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MONETARY POLICIES AND THE ECONOMY--THE TRANSMISSION MECHANISM

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My subject tonight is the process by which monetary policies are transmitted into changes in expenditures for Gross National Product. My account will be selective, and far from complete. I will concentrate on certain links between financial variables and demands for goods and services. I will say relatively little about the other part of the story, how the various instruments at the disposal of the central bank affect the financial variables. I don't have time to do both, and the proximate mechanisms of monetary control seem to me to be less important and less controversial.

As to controversy, it will be clear to you that I am presenting an account of the transmission process which is an alternative to monetarism. But I have, for the most part, resisted the temptation to point out the differences of view, preferring to let you the listeners infer them from my exposition of my own theories. It will suffice to remark at the outset that I clearly do not subscribe to the prevalent view that what the central bank does is to control the money supply, which in turn determines money income and prices. I would say instead that the central bank controls some short-term money-market interest rates and/or reserve aggregates and that these variables simultaneously affect other interest rates and financial quantities, GNP expenditures, and monetary aggregates.

Much of what I shall argue is not new but old-fashioned. I refer particularly to the attention I shall give in the second and third parts of the paper to credit, as distinct from money, i.e., to the asset, as well as the liability, accounts of commercial banks and other intermediaries. The first section concerns the link between asset valuations and capital spending. The second section deals with ways in which credit availabilities affect the spending of liquidity-constrained households and firms. The final section concerns some implications of the role of commercial banks in financing the working capital requirements of business customers.

Asset Valuation and Capital Spending.

In 1965 the bond and stock markets valued the real capital of U. S. nonfinancial corporations at almost 170% of its replacement cost. In 1974, the same ratio was 75%.^{1/} In 1966 fixed nonresidential investment was 10% of the capital stock, valued at replacement cost. In 1975, it was 8%. The figures are illustrative of a general positive correlation between the market value/replacement cost ratio and the rate of investment.

The correlation is scarcely surprising. As Keynes wrote in The General Theory,

"...the daily revaluations of the Stock Exchange, though they are primarily made to facilitate transfers of old investments between one individual and another, inevitably exert a decisive influence on the rate of current investment. For there is no sense in building up a new enterprise at a cost greater than that at which a similar existing enterprise can be purchased; whilst there is an inducement to spend on a

new project what may seem an extravagant sum, if it can be floated off on the Stock Exchange at an immediate profit." ^{2/}

The ratio of market value to replacement cost is a summary measure of one important impact of financial markets on purchases of goods and services, in particular durable goods. I have, not very imaginatively, called the ratio q , and a couple of irreverent former students have given me a gaudy T-shirt with the legend "q is all that matters" in front and the team identification "Yale School" in back. Well, q is not all that matters, but it does matter. I would say the same for M .

In equilibrium q has a normal value -- 1 in a purely competitive economy with constant returns to scale, -- which sustains capital replacement and expansion at the natural growth rate of the economy. In practice, even leaving aside statistical quirks, the normal value exceeds 1 by the capitalized value of rents or monopoly profits. In the short run, events, policies, and expectations move q up and down, creating or destroying incentives for capital investment. Among those determinants is monetary policy. It is certainly not the only factor. But whether the central bank is seeking to influence investment spending on its own, or merely to counter other disturbances, q is an indicator it should watch.

The theory is simple and straightforward. One way to look at q is that it represents the comparison between, on the one hand, the marginal efficiency of capital, the internal rate of return on investment at

its cost in the commodity markets, and on the other, the financial cost of capital, the rate at which investors discount the future returns from such investment. In pages of the General Theory other than the one cited, Keynes gave the misleading impression that investment is inversely related to the level of "the rate of interest." His condition that the marginal efficiency of capital equal the interest rate determines the equilibrium stock of capital. In such a long-run equilibrium, net investment will be zero in a stationary economy, or in a growth equilibrium enough to expand the capital stock at the natural growth rate. In Keynesian short runs, marginal efficiency of capital and interest rate diverge. Investment is related to the difference or ratio of the two rates rather than to their absolute levels.

How can they ever diverge? Why doesn't arbitrage always close instantaneously any incipient gap between the present value of returns from investment projects, calculated with market discount rates, and their cost? What keeps the rate of investment within finite bounds when q exceeds one, or above zero when q falls short? Why, in other words, is the stock of capital ever out of equilibrium relative to the interest rate?

The answer surely is that investment takes time and that the acquisition and installation of capital goods costs more, both on average and on the margin, both for individual firms and the economy at large, the faster the capital stock is expanded. If these adjustment costs are added to the normal costs of the capital goods, then a q -like ratio so calculated may always be 1, but it takes variation in the speed of investment to keep it so. I trust

that this explanation will satisfy purists who cannot bring themselves to believe that arbitrage opportunities can stand, even temporarily, as incompletely exploited incentives. Personally I think that can happen, simply because it takes time for those individuals and bureaucracies in a position to exploit such opportunities to act.

An economy-wide calculation of q conceals the immense variation of the ratios for individual firms and diverse capital goods. When aggregate q is low, many firms and many kinds of capital bear q 's which discourage all gross investment, even for replacement. But gross investment cannot be negative. The frequency of firms in this position is smaller when aggregate q is high. This non-linearity of aggregation reinforces the economy-wide relation of investment and q .^{3/}

What is "the interest rate" whose divergence from the marginal efficiency of capital regulates investment? It is the discount rate implicit in the market valuation of securities which are claims to the capital stock and its future earnings. It is a rate appropriate for valuation of streams of future returns with the time patterns, uncertainties, and covariances of business cash flows. It is not the interest rate on long term government bonds, or even on long term corporate bonds, or any other interest rate on fixed-money-value contracts. Here Keynes in the General Theory misled readers who took literally a convenient simplifying assumption. Since businesses are at least partly financed by shareowners, the rate required to induce them to take the risks of equity capital is clearly relevant.

The true financial cost of capital is some combination of bond, equity, and other rates. It cannot be represented by any single rate. The full cost of bond finance, for example, cannot be calculated without allowing for the effects of additional indebtedness on share prices. We do not have to follow Modigliani and Miller in their contention that one financial structure for the corporation is as cheap as any other. All we need is the proposition that if the optimal allocation of finance among equity, bonded debt, and other liabilities has been attained, the cost of additional finance on the margin is the same for all financial sources in use. Since the optimal financial structure will differ from one firm to another, so will the relevant mix of market rates.

How does the central bank affect the cost of capital and q ? Its influence is indirect but powerful. It operates through a chain, or network, of asset substitutions. Corporate bonds and equities are imperfect substitutes for each other and for other assets in the portfolios of many investors. The other assets include deposits in banks and other intermediaries, and short-term Treasury or commercial paper. The central bank operates in the first instance on the rates on short-term fixed-money-value instruments. Via portfolio substitutions, affected both by the current levels of these rates and by expectations of their future paths, monetary operations are transmitted to bond rates and equity yields.

The linkage is loose, and there is plenty of opportunity for slippage. Events and shocks other than monetary policies affect the cost of capital.

Consider, for example, increase in generally perceived uncertainties of business earnings, or diminished willingness of investing individuals and institutions to take these risks. The cost of capital will rise, q will fall, independently of monetary policy. Of course, the ratio q will also vary, independently of monetary policy, as estimates of future earnings change. These are systematically related to other economic variables, but Keynes rightly emphasized also the subjectivity and volatility of the marginal efficiency of capital.

Business firms making investment decisions are interested in the q for specific incremental investments, not in the average q for the firm, much less for the whole economy. The relevant comparison is this: An investment costing a million dollars in the commodity markets is considered. When the prospective earnings are evaluated by the securities market, will they add at least a million dollars to the value of the firm? If so, the investment can be undertaken -- financed by some combination of security issues and retained earnings -- without decreasing, but possibly increasing, the equity of the existing shareholders.

It is easy to imagine cases where marginal q 's differ from average. Indeed if capital investment were generally Schumpeterian in nature, embodying new processes or products that render existing capital, perhaps also existing firms, obsolete, this would typically be the case. Less dramatic examples are the following: Increases in energy costs or anti-pollution standards simultaneously lower the average q 's of energy-using

industries while raising the marginal q 's for energy-saving or environmental-protecting investments. An increase in tax credit for new investments raises marginal more than average q 's .

Since it is average q 's that can be most easily estimated statistically, their usefulness depends on a reliable relationship of average q 's to unobserved marginal q 's . Confidence in such regularity will be much greater if most investments involve capital goods which are close substitutes for existing stocks. This is an empirical matter. Econometrically, there is a good relationship of investment to q 's, with lags distributed over eight quarters and with an elasticity of about $.8$ ^{4/}.

As previous remarks already suggest, we make an even stronger abstraction of aggregation in speaking of one " q " for the economy as a whole than in speaking of "the rate of interest." Estimating q 's for a cross section of individual companies with listed stocks, my colleague William Brainard and I found the standard deviation to be only slightly less than the mean value.^{5/} The concept can also be applied outside the corporate sector. Existing houses, for example, are traded and valued in a thriving market. The valuations presumably reflect a capitalization of future net rentals, actual or imputed. The incentive for new building can be measured by comparing the value of old homes with the cost of building new ones. The new ones won't be duplicates of the old, but will be close functional substitutes. We could expect residential investment to be sensitive to the housing q . Probably, as Keynes suggested, the valuation

of houses depends on expected rentals and the mortgage rate; but other factors -- rationing of mortgage credit, taxes, expected inflation in real estate prices -- are also relevant. A similar mechanism applies for automobiles and other consumer durables.

I turn now to the effects of inflationary expectations on q . The first approximation is that there are none. This answer applies for a change in expected inflation which applies to the future prices of all commodities, does not alter expectations of relative prices or other real magnitudes, and is fully reflected in nominal interest rates and discount factors. After all, the goods value of claims to goods should be independent of the money price of goods. But there are several other factors leading to somewhat contradictory modifications of the first answer. Given the real quantity of money or of the monetary base, an increase of expected inflation lowers the real interest rate on money, pulls other real interest rates down in sympathy, and raises q . The neutrality of the conventional story -- which says that nominal interest rates rise point-for-point with expected inflation -- requires restrictive monetary intervention by the central bank. There are other reasons why a change in the inflation rate will not be neutral, given the overlap of debts, tax valuations, and other dollar magnitudes geared to the old inflation rate. One reason for non-neutrality of great current relevance in the United States is the following: If the public believes that inflation will induce strong deflationary counter measures by the central bank, it is understandable why inflationary news is bad for the stock market and for q .

One warning I would like to emphasize: Naive calculations of Fisherian real rates of interest are very unreliable indicators of financial incentives for real investment. It is easy to subtract moving averages of inflation rates from nominal interest rates on bonds, bills, and loans and obtain zero or negative real rates. The fallacy is the implicit assumption that at those nominal rates actual live borrowers have, or perceive themselves as having, operational opportunities to earn without risk dollar returns equalling or exceeding those rates of inflation. If such opportunities had been available during recent double-digit inflation, there would not have been a stock market collapse which took q down to .7 or a collapse of residential construction. It is not in fact possible to invest in the GNP Deflator or to hoard the basket of goods, services, and taxes valued by the Consumer Price Index. Moreover, I repeat my earlier point that the absolute level of interest rates is of no particular consequence by itself. It is important only in comparison with the marginal efficiency of capital. Although this is in the long run governed by such fundamental factors as technology and capital/labor ratios, in the short run it is, as Keynes emphasized, a highly variable and psychological magnitude. It is hard to imagine any proposition more divorced from experience than the currently fashionable proposition that marginal efficiency of capital and real interest rates are always equal to each other and constant.

Liquidity Constraints and Credit Policy.

In the theory I have just outlined, I have spoken as if savers and investors choose freely among alternative financial and real assets, taking long or short positions constrained only by their net worth and the balance sheet identities. I also assumed implicitly that asset markets are cleared by adjustments of asset prices and yields. While I do not think the story I told is misleading, it does miss important features of the transmission of monetary impulses to demands for GNP. The features I have in mind fall under the general heading of liquidity constraints.

An individual is potentially liquidity-constrained if he possesses wealth which he can spend only at certain dates in future, or if he can substitute current for future spending only at an interest cost in excess of what he can earn by postponing spending. Effective liquidity constraints are the combined effects of two things: (1) the nature of certain forms of wealth and of the markets, if any, in which they are traded, and (2) the time and risk preferences of the wealth-owner. For example, human capital is an illiquid asset; for good reasons, the opportunities for borrowing against, or selling shares in, future labor incomes are extremely limited. Most workers, nonetheless, are not liquidity-constrained; they would not choose to mortgage future wages even if they could do so at prevailing interest rates; they voluntarily choose a lifetime consumption pattern which implies positive net worth in non-human capital. But many households, mainly the young and the poor, are at

corners of maximum current consumption; they would borrow more and spend more today if they could. Prospective social security benefits and other retirement pensions are another illiquid asset; many workers can consume such wealth now by restricting other kinds of saving, but for many others payroll taxes and pension contributions fall fully on consumption.

Over the past thirty years, some structural trends in our financial system have increased the likelihood of liquidity constraints, and others have reduced it. In the first category is the vast increase in compulsory or semi-compulsory provision for retirement. In the second is the increased availability of mortgage credit and consumer credit, both of which by making homes and consumer durables more liquid assets serve to increase the intertemporal fungibility of wages and salaries. Home mortgage debt has risen from 20% to more than 40% of the value of the housing stock, and in a number of recent years mortgage indebtedness has risen by more than the increment in value of the stock. Outstanding consumer credit has risen from 15% to 60% of the value of the stock of consumer durables, and the fraction of new purchases covered by new debt is now $2/3$ instead of $1/3$.

Liquidity-constrained consumers behave as if they have short horizons, measured in weeks or months or years rather than decades or lifetimes. They will spend any increment of liquid resources within those short horizons, rather than diluting the impact by spreading the resources thinly over many years. That is why tax reductions, even if temporary, are more powerful than

is implied by a model which relates consumption solely to fully fungible lifetime wealth. That is why the distribution of tax cuts, rebates, and other windfalls has an important bearing on the strength of the consumption response.

More to our present point, that is why monetary policies and events which relax or tighten liquidity constraints are especially powerful, beyond what would be expected by considering marginal responses to changes in interest rates and asset prices. Liquidity-constrained borrowers spend every cent they are permitted to borrow, or every cent they can raise by asset sales; they do not require the inducement of lower interest rates, and they are not borrowing just to reshuffle their portfolios of financial assets and liabilities. There are several mechanisms at work here. I give three examples. (1) Lending institutions adjust down payments, collateral requirements, amortization speeds, and credit standards as their own costs of funds vary. (2) The terms of trade credit, and their enforcement, vary in the same way. (3) There are always some individuals who by circumstances or choice are spending the proceeds of liquidity or borrowing against variable-price assets; the amount of their spending depends directly on the value of those assets, which in turn depends on monetary policy.

Many businesses, like many households, are liquidity-constrained. The pace of their real investment, whether in working capital or fixed capital, is limited by their cash flow and the credit they can obtain. Their own estimate of the marginal efficiency of such capital exceeds the interest

rate on such loans. Perhaps they are unobjectively optimistic; perhaps they are risk-lovers instead of risk-aversers. In any case their borrowing is limited by collateral and margin requirements rather than by rates. Credit rationing is not necessarily a market imperfection. It is intrinsic to the difference of perspective between lender and borrower. As the lender cannot really control the borrower's use of the funds, there is no way the lender can make an actuarially sound loan simply by setting interest rates and letting the borrower decide how much to take. The implication is that there is almost always an "unsatisfied fringe of borrowers" at existing rates, and these borrowers are sure spenders. When easy money conditions diminish the cost of funds to banks and other lenders, extra lending to venturesome entrepreneurs is a powerful effect. An indirect mechanism by which risk-loving and liquidity-constrained businesses obtain finance, in amounts which likewise vary with general monetary conditions, is through trade credit extended by suppliers or customers who have credit ratings more acceptable to banks and other institutional lenders.

These mechanisms illuminate some phenomena of credit markets which participants in those markets understand much better than monetary theorists. A "credit crunch" is not just a time of high and rising interest rates. It is a time when some business customers of commercial banks find that they cannot fully use the credit lines they thought they had, that they cannot obtain the timely accommodation they presumably had paid for by good deposit behavior in the past. They are liquidity-constrained all of

a sudden, in the sense that they need credit to carry out their investment and financial budgets. Of course many priority loan customers are partially or fully accommodated. They then displace mortgage and consumer credit applicants, many of whom are also liquidity-constrained. The upshot is that reductions in spending are exceptionally large for the interest rates nominally quoted.

The futility of "pushing on a string" is a refrain regularly heard from central bankers around cyclical troughs. It's not a very good excuse for inaction if possible futility is the worst that can be said of an aggressive easy credit policy. But the refrain does make some sense. Just as the prevalence of liquidity-constrained unsatisfied borrowers in booms augments the power of tight money and credit crunches, so the relative absence of such borrowers in depressions and deep recessions weakens expansionary monetary policy. There is some merit to the view that in those times few credit-worthy households or firms are limiting spending for lack of liquidity. Once the system is thrown back on the marginal responses of unconstrained agents to reductions of interest rates, the gains from monetary actions are much less dramatic.

Commercial Banks as Financial Intermediaries.

These observations lead me to a general point about commercial banks, which are after all the institutions through which monetary policies are transmitted in the first instance and the institutions whose liabilities are the major component of money stock. Like other intermediaries, their business is to borrow from one set of people and lend to another. Their

liabilities are tailored to the needs and preferences of their depositors, for safe, liquid, convenient, divisible, negotiable, fixed-money-value assets. Their assets are tailored to the needs and preferences of their borrowers, longer in maturity and often risky, lumpy, and illiquid. The function which banks and other intermediaries perform is to accommodate the borrowers at lower cost and easier terms than they could get by direct loans from the ultimate lenders, the depositors. Via the fractional reserve system, the central bank controls the availability and cost of credit to bank borrowers. It also controls the aggregate scale of banks' assets, and given the balance sheet identity, their monetary liabilities. The two sides of the T account rise and fall together, and it seems to me gratuitously one-sided to say that the importance of the banks' intermediary operations lies solely in the scale of their monetary liabilities. It is equally unfortunate to ignore the similar magic of transformation accomplished by intermediaries whose liabilities are arbitrarily defined as near-money rather than money.

Let me remind you of the tremendous change in the nature of commercial banking that has occurred since the second world war, a change which is really a return to the historic role of commercial banks. In 1950, loans to private borrowers were only a third of deposits, business loans less than a fifth, and half of deposits were invested in Treasury securities. In 1970, loans to private borrowers were almost 3/4 of deposits, business loans about 30%, and Treasury securities had dwindled to 1/8. At the earlier date the banks were, in effect, custodians, simply saving depositors the

trouble of holding government debt directly. Now the banks are monetizing, if you like, the debts of many private businesses and households who would otherwise be accommodated, if at all, at much higher rates. The real effects, both average and marginal, on GNP spending are certainly much more substantial.

The distinctive business of commercial banks is to finance the working capital of business, specifically their inventories of materials, goods in process, and finished products, the wages they must disburse prior to selling the produce of their labor, and their accounts receivable. To the extent that working capital is financed by bank loans, businesses can use their open-market sources of debt and equity capital to finance long-term capital accumulation. The working capital positions of individual businesses fluctuate seasonally and cyclically in many diverse patterns. In considerable degree, banks are the vehicle through which the temporary surpluses of some businesses, deposited in banks, finance the temporary deficits of others. In addition, of course, banks mobilize in deposits the fluctuating working balances of households.

The reciprocal relationship of business customers to banks, sometimes as depositors, sometimes as borrowers, is a central fact which exclusive emphasis on monetary aggregates obscures. The size of business deposits cannot be explained by transactions needs alone. As is well known, deposits are payment for credit lines and credit accommodation when needed. The compensatory arrangements vary considerably in formality and tightness,

but no one can doubt that they are there. It follows that holdings of deposits will be related, not just to the variables conventionally included in money demand relations, but also to past, present, and prospective use of bank credit by business depositor-customers, to the size of compensating balance requirements, and to the difference between the prime rate and the open-market commercial paper rate. I suspect that this relationship is a major part of the explanation of recent increases in the velocity of M_1 , which are otherwise surprising. Over the past two years, until just recently, commercial lending by banks has declined, even in dollar value, partly because of the severity of the recession, partly because both business and banks have been shifting to more cautious and liquid balance sheets. The banks have allowed the differential of prime above the commercial paper rate to widen drastically. If this is correct, and if the process has run its course, the pleasant surprise which kept the Federal Reserve's conservative monetary growth targets from raising interest rates during the recovery to date may not recur in the coming year.

Let me conclude with some possibly controversial propositions that summarize my message. The institutional fact that our monetary supplies are predominantly "inside" rather than "outside" money is far from trivial. The system behaves quite differently from one in which monetary liabilities are subject to 100% reserves. When banks and other intermediaries monetize private debts, and indirectly the real capital asset holdings those debts

finance, their economic impact is quite different from monetization of federal debt. Indeed inside money is, in this sense, more powerful stuff than outside money.

Attention to the process of financial intermediation has other implications, derived from the inevitable realization that borrowers and lender-depositors are different in economic behavior. The celebrated Pigou effect concerns the impact on spending of changes in the purchasing power of fixed-money-value assets. When the public is treated as homogeneous, and inside debts and credits are washed out, the base for the Pigou effect is reduced to the high-powered monetary base, the non-interest-bearing demand debt of the central government. But the neutrality assumed in the washing out of inside debts and credits is very implausible. Debtors are intrinsically bigger marginal spenders than creditors, and in this degree the effects of price level changes run counter to, and may dwarf, the conventional effect on the real value of the monetary base. In this observation I follow my great Yale precursor Irving Fisher, who emphasized the effect of price deflation on debt burdens as a factor intensifying, not cushioning, the depression.

A second implication of the approach I have sketched is that the effects of an expansion of monetary aggregates depends on how it is brought about. Here is another and final example. A common feature of various definitions of money is that the included assets have legally controlled interest rates. It is possible, therefore, to increase their supply by raising these rates, e.g. by allowing interest on demand deposits

and lifting ceiling rates on savings deposits. Anyone who thinks an expansion thus induced has the same effects as one stimulated by open market purchases is mistaking appearance for substance. There really is no substitute for analysis which does justice to the significant institutional complexities of our monetary and financial institutions and markets.

FOOTNOTES

- 1/. These are estimates made by Professor John Ciccolo of Boston College. The estimates of the Council of Economic Advisers, published in the 1977 Economic Report of the President are 136% for 1965 and 84% for 1974. The two series agree in general countour, but the CEA series has smaller variance.
- 2/. J. M. Keynes, The General Theory of Employment, Interest, and Money, p. 151.
- 3/. For more discussion of the relationship of q to investment and for some disaggregated estimates, see "Asset Markets and the Cost of Capital", J. Tobin and W. C. Brainard, in: Economic Progress: Private Values and Public Policy (Essays in Honor of William Fellner), Richard Nelson and Bela Balassa, eds., North-Holland Pub., Amsterdam, 1977, pp. 235-262.
- 4/. This result is due to John Ciccolo, Four Essays on Monetary Policy, unpublished Ph.D. thesis, Yale University, 1975, Essay III.
- 5/. Tobin and Brainard, op. cit.