to denote an asset that is important for explaining changes in the price level and an asset that renders a variety of "services," usually summarized by some undefined phrase. These phrases include, but are not limited to, "medium of exchange," "liquidity," "synchronization of receipts and payments," and "temporary abode of purchasing power." Removal of this ambiguity, I believe, will add significantly to our understanding of the differences between a monetary and a bar-

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5 Broadening the definition of money to include time deposits at commercial banks increases the size of the responses of the nominal stock resulting from a change in time deposits or currency relative to demand deposits. The relative size of the increase in the response of money plus time deposits is greater for a change in the ratio of time to demand deposits than for a change in the currency ratio. To check the conclusions see the appendix to [9]. Although this argument is not compelling, it favors the narrower definition, particularly for analysis of short-term movements.

6 I base this conclusion on [8] and on the recent work of Hamburger [29]. The main evidence to the contrary comes from Lee [38] [39]. Hamburger has now replied [30] and shown that Lee's conclusions are based on an inadequate test. Hamburger's own test reconfirms his earlier conclusion that shares (deposits) at nonbank institutions are not particularly close substitutes for money defined as currency and demand deposits. For an alternative interpretation see Friedman and Schwartz [25].

7 The indicator concept is discussed more fully in [8].
ter economy and of the role of money. Sixth, many of the conclusions of monetary theory develop from the proposition that money is a debt of the issuer. Pesek and Saving's demonstration that real money balances add to net wealth and are not "offset" by debt, forces a reexamination of some main conclusions of monetary theory. In growth theory, this reexamination has started. I consider next some recent work on the role of money in economic growth and pursue the analysis of the effect of changes in the rate of inflation that I neglected here.

II. Money and Growth

Until recently much of the literature on economic growth concentrated on the properties of production functions and either neglected demand and the allocation of resources entirely or made the saving ratio a constant and ignored the theory of money. Treating the theories of money and of the allocation of consumption over time as separate problems has a long history in economics. As distinguished an economist as Irving Fisher contributed importantly to both [17] [18] but failed to analyze the demand for money as a problem in capital accumulation or to link his theory of money directly to his theory of resource allocation over time. The more important work on money and economic growth attempts to remedy this deficiency in the received theory.

Once again, Metzler's analysis [49] of open market operations and changes in money is a useful starting point, but now my focus shifts from the effects of changing the composition of the money stock, analyzed in the previous section, to the effects of changes in the rate of inflation on the consumption of goods and the accumulation of capital and money. In Metzler's analysis, fiscal policy affects long-run growth by changing both the size and composition of wealth, but monetary policy—a change in money—affects only the price level. Later writers, of whom Tobin [62] [63] is the most influential, pointed out that the rate of inflation may also affect the real growth rate by changing the return received by holders of money and thus changing the desired rate of accumulation of real capital and money. Metzler's analysis of the effects of open market operations on growth is incomplete, therefore, because he ignores the consequences of changes in the rate of inflation.

Several of Tobin's conclusions, and criticisms of his conclusions, have been challenged in recent papers by Johnson [34] [35], Marty [43], Levhari and Patinkin [40], Sidrauski [58], and Stein [59]. Differences in conclusions have been shown to depend in some cases on differences in the definition of income, on the assumed constancy of the saving-income ratio and on failure to take account of the nonpecuniary services provided by money, services that are productive and that increase utility. As a result, the discussion now ranges over a number of topics, including, but not limited to, the definition of disposable income, the effect of inflation on growth, the neutrality of monetary changes, the optimal stock and/or growth rate of money, and the role of money as a consumer and as a producer good. To reduce the list of topics, I accept the results of the previous section and postulate that changes in the composition of the money stock between inside and outside money affect the real growth rate primarily by changing the rate of inflation or deflation. This permits me to discuss the effects of changes in the growth rate of money and in the composition of money within the same framework and to avoid distinguishing between changes in the growth rate of money brought about by changes in the growth rate of the monetary base and changes in the technology of
making payments that permit a continuous decline in the ratio of currency to deposits and a continuous rise in the money multiplier. Changes in the growth rate of money, however, should not be confused with a once-and-for-all change in the ratio of currency to deposits, such as the change resulting from the elimination of a banking monopoly and discussed in the previous section.

More important than the distinction between inside and outside money is the difference between the services provided by real balances as a consumer good and as a factor of production. In the latter role, the use of money permits both output and leisure to increase, for example, by reducing the time and effort devoted to making and receiving payments. Although I believe the productive services are by far the more important, most of the recent literature treats money as a consumption good.

Throughout, I ignore any effect of differences between actual and anticipated rates of inflation and any costs of obtaining information and adjusting anticipations. As the work by Cagan [10] and Allais [1] has shown, these are perhaps the most important costs of changing from one rate of inflation to another. I ignore these aspects not only because it has become customary in long-run analysis to let actual rates equal anticipated rates, but because the literature discussing inflation and growth has focused almost entirely on the consequences of higher and lower maintained rates of inflation.

Very little mention is made of the way in which money enters the analysis. The monetary sector is undeveloped and the resource cost of producing money is set at zero. Following Tobin [62] most writers introduce money as a transfer payment from government into the now standard neoclassical growth model in which the maintained rate of growth, \( g \), is set by the rate of growth of population, and by technical progress that increases the efficiency of the labor force. Along an equilibrium balanced growth path, the ratio of capital, \( K \), to labor, \( L \), the latter in efficiency units, remains constant and equal to \( K/L \). For this to be true, the population must save at a rate that permits the rate of capital accumulation to equal the growth rate of the effective labor force, \( g \). A higher rate of saving lowers the rate of interest and marginal product of capital and raises \( K/L \).

If both saving and investment depend only on real rates of return, the introduction of money in the neoclassical growth model has no effect on the desired or actual capital-labor ratio or the preference for present rather than future consumption, as Sidrauski [58] has noted. The rate of monetary expansion is irrelevant for choosing a capital-labor ratio, and the implications of the standard growth model are unchanged. However, for these implications to be correct, any monetary theory that posits a relation running from wealth to saving must be incorrect or based on a very different theory of growth. Alternatively, if real money balances are a "store of value" and held as part of wealth, they yield a net rate of return equivalent to the rate of return on real capital. Where interest payments on money are prohibited or restricted, part of the return received by moneyholders takes the form of an increase or decrease in wealth, or "capital gain" or "capital loss," that accrues to holders of money if prices fall or rise at a steady rate.

These conclusions can be demonstrated if we add a Cobb-Douglas production function with arguments restricted to capital and labor to some equations of a simple model of the Metzler type. Let

\[
A = K + M/P \\
Y = \sigma K \\
\frac{dA}{dt} = S = f(r, A) \quad S_t > 0, \quad S_A < 0
\]
where \( A, K, \) and \( S \) are respectively wealth, capital, and saving, each in real terms; \( P \) and \( M \) are the price level and the nominal stock of money; \( Y \) is real output of goods and all services other than the services of money balances; \( r \) is the real rate of interest; and \( c \) is a fraction (greater than one) representing the distribution of output, \( Y \), in returns to the two factors. Since wealth can be held in real balances or in real capital and \( Y \) excludes the services of money, the ratio of wealth to output, \( A/Y \), exceeds the capital-output ratio whenever some money balances are held. To be explicit, we know from the above equations that \( A/Y = (1/cr) (1 + M/PK) \) cannot equal \( K/Y = l/cr \) unless money balances are zero. If both real balances and real capital are held in a growing economy, for any distribution of wealth between the two forms, there is a real rate of interest at which the ratios \( A/Y \) and \( K/Y \) remain unchanged. In Metzler's terminology, a shift in the demand for real money balances (for example, from zero to a positive value) along a given money requirements schedule raises the real rate of interest, reduces investment, and lowers the growth rate of output. In Tobin's model \([62]\), if saving is "diverted" into the accumulation of money, the capital-output ratio falls, the real rate of interest rises, and the capital-labor ratio falls. On the new balanced growth path, wages are lower and the marginal product of capital is higher.

Since the opportunity cost of holding money rises with the rate of inflation, and real resources and productivity are said to be unaffected by the fully anticipated rate of inflation, real wealth and output are affected differently. Higher rates of inflation shift wealth owners away from money and toward real assets, lowering the real rate of interest at which money and real capital co-exist in portfolios.

Metzler did not distinguish between real and nominal rates of interest and made the demand for real money balances depend on the real rate. In the analysis of the effects of inflation on economic growth, the demand for money depends on the nominal rate of interest. Let the demand function for money be

\[
\frac{M}{P} = L(i)K
\]

where

\[
i = r + \frac{dP}{dt} \cdot \frac{1}{P}
\]

and

\[
\frac{dP}{dt} \cdot \frac{1}{P}
\]

is the fully anticipated rate of price change. Any maintained change in the rate of inflation changes the opportunity cost of holding money and, therefore, changes the desired ratio of real balances to real capital. For example, an increase in the rate of monetary expansion immediately raises the price level, reduces real wealth, and increases saving. The ratio of wealth to output falls, lowering interest rates and the equilibrium marginal product of capital and increasing the rate of investment in real capital. The capital-output ratio and the capital-labor ratio rise and are higher along the new balanced growth path, so real wages and the growth rate of output rise. Since prices now rise at a higher rate, the opportunity cost of holding money remains higher. Maintaining the higher rate of inflation shifts wealth holders away from money toward real assets, permanently raising the growth rate of the capital stock and lowering the marginal product of capital and the real rate of interest.

Most writers make the adjustment from one equilibrium growth path to another costless and either ignore the effect on saving of changes in the rates of employment of labor and capital or mention these adjustments only in passing. A main consequence of acceleration and deceleration of
price changes is that individuals and firms learn that past consumption and investment plans were based on faulty expectations about the size and timing of future price changes or rates of change and, recognizing their error, are forced to revise expectations and plans. Since the choice between labor and leisure must be consistent with an individual's long-term consumption plan, changes in the rate of inflation affect the labor-leisure choice also. Similar reasoning suggests that changes in the rate of inflation alter a firm's decision to hire or fire labor.

A world of frequent change around some mean value is both riskier than the world of steady change and more uncertain because the cost of acquiring information of a given degree of accuracy rises when unforeseen changes occur frequently. Tobin, who has extended his earlier analysis in a number of directions [63], analyzed the effect of risk on saving and capital accumulation and concluded that the risk-averse investor saves more in a monetary than in a non-monetary economy. However, Tobin also concludes that the introduction of money may reduce the rate of capital accumulation if risk aversion is widespread. The reason is that in a monetary economy wealth can accumulate through deflation as well as through the production of real assets. If after the introduction of money, the demand for money rises more than the stock of money, the introduction of money can shift the economy to a slower rate of capital accumulation and a lower growth rate of output. Tobin concludes that the effect of the rate of monetary expansion on the growth of real output is indeterminate in this case.

If the growth rate of a monetary economy falls below the growth rate of a non-monetary economy, the government can use fiscal or monetary operations to raise the rate of capital accumulation. By doing so, the government forces present individuals to accept risks that they do not wish to bear so as to provide a higher real income for future generations. As Tobin notes, governments concerned with maximizing welfare should not force the community to bear greater risks than would be willingly borne in a competitive economy where pooling of risk through diversification reduces each individual's risk to a minimum.

Tobin considers the effect of technological changes that reduce the demand for money by reducing the costs of making transactions, but Johnson [35] and Levhari and Patinkin [40] take the analysis further by allowing real money balances to enter the production function. Johnson's analysis is much less formal and explicit but is also simpler and arrives at the same general conclusion, or lack of conclusion, namely, that most of the effects of inflation on growth and the capital-labor ratio cannot be determined from theoretical analysis unless we are willing to make assumptions about orders of magnitude. Levhari and Patinkin suggest that the effect on real per

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20 On Tobin's analysis, the clear cut case for intervention and a definite conclusion about the desirable rate of monetary expansion comes when the real rate of return on capital is less than the growth rate. The society is then "overcapitalized," and consumers are sacrificing present consumption for too little future consumption. The government can raise the growth rate by increasing the rate of growth of nominal money until the rate of monetary expansion reaches the nominal rate of interest. Society is then on a "golden rule" path.

One caveat should be mentioned. Tobin's analysis of risk and return along equilibrium paths makes the consumer uncertain about future returns to saving but permits no deviation of actual from expected rates of change of prices. The reasons for yield uncertainty are unclear when prices are assumed to be known and costs of learning about price changes are set equal to zero. The problem is that in [63] Tobin does not make clear which of the standard postulates of growth models are retained and which are relaxed.

21 Several writers refer to this outcome as an "indeterminate" result, a conclusion that takes an overly pessimistic view of the possibilities of obtaining reliable empirical estimates of orders of magnitude. It is worth recalling that the slope of the consumer's demand curve is "indeterminate" in precisely the same sense and for an analogous reason.
capita output must be positive if money is a productive asset and the capital-output ratio is unchanged, otherwise the community could raise output per head by dispensing with the "productive" services of money. This argument is not helpful for two reasons. First, the relevant comparison is between the effects of money as a consumer good and as a producer good and not between a barter and a monetary economy. Second, as Levhari and Patinkin recognize, total output may rise while the growth rate of output falls, if the introduction of money lowers the capital-output ratio by shifting the distribution of saving in favor of capital gains and away from capital accumulation.

The analysis of money as a producer good takes Levhari and Patinkin [40] several pages to develop, but the main reason that they cannot reach a conclusion about the direction of the effect on growth is easy to understand. A higher rate of deflation initially raises output and reduces the marginal product of money, but if the marginal product of real money balances is relatively low and the marginal propensity to consume relatively high, the increase in output is small and goes mainly to consumption. The rise in $K/L$ resulting from the small increase in saving going into nonmoney wealth may be more than offset by the change in the composition of both saving and wealth as capital gains replace capital accumulation, so that the capital-labor ratio falls as the money-capital ratio rises. The effect on the growth rate of output then depends on the relative influence of the two ratios.

Comparison of the conclusions reached by various writers is made more difficult because they are obtained using different definitions of disposable income and consumption, and different postulates about the constancy of the saving ratio. These differences are important for some of the conclusions reached about the optimal growth rate of money, or the optimal rate of inflation, and the neutrality of monetary policy in a growing economy. Indeed, two of the main results of the analysis have been to point up differences that arise from the use of different definitions and the importance of distinguishing between income or wealth, and the utility of income or wealth.

The Definition of Income and Consumption

The main differences in the definition of disposable income concern the services of money balances. Tobin [62] [63] ignores these services and the opportunity cost of holding money balances; disposable income is $Y + g(M/P)$, where $g$ is the growth rate of the labor force in efficiency units and, along an equilibrium growth path,

$$g = \frac{dM}{dt} \frac{1}{M} \frac{dP}{dt} \frac{1}{P}$$

is the income resulting from government transfers and capital gains. Johnson [34] [35] adds a measure of the utility or services provided by money and measures the flow of money services as the area under a linear demand curve from zero to the amount of money held. Disposable income then includes the opportunity cost of holding money plus the consumer's surplus. Levhari and Patinkin [40] include the opportunity cost of holding money but not the consumer's surplus, so their measure of disposable income exceeds Tobin's for positive nominal rates of interest by $i(M/P)$ where as before the nominal rate of interest, $i$, equals $\left[ r + (dP/dt)(1/P) \right]$.

The Levhari and Patinkin definition of income appears to me to be the most useful definition for the analysis of money and growth. The standard national income accounting definition used by Tobin has the

Although there has been some discussion of the appropriate definitions of neutrality, most writers now follow Marty [42] and restrict the term to the situation in which changes in the growth rate of nominal money have no effect on any of the real variables.
advantage of consistency with the income accounts, but this strength is also its weakness because it leads to the anomalous conclusion that by holding real money balances society sacrifices real goods and services without receiving any flow of services in return. Johnson goes to the opposite pole and includes the flow of utility, measured in units of service per period and dimensionally equivalent to real income, so as to avoid the conclusion just mentioned and the implication that, if the demand function for money is inelastic, the value of money services falls with the rate of interest until at a zero nominal rate of interest the value of money services vanishes. Johnson's definition blurs the distinction between income or wealth and utility, as he recognizes, and treats the income and utility yielded by money at a zero rate of interest differently than the income and utility yielded by other gratuitous goods. The importance of maintaining the distinction between utility and wealth (or income) should be clear from the earlier discussion of paying interest on deposits where we found that the utility yielded by money may increase even though real wealth or the income from money balances declines.

Both Marty [43] and Bailey [3] criticize Johnson's definitions of income and consumption. Marty points out that Johnson was inconsistent in his earlier paper [34], treating outside money but not inside money as productive of a utility yield, but Johnson [35] now accepts the Pesek and Saving argument [51] and views both inside and outside money as part of wealth and productive of utility, so this argument now loses much of its force. Marty also suggests that although the nonpecuniary services of willingly held cash balances are received by the community only if money is held, the addition to income of the utility yield on money is not fully matched by an increase in total consumption. The decision to hold more money is a decision to consume more of the services of money. Unless the marginal propensity to consume depends on the form in which income is received, the decision to hold more money does not change the division of income between consumption and saving. The increase in (nonpecuniary) income raises saving, raising nonmonetary wealth. Finally, Marty allows nonmonetary wealth to provide nonpecuniary services and suggests that these services be included in utility. Below, I discuss the definition of consumption and saving and take up the first part of his argument more fully; the second part of the argument is diversionary, I believe, and requires at most that the service yield on money be defined net of the nonpecuniary services of nonmonetary wealth, a point that is implicitly made when both assets are held in equilibrium portfolios, payment of interest on money is prohibited, and the nonpecuniary yield on money is measured by the return on other assets. The existence of nonpecuniary yields on bonds and/or on real assets is important, however, for the explanation of portfolio diversification and of differences in the subjective rates of discount used by different individuals in equilibrium. I return to this point below.

Bailey [3], in a cryptic comment, disagrees with Marty about the definition of saving on the grounds that an increase in willingly held cash balances must add equally to total consumption and total income because the capitalized value of the services willingly consumed is just equal to the capital gain from deflation. On Bailey's argument, deflation does not affect other types of consumption; both consumption and income increase by the amount of the increased services enjoyed by holders of money. The conclusion appears to be a re-statement of a main result in Bailey's classic

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23 Later in his paper Marty [43] makes use of his argument to suggest a mechanism by which an economy reaches a new equilibrium path on which private and social costs are equated.
In a growing economy, as in a stationary economy, a one-time change in the stock of money that raises prices does not affect equilibrium consumption. A change in the rate of inflation, however, changes the opportunity cost of holding money, disturbs equilibrium, and starts a process of adjustment that does not end until the pecuniary and nonpecuniary returns to money and other assets are equal for each individual. If saving and the marginal rates of time preference are independent of both the level and composition of wealth, the change in the rate of inflation need not affect the return to real capital or the rate of capital accumulation. For a simple example, let the rate of time preference and saving to accumulate capital be zero everywhere, so that the consumption of nonmoney goods and services is always maximized. Saving to accumulate capital remains zero when real balances rise relative to real capital and consumption of nonmoney goods and services is of course unaffected by the change in money or in the rate of inflation.

A related but less restrictive argument based on independence of time preference and wealth has been made by Sidrauski [58], but the approach lacks general appeal in part because Sidrauski ignores short-term adjustments in expectations that affect saving and the use of resources, as Phelps has noted [54], and, more importantly, I believe, because the basic postulates of the model are inconsistent with some main features of a monetary economy.

Friedman [23], in a powerful essay on the relation of the rate of inflation to the marginal rate of time preference, shows that if (1) individuals and capital last forever, (2) all prices are established in competitive markets, (3) the social cost of producing money is zero, (4) there are no nonpecuniary returns to assets other than money, and (5) no uncertainty about mean aggregate values, then the marginal rate of time preference and the saving rate are zero in every full equilibrium. Friedman's conclusions support Bailey's proposition about the effect of inflation on the equilibrium value of saving in long-run steady states. But, unlike Bailey, or my interpretation of his argument, changes in the rate of inflation affect present and future consumption by changing relative returns. At different maintained rates of inflation, society reaches equilibrium with a different capital stock and a higher or lower stream of nonmonetary goods and services.

As the discussion suggests, differences about the definition of income carry over to the definitions of consumption and saving used in the analysis of the effect of inflation on growth. For Tobin, money balances do not contribute to income, output, or consumption; money is unproductive, and saving is defined in the usual way as disposable income not consumed, $Y_d$, where $Y_d$ is real disposable income (per capita) and $s$ is the saving ratio. Because the services of money are excluded from output and changes in money are included in disposable income, as a transfer, changes in money alter the ratio of disposable income to output. Johnson [34, p. 172] adds all of the utility yielded by cash balances to the consumption of nonmonetary goods and services on the grounds that the services of willingly held cash balances are received by individuals who elected to hold cash. Johnson includes the utility yield as a part of the saving available for investment in nonmonetary wealth. Levhari and Patinkin [40] define consumption in the same way as Marty [43] and distinguish between consumption of the services of money and of nonmonetary wealth. The latter is physical consumption. On their definitions,

\[
Y_d = Y + \frac{M}{P} + \frac{\delta}{P} - \frac{\beta}{P};
\]
total consumption,
\[ C_p = (1 - s) Y_t, \]

physical consumption,
\[ C_p = (1 - s) Y_t \frac{M}{P} = (1 - s) (Y + \frac{M}{P}) - s \frac{M}{P}; \]

and physical saving,
\[ S_p = s Y - (1 - s) g - s \frac{M}{P}. \]

\( S_p \) is the amount of saving (per capita) available for investment in nonmonetary wealth and is the sum of three components, (1) the amount of output going to saving, (2) minus the share of income from capital gains going to real consumption, (3) plus the share of income just equal to the opportunity cost of holding money that goes to saving. From these definitions, we can obtain the real per capita value of total saving, \( S_t = Y - C_t \), and at time \( t \), wealth, \( A_t = A_0 + (s Y_t / g) [1 + \lambda (g + i)] e^{\epsilon t} \) with \( \lambda \) the ratio of real money balances to output, and \( \epsilon \) the Napierian constant. The subscripts on \( A_0 \) and \( Y_0 \) refer to the values of per capita wealth and output in some initial period.

Let \( Y_t = Y_0 e^{\epsilon t} \) and let \( \beta \) be the ratio of total saving to total output. \( S_t / Y_t = s [1 + \lambda (g + i)] \). Dividing \( A_t \) by \( Y_t \), we obtain the ratio of wealth to output toward which the economy moves as it approaches a steady state growth path.

\[ \frac{A_t}{Y_t} = \frac{\beta}{g} + \left( \frac{A_0}{Y_0} - \frac{\beta}{g} \right) e^{-\epsilon t}. \]

The first term on the right is the ratio of total saving to output divided by the growth rate of output per man. In the steady state, \( \beta / g \) and \( A_t / Y_t \) are equal. The second term is a disturbance term. If the rate of inflation, the effective labor force, or some other parameter changes, \( \beta \) rises or falls relative to \( g \). Equilibrium is disturbed and is not reestablished until, with the passage of time, the equality between \( A_t / Y_t \) and \( \beta / g \) is restored.

The equilibrium value of \( A_t / Y_t \) is the equilibrium "capitalization rate," the amount of wealth that must be held in money and real capital to produce a dollar of equilibrium real output. This ratio depends on the growth rate of output, the ratios of saving and real balances to output, and the market rate of interest. The higher are \( s \) and \( \lambda \), other parameters unchanged, the higher is \( A_t / Y_t \) and the equilibrium capitalization rate, and the lower is the equilibrium real rate of interest in the economy. Changes in the growth rate \( g \) affect the numerator \( (\beta) \) as well as the denominator of the ratio, so the effect on the equilibrium real rate of interest of changes in the growth rate requires further analysis.

**Inflation and Capital Accumulation**

The main conclusions drawn from the analysis of inflation and growth concern (1) the effect of monetary policy—changes in money and in the rate of inflation or deflation—on the capital-labor ratio, and (2) the effect of inflation on real variables, the neutrality of changes in monetary policy. A main policy conclusion concerns the existence of an optimal rate of inflation or deflation, and if it exists, the factors on which it depends. As can be seen from the ratios in the previous section, a change in the rate of inflation has several different effects on the equilibrium rate of interest. Higher rates of inflation increase \( \epsilon \), raising \( \beta \) relative to \( g \), raising the equilibrium ratio of \( A_t / Y_t \) and lowering the real rate of interest; if \( \lambda \) and \( s \) depend on \( \epsilon \) and thus on the rate of inflation, at higher rates of inflation there is a shift from money and saving to physical consumption. This shift lowers \( \beta \) relative to \( g \) and raises the equilibrium real rate of interest.

Using the definitions in the previous section and the assumptions that both physical saving and the demand for real balances (therefore \( s \) and \( \lambda \)) depend on the market rate of interest, Levhari and Patinkin [40] establish the conditions under which the combined effect of changes in the main-
tained rate of inflation raise or lower the equilibrium real rate, the steady state capital-output ratio, and the marginal product of capital. When money is treated solely as a consumer good, the net effect on the steady state capital-output ratio is indeterminate. The reason is that the direction of change in the capital-output ratio depends on the direction of change in the capital-labor ratio, and the direction of change in \( K/L \), in turn, depends on the direction of change in the steady state ratio of physical saving to output. Moreover, the direction of change in \( K/L \) and in the ratio of physical saving to output are interdependent, since any change in the capital-labor ratio affects the returns received by factors of production, thereby changing the real rate of interest, the desired rate of capital accumulation and the desired saving ratio. In addition, changes in the rate of inflation directly affect the ratio of physical saving to output.

Levhari and Patinkin show that inability to deduce the direction of change in the ratio of physical saving to output resulting from inflation is the principal cause of the indeterminacy about the effect on capital intensity. On their analysis, if the demand for money is interest inelastic, the capital-labor ratio and the physical saving ratio change in the same direction. Since there are diminishing returns to both factors and the production function is linearly homogeneous, the capital-output ratio rises or falls with the capital-labor ratio; the steady state marginal product of capital and the real rate of interest change in the direction opposite to the capital-labor ratio.

The response of the physical saving ratio to changes in the rate of inflation contains three components. One is the effect of a change in the desired composition of wealth. At the higher market interest rates due to inflation and an unchanged saving ratio, households shift away from money holding to physical saving and consumption. For a given rate of inflation, the size of the shift depends on the elasticity of the demand for money and the marginal propensity to save, but the direction of the effect is positive; the higher the rate of inflation, the higher the ratio of physical saving to output. A second component is the effect of inflation on the fraction of disposable income saved. Levhari and Patinkin assume that inflation reduces the fraction of disposable income saved and, since the composition of saving is considered separately, the ratio of physical saving to output falls proportionally. Their argument is that higher rates of inflation lower the return from real money balances and thus lower the value of the stream of future consumption services relative to the value of current consumption. However, the rise in opportunity cost is accompanied by a change in imputed income, since the Levhari and Patinkin definition of income includes the imputed income from cash balances, \((M/P)\). The third component of the response of the physical saving ratio allows for the change in imputed income. If the demand function for money is interest inelastic, inflation raises the imputed income received by holders of money and saving increases; if the function is elastic, saving and (imputed) income fall. Since output excludes the services of cash balances, the ratio of physical saving to output rises or falls with the change in saving. In general, the three effects of inflation on the physical saving ratio are not offsetting, so changes in the rate of inflation—and therefore in the rate of monetary expansion—are not neutral.

Levhari and Patinkin analyze money as a consumer good and as a producer good separately. Friedman [23] combines the two approaches to money; for firms, money is a producer good, held because it is productive; for households, money is a consumer good, held because it provides pecuniary and nonpecuniary services that contribute to utility.
Friedman's essay extends his earlier work on consumption in a moneyless economy [21] to a monetary economy and links the theory of consumption and the theory of money as separate, but related, parts of capital theory. Starting from the assumptions that I set out earlier and gradually relaxing restrictions, Friedman shows that any change in the maintained and fully anticipated rate of inflation must raise or lower the services yielded by money and change the rate of time preference for some individuals and the community. On his analysis, there is a rate of inflation that maximizes welfare—an optimum rate of inflation—and therefore an optimum rate of monetary expansion. Friedman does not show how the time path of consumption changes as the community moves from one equilibrium to another. He concludes, however, that in a stationary economy both saving and the marginal rate of time preference must be zero if nonmonetary wealth is held only for its pecuniary yield. In a growing economy, the saving ratio is a constant in long-run steady states, and presumably it is higher, the higher the rate of interest.

The main conclusions of Friedman's analysis depend on four propositions and the arguments supporting them. First, if there are no nonpecuniary returns to nonmonetary wealth, each individual must value a dollar of present and future consumption and a dollar of money balances identically at the prices prevailing in equilibrium; the marginal rate of time preference must be the same for every individual. This proposition is a consequence of the market process, under the stated assumptions. In equilibrium, each consumer values a unit of money at its cost, which may be zero for society, but for the individual is the amount of consumption sacrificed by holding money; out of equilibrium, individuals shift from money to nonmoney wealth or nondurable consumption until the marginal rate of time preference is equal to the pecuniary and nonpecuniary returns from holding a unit of money. If marginal rates of time preference differ among individuals, exchanges of money for goods at prevailing market prices increase welfare by shifting nonmoney wealth and consumption to those with high rates of time preference, thereby lowering their rates, and by shifting money to those with low marginal rates of time preference, thereby raising their rates. Exchanges continue until, at a full equilibrium, the marginal rate of time preference is the same for each individual and is equal to the market rate of interest on income-yielding assets. By a similar argument, the equilibrium marginal product of money to a firm must be equal to the equilibrium marginal rate of time preference and market rate of interest.

Second, in a stationary economy with a constant stock of money and a constant price level, where uncertainty does not affect mean values, where individuals and capital have infinite lives, and nonmoney wealth has no nonpecuniary return, saving and the marginal rate of time preference are zero at each full equilibrium. At any positive rate of interest, an individual can acquire an infinite stream of future consumption by sacrificing a dollar of current consumption. If there is diminishing marginal utility of present and future consumption, each exchange of present for future consumption lowers the marginal rate of time preference until the consumer regards the utility of a unit of current consumption as equal to the utility of a unit of future consumption. At this point all opportunities to increase the utility of consumption have been taken, so the utility of consumption is a maximum, and saving is zero. A zero marginal rate of time preference is thus a consequence of rational behavior in the stationary economy that satisfies the postulates of the model.

Third, if money is produced at zero cost and the stock of money is not constant but
rises or falls at a steady rate, the market rate of interest and the opportunity cost of holding money are not zero in the stationary state. At a nonzero opportunity cost of holding money, private costs and returns can be equal while private and social costs are unequal. Since the services provided by a unit of money balances changes in the same direction as the stock of wealth, rising in deflation and falling in inflation, wealth owners desire to hold less or more money at higher or lower maintained rates of monetary expansion. If the costs of producing and maintaining money remain zero by assumption, it remains optimal to reduce the nominal rate of interest to zero by providing a rate of deflation just equal to the real rate of interest. As Friedman notes, the same policy conclusion applies where the equilibrium real rate of interest is positive, for example, in a growing economy or under conditions of uncertainty.

Fourth, if the nonpecuniary yield on nonmonetary wealth is positive but less than the nonpecuniary yield on money, the market rate of interest no longer measures the nonpecuniary services of money. In equilibrium, the marginal rate of time preference now equals the sum of the pecuniary and nonpecuniary yields on nonmonetary wealth, or what is the same, the equilibrium market rate now equals the marginal rate of time preference net of the nonpecuniary return to nonmonetary wealth. In a stationary economy, exchanges between money, nonmonetary wealth, and current consumables continue until there are no opportunities for anyone to raise utility by sacrificing money and acquiring future consumption, or vice versa. Those for whom nonmonetary wealth has a relatively high nonpecuniary yield have relatively high marginal rates of time preference, and at a relatively low market rate of interest they save to accumulate nonmonetary wealth and receive the nonpecuniary return. Those with relatively low marginal rates of time preference dis-save at relatively high rates of interest. At some interest rate, the community reaches a stationary equilibrium at which net saving is zero, but it is no longer true that the marginal rate of time preference and the market rate of interest are driven to zero at this rate. Since by assumption it is still costless for society to produce and maintain money, a social optimum can be achieved by reducing the rate of interest to zero. At a zero rate of interest, the positive net nonpecuniary services of money become zero.

One implication of this analysis is that in a stationary economy optimal policy calls for keeping the market rate of interest at zero and the stock of money and the price level constant. As I stressed above, the implication is obtained from an analysis in which the cost of producing money is assumed to be zero. If there are changes in the demand for money, the price level rises or falls until the desired real balances are obtained and the market rate of interest returns to zero. If there is a positive marginal cost of producing and maintaining money, the rise in the demand for money draws resources into the production of money, the market interest rate rises, and the price level falls less than in proportion to the reduction in the demand for money. Of course, if the marginal cost of producing money is less than the value of the consumption goods or streams of income obtained by using money in exchange, there must be a limit to the production of money; the monetary base must be controlled. But, even with control, the market rate of interest rises, and banks are induced to pay higher interest rates or offer more services to obtain a larger frac-
tion of the monetary base, as in the analysis of intermediation above.

A main difference between Friedman's conclusion and the conclusion of other writers is not about the final equilibrium in a world peopled by individuals with infinite lives who have no reason for discounting the future, but about the effect of changes in the ratio of nonhuman wealth to income on the total amount of goods and services available to be consumed in equilibrium. Since humans cannot be purchased or sold, the discount rates applicable to the streams of income from the two sources most likely are unequal, and changes in the ratio of income to nonhuman wealth can affect consumption and the rate of capital accumulation. Most of the analyses of money and growth seem to take this difference in discount rates as a starting point, although they do not always make this point clear. I believe that differences in the response to changes in human and nonhuman wealth and in their respective rates of return may help to explain some of the commonly cited features of economic growth, such as the rise in financial assets relative to output.

Some Implications

Several years ago, there was considerable discussion of the desirability of making an explicit target rate of growth one of the goals of economic policy, and for a much longer time economists have discussed the desirability of stable prices. Analyses of the effect of inflation on growth have implications for both of these discussions and thus for the long-term aims of monetary policy and for the neutrality of changes in money. In this section, I mention these implications briefly to point out main conclusions.

First, a change in the quantity of money does not change any real equilibrium value in the models I have considered. The growth rate and capital-labor ratio that put the community on a steady state growth path do not depend on the price level and are unaffected by a once-and-for-all change in the price level. Unless monetary policy changes the rate of change of prices (or perhaps the expected rate of change), the long-term position of the economy is unaffected. The reason is that an increase or decrease in nominal money does not change tastes, opportunities, resources, knowledge, or expectations of income, so it cannot change the inter-temporal consumption plan or the demand for money.

Second, the more frequent are changes around a constant growth rate of \( M \), the higher the private productivity of resources devoted to managing cash balances and to predicting changes in money and prices. High variability of monetary policy draws resources from socially valuable tasks and generates expectations that will not be fulfilled if the mean growth rate is constant. This conclusion does not depend on the particular value of the growth rate of money or on whether the nominal stock is rising, falling, or remaining constant. It depends on the very low social cost of producing base money and increasing the size of the nominal stock of money, and on the higher social cost of the resources diverted to managing cash balances.

Third, the government can generally

\[ \text{As in the earlier part of the paper, I distinguish the cost of producing money from the cost of providing banking services. The positive social and private cost of providing more banking services is irrelevant for computing the social cost of increasing the nominal stock of deposits, and it is the latter cost that most writers set to zero.} \]
change the private cost of holding money by changing the rate of deflation until the utility yield or opportunity cost of holding money is equal to the cost of producing money. By doing so, the government removes any discrepancy that arises between private and social cost and some (or all) of the incentive to devote resources to the management of cash balances. The more complete analyses do not show whether the increase in welfare is accompanied by a change in the stream of lifetime consumption of nonmonetary services. Conceivably, the gain in consumption resulting from the increased services of cash balances can be more than offset by a reduction in physical consumption if the change in the rate of inflation lowers the growth rate of consumption and output.

A particularly interesting case occurs if the equilibrium growth rate is less than the real rate of interest. In this case, the dependence of the capital-labor ratio on the rate of inflation provides monetary policy with an opportunity to increase welfare and raise present and future consumption, as Tobin has noted [63]. By providing the wealth, in the form of money balances that the community desires to hold, the capital-labor ratio is forced down and the marginal product of capital increases. Society is able to move to a “golden rule” point, i.e., a point at which the real rate of interest and the growth rate are equal to the nominal rate of interest. In this case the optimal monetary policy is one that maintains this steady rate of monetary growth.

Fourth, the above discussion shows that changes in the growth rate of money or in the rate of inflation are not neutral in a growing economy if neutrality is defined as the absence of an effect on any real variable. The discussion also suggests that it may be useful to distinguish between the effect of changes in the rate of inflation that (1) change disposable income and total consumption by equal amounts and (2) affect consumption and real capital accumulation. Theoretical analyses of the effects of inflation on growth do not tell which of these is the more relevant. The answer depends, in large part, on differences in the response of lenders and borrowers, differences in the capitalization rates applied to human and nonhuman wealth, the treatment of windfall gains, and the willingness of individuals to apply the same rate of discount to income expected in the near-term and in the more distant future.

Fifth, most participants in the discussion agree that in practice there are probably limits to the rate of deflation that can be achieved without major changes in popular views about the nature of progress. The limit most often suggested reflects the widely held view that workers and consumers do not regard an increase in real income produced by a smaller fall in factor prices than in product prices as equivalent to the same rise in real income produced by rising factor and product prices or constant factor prices and falling product prices. Since all the price changes discussed are fully anticipated by assumption, most writers suggest that the difference is due to the cost of adjusting from inflationary to deflationary progress. If there is asymmetry between inflation and deflation, wise policymakers should err on the side of avoiding deflation or at least deflation of factor prices. Aside from the early 1930s, there are few periods of prolonged deflation for which we have reliable data, but the importance of the proposition for monetary theory and policy suggests that it is worthwhile to exploit these data more fully than we have.

Most writers conclude that the required rate of deflation can be reduced, and the need for deflation might be eliminated if banks were permitted to pay interest on deposits. This policy change is desirable, although I doubt that the payment of interest on deposits would have much effect on the size of the return received by depositors.
The main effect would be to release some resources now used to furnish non-pecuniary services and to reduce the cost of searching for preferred combinations of banking services. A far more important change, I believe, is the elimination of restrictions on entry and branching in the banking industry.

Conclusion

This lengthy summary and critique of work on the relation of money to intermediation and growth is evidence of the activity and progress mentioned in the introduction. Both areas have been active, and in both, research has permitted a number of substantive conclusions to be reached. Since many of these conclusions are summarized at the end of previous sections, I will not repeat them. Instead, I comment on some tendencies in monetary theory related to those I discussed in the text.

One significant shift in emphasis and approach is the treatment of money as an asset held because it is productive and/or because its services provide utility. Writers such as von Mises emphasized the utility of money in the past, but his view differs in several respects from the current view and has not been accepted. On the other hand, present-day analysis attributes the productivity of money or the utility of money services to the avoidance of stochastic uncertainty, as in Patinkin [50], or relies on undefined terms such as "liquidity" to account for productivity or utility. Neither approach seems entirely desirable, the one because it takes the individual's payment schedule as fixed, the other because it fails to provide a rationale for holding and using money. A by-product of the failure to treat money as a productive asset is that the services provided by money are excluded from output. Many of the problems that have concerned monetary economists recently are a result of this convention, as my survey suggests.

Past failure to treat money as a productive asset focused attention on the alleged advantages of holding assets other than money and prolonged discussion of the role of intermediation. Much of this work ignored the factors affecting the amount of money supplied, such as the monetary base and the demand for currency relative to deposits. The latter has been an important influence on money and its rate of change during cycles, as Fisher explained [17] and Cagan reaffirmed [11], and an important source of the divergence in the rates of change of money and bank credit during cycles [9]. Failure to analyze changes in currency has limited our understanding of the feedback from real to monetary factors during cycles. Lack of knowledge of the determinants of the demand for currency remains one of the large gaps in our understanding of the interaction of monetary and real variables during cycles.

Cyclical changes in the demand for currency relative to total commercial bank deposits take place against a declining long-term trend in the ratio of the two. The early trend reflected changes in the productivity of the banking system that permitted banks to offer more services and to attract more deposits. Increased productivity enabled the banks to draw a larger portion of the monetary base away from currency and into reserves, thereby gradually but steadily raising the ratio of inside to outside money. Changes in the currency ratio during the expansion phase of cycles are opposite in direction to long-period changes and may reflect expectations about future expenditures, changes in payments schedules, or changes in the relative cost of making payments using demand deposits and currency. Each of these channels suggests a link between the composition of the stock of money and the behavior of the economy during cycles that has not been explored as fully in recent econometric studies of the demand for currency [13] [15] [55] or in the theory of cycles as it was in the past [17].
Most of the work I have discussed in this paper ignores differences between the rate of consumption and expenditures for consumption and disallows any difference between expected and actual rates of price change. Divergences between expected and actual prices are permitted only for the instant during which the growth rate of money changes. Much of the recent work on the role of money during cycles makes the effect of changes in money on output depend on the deviation of actual from expected price changes. If price changes were fully anticipated, as in the theory of growth, desired and actual money balances would coincide and this main cause of cyclical change would be removed. Recent work by Cagan [10], Lucas and Rapping [41], Meiselman [44], and Phelps [52] [53], when combined, suggests that if expected and actual rates of price change coincide, market rates of interest, the demand for real balances, wages, and prices would adjust, so that there would be little if any effect on output and employment. On this reasoning, the very high cost of acquiring information and anticipating price and output changes not only prevents rapid adjustment of expectations but explains why the currency ratio, the saving ratio, and capital accumulation are affected, temporarily or permanently, by changes in money or its growth rate. The outline of an integrated theory of growth and cycles, in which expectations differ from actual rate of change, can be dimly seen emerging from a combination of this work with the work on growth discussed here. Such an outline promises to be an important step in the development of monetary theory and can be expected to maintain or further accelerate the rate of progress.

References
16. DeFanti, "Keynesian Monetary Theories, Stabilization Policies and the
Meitzer: Money, Intermediation, and Growth

43. ———, "The Optimal Growth Rate of Money," J. Polit. Econ., 1968, 76 (suppl.).
45. A. H. Meitzer, "The Behavior of the
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