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James Tobin's Contributions to Economics

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I. Introduction**

Keynes wrote: "In the long run we are all dead." This perceptive comment is often usefully quoted in discussions on economic policy. It has force in such debates because it is so obviously unassailable as an observation about an individual's ability to share in the general fruits of economic life. Fortunately it is totally false as an observation about an individual's ability to contribute to the welfare of society. The contribution of science to human welfare rests on the ability of current scholars to build on the contributions of their predecessors, and to lay the foundations for the contributions of the next generations. Ideas are not mortal.

James Tobin's scientific contributions amply illustrate this general principle. He has consistently and effectively extended the work of other scholars, and without question his own work provides a framework to which economists (including Tobin himself) will profitably add in the future. But his work also stands on its own, providing highly original insights into the problems with which economists have been preoccupied, and defining new areas and directions for scientific endeavor.

Perhaps fittingly, Tobin has built on the work of Keynes himself, obviously being much influenced by Keynes' ideas on wage formation and

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** Biographic footnote: James Tobin was born in Illinois in 1918. He graduated from Harvard in 1939 and continued there for post-graduate studies from 1939–41. He served as an economist in Washington (1941–42) and then as a line officer in the U.S. Navy (1942–46). He returned to graduate studies in 1946; in Cambridge he met and married Betty Ringo. After receiving his Ph.D. from Harvard in 1947 he became a Harvard Junior Fellow for three years, spending the last year as a visitor to the Department of Applied Economics in Cambridge, England. In 1950 he moved to the Economics Department at Yale, with which his name has become synonymous. He became Sterling Professor at Yale in 1957, and has served two terms each as Department Chairman (1968–9 and 1974–8) and as Director of the Cowles Foundation for Research in Economics (1955–61 and 1964–5). In 1961–62 he was a member of President Kennedy's Council of Economic Advisors.

unemployment; uncertainty and expectations; liquidity preference; the determinants of investment and its role in fostering the business cycle; and on the role of government policy. Tobin's early work also reflects the influence of his teacher at Harvard, Joseph Schumpeter, and of other prominent economists including Alvin Hansen, Sir John Hicks, Abba Lerner, and A. C. Pigou. As I will argue in this essay, Tobin has raised the general level of analysis used in macroeconomics. He has improved both the answers we have and the questions we ask. He has provided a framework which economists can build on and contribute to for many years to come.

James Tobin is an economist's economist. His contributions range over the entire spectrum of modern economics. He has made fundamental contributions to pure economic theory; indeed his early work on the mean–variance approach to portfolio choice[1] not only constituted a major contribution to the core of economic theory but can be argued to have fostered a whole new discipline—the theory of finance. He is perhaps most widely known for his writings on monetary theory and macroeconomics, and for his work on the theory and practice of stabilisation policy. But he has also made contributions that extend beyond the domain of mainstream macroeconomics. He has developed new statistical techniques to deal with discrete and limited dependent variables;[2] analysed the informational content of survey data and their use for forcasting;[3] pioneered in the use of pooled time-series and cross-section data;[4] contributed papers on poverty which are now considered to be classics;[5] written widely in the popular press on issues of political economy and social policy; and contributed to a number of other fields in economics. In addition, he has been actively involved in service to the profession and the public: he served on President Kennedy's Council of Economic Advisors (1961–62); he has regularly testified before key U.S. Government committees; he was the first director of the Cowles Foundation after its transfer from Chicago to Yale in 1955; he has served the American Economics Association in many capacities, including Presi-

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[1] "Liquidity Preference as Behavior Towards Risk", *Review of Economic Studies*, Vol. XXV, No. 67, 1958.

[2] "The Application of Multivariate Probit Analysis to Economic Data", Cowles Foundation Discussion Paper No. 1, 1955; and *Comment, The Measurement and Behavior of Unemployment* (National Bureau of Economic Research, Princeton, 1957), pp. 596–600.

[3] "On the Predictive Value of Consumer Intentions and Attitudes", *Review of Economics and Statistics*. Vol. XLI, February 1959, No. 1, pp. 1–11.

[4] "A Statistical Demand Function for Food in the U.S.A.", *Journal of the Royal Statistical Society*, Series A, Part II, 1950, pp. 113–141.

[5] "Raising the Incomes of the Poor", in *Agenda for the Nation*, Brookings Institution, Washington, D.C., 1968, pp. 77–116; and "The Case for a Negative Income Tax", *Money and the Poor: Public Welfare, the Negative Income Tax, or What?*, Proceedings of a Conference co-sponsored by the University of Connecticut Schools of Law and Social Work, February 3, 1969, pp. 60–67.

dent in 1971; and he acted as chairman of a committee which examined Puerto Rico's economic problems in 1974–75.

To discuss Tobin's entire contribution in detail would clearly be excessive and would require much more time and space than I have been allocated. Hence I shall focus on a specific subset of the areas to which he has contributed. First, I discuss what are probably his best known contributions, those pertaining to monetary theory. This section includes a discussion of his fundamental early work on portfolio balance and risk; as I argue below, if one had to choose to identify Tobin's single most important contribution, this would undoubtedly be it. Further, as this work implicitly forms the basis for much of his later writings, it is useful to discuss it at the beginning.

I then turn to his papers in macroeconomic theory, focussing on his writings on wage determination, on the transmission mechanism, and on money and economic growth. A recurrent theme in this section is the development and application of a "general equilibrium" framework based on the principles of portfolio balance.

Finally, I evaluate his contribution to our understanding of the role of stabilization policy, focussing in particular on his participation in the debate on monetarism. Although this section may go beyond the bounds of evaluating "scientific contributions", it is included in the belief that any review of Tobin's work would be incomplete without it.

While this "piecemeal" approach appears to be the only feasible approach, I nevertheless follow it with considerable hesitation. In two important senses it is at complete odds with Tobin's approach to the subject. First, as his theoretical work stresses, the correlations between the items in a portfolio are an important aspect of evaluating the whole portfolio. Correspondingly, the value of any one asset must be judged in terms of its relationship with the other elements of the portfolio.[6] This principle applies no less to Tobin's "portfolio" of contributions. Second, one of the hallmarks of Tobin's work is emphasis on the interdependence of agents' behavioral relations and on the need for incorporating relevant prior information, gleaned from the system as a whole, when specifying particular behavioral functions.

The arguments in the preceding paragraph suggest two useful departures from the piecemeal approach. First, I shall try throughout to emphasize the interdependence, and therefore the internal cohesiveness, of his various writings. Second, in addition to the detailed discussion of the specific

[6] For this result alone, all economists are in Tobin's debt. He has provided us with the perfect answer when confronted with the inevitable cocktail party question: "Since you are an economist, tell me: What stocks should I buy?" From Tobin, the economist's answer is: "That depends upon what stocks are in your portfolio now." Usually, this is the end of the conversation.

categories in the next three sections, in the concluding section I shall attempt a brief overview of some persistent themes in Tobin's work and relate them to his overall contribution.

II. Money and the Theory of Finance

The role of fiat money in the market economy provides at one time material for some of the most abstract and some of the most applied analysis done by economists, with the whole intermediate ground between these extremes also well occupied. Money in its various roles of medium of exchange, unit of account, and store of value has been as thoroughly examined as any economic good. Liquidity, security, temporary abode of purchasing power, and even "marginal non-pecuniary services of money" have been put forward as explanations of why people hold money at zero interest when other, interest-bearing assets are available. At the same time, the supply of money is also singled out for study. Since the exchange value of fiat money far exceeds its replacement cost, monopoly in supply is a necessity. Yet financial intermediaries offer liabilities which serve in varying degree as substitutes for fiat money; hence control and regulation of such intermediaries seems essential to preserve the role of fiat money.

James Tobin's name is prominent in any list of fundamental contributors to the literature on the role of money in the economy. He has written extensively on the motivation for holding money and on the implications of the production of money-substitutes by financial intermediaries. In this part we discuss in turn Tobin's contributions to the theory of the demand for and the supply of money.

(*a*) *Financial Theory and the Demand for Money*

The theory of the demand for money is often divided into theories pertaining to transactions motives and theories pertaining to risk-related, speculative/precautionary motives. Tobin contributed to both, and his early work did much to dispell the notion that these could legitimately be treated separately.[7] In this subsection I discuss briefly Tobin's 1956 paper "The interest elasticity of the transactions demand for cash"[8] which established the proposition implicit in its title; I then turn to a more detailed discussion of his fundamental 1958 paper "Liquidity preference as behavior towards risk" mentioned above which, of course, dealt with a different source of interest elasticity of demand for money. It is also interesting to note that

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[7] Indeed, his 1950s' contributions discussed in this section read much like the outcome of executing Sir John Hicks' research strategy outlined in "A suggestion for simplifying the theory of money" (Hicks, 1935).

[8] *Review of Economics and Statistics*, August 1956, pp. 241–247.

Tobin did some of the very earliest (if not, in fact, the first) empirical work on the demand for money in the United States. This appears in his 1947 paper "Liquidity preference and monetary policy" and in a subsequent reply to Clark Warburton in 1948.[9] Here the major focus was on using Keynesian liquidity preference theory to explain observed movements in the money supply, velocity, and interest rates in the United States in the inter-war period; the principle conclusion is that the data support the view that the demand for money does depend upon the interest rate.

Transactions Demand for Money. Pre-Keynesian notions of the role of money in the economy are embodied in the equation of exchange, in terms either of Irving Fisher's (1911) transactions version or in terms of the Cambridge *k*—see, e.g., Pigou (1917). As Laidler's discussion points out (1977, pp. 55–74), the Cambridge *k* approach transformed the equation of exchange into a theory of the demand for money.[10] The demand for money arising out of that model stresses the technology of transactions, and attributes rather mechanical behavior to agents. In particular, it fails to explain why agents would *hold* cash balances; even if they were required to *use* cash in transactions, it would pay to *hold* interest-bearing assets and convert to cash when transactions needs arose. Tobin redressed this by introducing transactions costs so that interest-bearing assets do not dominate money; households face a non-trivial choice as to how to hold their wealth.[11] There is a trade-off between earning interest and bearing "brokerage" costs when transactions needs for cash arise. The key proposition is that even in a mechanical model with exogenous transactions, the possibility of economizing on cash balances emerges, rendering the demand for such balances interest elastic.

Liquidity Preference and Risk. Keynes himself of course contributed immensely to generalization of the theory of money demand beyond the equation of exchange orientation. His analysis of risk and liquidity preference in the *General Theory* led to the notions of precautionary and speculative demands for money taking a central place in post-war macroeconomics. But nevertheless, there were serious deficiencies in Keynes' for-

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[9] *Review of Economics and Statistics*, May 1947, pp. 124–131, and "Rejoinder", *Ibid.*, Nov. 1948, pp. 314–317; also Chapter 3 of *Essays in Economics, Macroeconomics-Volume I*, Markham Pub. Co., 1971 North-Holland, 1974.

[10] Friedman's 1956 classic "restatement" elaborates on this view and outlines his view of the determinants of the demand for money.

[11] A related contribution by Baumol (1952) was apparently not noticed by Tobin until after he had completed "Consumer Debt and Spending: Some Evidence from Analysis of a Survey", *Consumer Installment Credit* (Washington: Board of Governors of the Federal Reserve System, 1957), *Part II, Conference on Regulation, National Bureau of Economic Research*, Vol. I, pp. 521–545. Tobin's model is considerably more general; he proves rather than assumes that cash-bond exchanges will be made in equal amounts at equal intervals, and he treats the case of transactions costs proportional to the size of the bond transaction.

mulation of the problem. Individuals were presumed to hold point expectations of the "equilibrium" interest rate. When the actual interest rate was below that, the individual would not hold any bonds in order to avoid the capital losses expected to occur when the market yield rose. Hence individuals, by implication, held speculative portfolios which were completely specialized—either all bonds or no bonds. Second, as William Fellner had argued, Keynes' liquidity preference can be objected to as an equilibrium phenomenon on the logical ground that speculators could not be assumed to continue indefinitely to expect higher interest rates than those experienced.

In 1958 Tobin published a fundamental paper—"Liquidity preference as behavior towards risk"—which dealt with both these objections, in the process re-establishing the intellectual respectability of Keynesian notions of liquidity preference. But the paper did much more than that. It provided a breakthrough in the analysis of monetary phenomenon, providing in particular a new answer as to why individuals hold fiat money in the presence of other assets which bear positive interest, and a new explanation of the negative relationship between the quantity of cash demanded and the yield on interest bearing alternatives. In the paper, Tobin established a fundamental theorem—the "separation" or "mutual fund" theorem which has been a centrepiece of the theory of finance ever since.[12]

The key breakthrough in the paper was to specify interest rate expectations in terms of a probability distribution rather than as a scalar. Liquidity preference arose in response to the risk associated with the dispersion of the probability distribution, hence meeting Fellner's objection that Keynes' liquidity preference required biased (i.e., irrational) expectations. Tobin showed that risk averters would diversify their portfolios between money, postulated to be a safe asset with a zero nominal yield, and a risky (basket of) asset(s) bearing an expected positive net return. Further, he showed that under plausible assumptions the share of the safe asset, money, in the portfolio would fall if the yield on the risky asset rose.

The analysis involved trading off the mean return expected on the portfolio against the variance of that return; increasing the share of the risky asset caused both to rise. The optimal portfolio arises when the marginal benefits of the first just offset the marginal cost of the second. In order to be able to

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[12] Tobin's own restatement of the theorem was as follows: "The theorem concerns portfolios, in which one safe asset is mixed with n risky assets. The composition of the "mutual fund" of risky assets is independent of the degree of risk aversion of the investor. It depends only on the investor's estimates of the variances, covariances, and expected returns of the assets. Differences in risk aversion are reflected not in the composition of this fund but in the proportions in which the investor divides his wealth between the fixed-weight fund on the one hand and the safe asset on the other." (*Essays in Economics*, Vol. I, op. cit.) This result is central to the Capital Asset Pricing model, and the so-called "market line" analysis, the key implication being that asset prices adjust so that in equilibrium the market is the efficient portfolio.

cast the analysis in terms of just these two parameters, either the probability distribution has to be completely described by knowledge of the first two moments, or the utility function has to be quadratic so that only the first two moments matter. This, of course, is now the stuff of undergraduate finance courses: what is remarkable is that Tobin foresaw these limitations and analysed them in this original, seminal article.

In this analysis, Tobin was drawing on some highly original work by Harry Markowitz (1952, 1959) as well as on the fundamental expected utility hypothesis of John von Neumann and Oscar Morgenstern (1953).[13] The relationship with Markowitz's work is especially interesting since Tobin was not the originator of mean–variance analysis, the first published piece apparently being Markowitz (1952). Markowitz's framework involved only risky assets so that the insights of the separation theorem which draws on the existence of a safe asset were due to Tobin's characterization of the problem. Further, their interests were quite different, with Markowitz's analysis reflecting his operations research perspective while Tobin's of course reflecting that of an economist. The following footnote from Tobin's original article[14] is worth quoting in full:

> Harry Markowitz, in *Portfolio Selection* (1959), treats the general problem of finding dominant sets and computing the corresponding opportunity locus, for sets of securities all of which involve risk. Markowitz's main interest is prescription of rules of rational behavior for investors; the main concern of this paper is the implications for economic theory, mainly comparative statics, that can be derived from assuming that investors do in fact follow such rules.

The implications for economic theory Tobin refers to, of course, include the negative interest elasticity of speculative demand for money, the separation theorem, the role of covariance in the benefits of diversification, and the measurement of risk, all of which are absolutely fundamental. From the viewpoint of the development of economic theory, it is the positive analysis (i.e., comparative static results) that Tobin developed from the mean–variance framework that warrants mention, in contrast to the normative analysis giving rise to prescriptive rules for investors.

The two-parameter, mean–variance model has, of course, often been criticized as being too restrictive, and certainly more recent theoretical developments[15] have meant that the basic Tobin apparatus is now the starting point for portfolio analysis rather than the last word. But it *is* the starting point for the whole literature. In evaluating the contribution of the

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[13] Mention should also be made of the early work done on the analysis of risk in a different context by Milton Friedman and Leonard Savage (1948).

[14] *Essays in Economics*, Vol. I, op. cit., p. 271, fn. 15.

[15] See "The Theory of Portfolio Selection", International Economic Assn., in *The Theory of Interest Rates*, Macmillan & Co., 1965, pp. 3–51, and especially Samuelson (1969) and Merton (1971).

analysis, it is important to cast it in the historical perspective of what was known at the time of his writing. In responding to critics in 1969, Tobin writes:

> I do not believe it is an exaggeration to say that, until recently, the basic model of portfolio choice in economic theory was a one parameter model. Investors were assumed to rank portfolios by reference to one parameter only—the expected return, possibly corrected by an arbitrary 'risk premium', constant and unexplained. This approach is rationalized, if at all, by assuming either subjective certainty or constant marginal utility. It is now more than a decade ago that I participated in the modest endeavor of doubling the number of parameters of investors' probability estimates involved in economists' analyses of asset choice. This extension from one moment to two was never advertised as the complete job or the final word . . .[16]

The stress on positive economics is also pursued, as the quote continues on to argue that the critics of the mean–variance model:

> . . . owe us more than demonstrations that it rests on restrictive assumptions. They need to show us how a more general and less vulnerable approach will yield the kind of comparative-static results that economists are interested in . . .[17]

"Liquidity preference as behavior towards risk" is a paper that, over twenty years later, still occupies a central spot on graduate reading lists in macroeconomics, monetary theory and finance. In fact, as noted above, it is widely viewed as initiating the latter discipline. Tobin himself has not, however, been a major contributor to the theory of finance.[18] Instead, he has chosen to take the central idea of that analysis—the role of risk aversion and portfolio diversification—and develop its more general implications for mainstream macroeconomics, monetary theory, and stabilization policy. These developments are discussed in detail below.

(*b*) *Financial Intermediation and the Supply of Money*

Financial intermediaries have liabilities which are very close substitutes for fiat money; some of these liabilities are included in some definitions of money, others are not. Exclusion is often arbitrary, and always subject to criticism and controversy. There is no clear dividing-line between money and non-money. Tobin is rightly scornful of models that ignore this, although of course theoretical models, including his own, assign "money" as a property and as a label to a specific aggregation of assets.

A well-known, nontechnical paper, "Commercial banks as creators of

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[16] *Essays in Economics*, Vol. I, op. cit., p. 269.

[17] Ibid.

[18] However, his influence in finance extends well beyond the one major article. Early important contributions were made by his students and collaborators, as reflected in particular in the papers in Cowles monographs 19, 20, and 21 (*Risk Aversion and Portfolio Choice*, J. Tobin and D. Hester, eds., Cowles Foundation Monograph No. 19, New York: J. Wiley & Sons, 1967, and *Studies of Portfolio Behavior*, J. Tobin and D. Hester, eds., Cowles Foundation Monograph No. 20, New York: J. Wiley & Sons, 1967). Much of this influence stems from the famous unpublished manuscript, Chapter 3 of which appeared in 1965.

money",[19] criticizes naive money-multiplier models of credit expansion. The issue at stake here is the arbitrary distinction drawn between commercial banks and other financial intermediaries; the liabilities of the former are traditionally treated as money but the liabilities of the latter are not. The essence of the argument was presented more formally in the first of a series of very productive joint papers with William Brainard.[20] These papers present an early example of the "general equilibrium" (GE) approach which characterizes much of his subsequent work. Care is taken to specify balance sheet restrictions, multi-market interactions, and substitution effects. The method is to set up models of general equilibrium in financial and capital markets and to use these models to trace the effects of monetary controls—i.e., reserve requirements and deposit interest rate ceilings. In their own words, the paper takes advantage of the fact that:

> ... introducing non-bank financial intermediaries, uncontrolled or controlled, into a system in which banks are under effective monetary control, presents essentially the same problems as introducing commercial banks as an intermediary, uncontrolled or controlled, into a system in which the government's essential control is the supply of its own currency. The analysis therefore centers on the more primitive question: the effects of financial intermediation by banks, the consequences of leaving their operations unregulated, and the effects of regulating them in various ways. The conclusions have some interest in themselves, in clarifying the function of reserve and rate controls on commercial banks. By analogy they also bear on questions concerning the extension of such controls to other financial intermediaries.[21]

The main conclusions are that the presence of uncontrolled banks does not vitiate monetary policy in the sense of changes in the supply of currency nor, by extension, does the presence of non-bank intermediaries mean that control of banks is without effect. However, substitutions into uncontrolled sectors do diminish the impact of a given change in the supply of currency.[22]

Don Hester (1977, p. 490) cites the important result that raising an interest rate ceiling on deposits can be expansionary in the sense of leading to a reduction in the required rate of return on capital and an increase in investment.[23] This interaction between the demand and supplies of money-

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[19] *Banking and Monetary Studies,* Deane Carson, ed., Richard D. Irwin, Inc., 1963, pp. 408–419. The endogeneity of reserves due to the optimizing behavior of the intermediaries is also stressed.

[20] "Economic Progress and the International Monetary System", *Academy of Political Science,* New York, Annual Meeting, May 1963, pp. 77–97, *Papers and Proceedings.* Tobin wrote a similar earlier paper with the same title in 1958.

[21] *Essays in Economics,* Vol. I, op. cit., p. 284.

[22] Much of Tobin's own work in the theory of financial intermediation is contained in his famous unpublished manuscript on monetary theory written in the late 1950s and widely circulated among graduate students ever since. Much of the published work is by his students, including Brainard, Donald Hester, Richard Porter and others.

[23] This result is from "Financial Intermediaries and the Effectiveness of Monetary Controls", (with Wm. C. Brainard), *American Economic Review* (*Papers and Proceedings*) Vol. LIII, No. 2, May 1963, pp. 383–400. The transmission mechanism, and in particular the relationship between asset equilibrium and the flow of investment, is treated in detail in Section II below.

substitutes is an important insight of the Tobin GE approach. Focusing on the required rate of return on capital as a measure of the expansionary impact on policy avoids the need to make arbitrary classifications of monetary aggregates, on one of which undue emphasis is then mistakenly placed.

III. Macroeconomic Theory

The major issues in macroeconomics could be placed in two distinct categories. The first includes those factors which determine how a given change in nominal income gets divided into changes in the price level and into changes in the level of real output; i.e., issues pertaining to aggregate supply. The second includes how various exogenous and policy-induced disturbances lead to changes in the level of national income; i.e., issues pertaining to the transmission mechanism and the linkages between the monetary and real sectors of the economy. Tobin has made important contributions to both, and I discuss each in turn. I then turn to a discussion of Tobin's contribution to the theory of macroeconomic growth. His writings in that area bring together the various strands of analysis that are discussed throughout this review, and illustrate the attention he has given to the relationship between short-run fluctuations and long-term growth—in his words "the two persistent grand themes in macroeconomics".[24]

(*a*) *Aggregate Supply and the Theory of Wages*

Tobin's first published paper,[25] which appeared relatively early in his graduate career, addressed the problem of whether a cut in money wages would exert an independent (i.e., other than via its influence on interest rates) influence on the level of aggregate employment. This issue, of course, was at the center of the debate which was then raging following the publication of Keynes' *General Theory* in which Keynes had put forward the controversial proposition, counter to perceived "Classical wisdom", that a cut in money wages would not alleviate the severe unemployment experienced during the great depression.

This piece, and a closely related follow-up,[26] give an early indication of

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[24] In the preface to volume I of his *Essays in Economics*, Tobin writes: "... the volume remains a collection of separate papers written at different times rather than a coherent statement of macroeconomics as I might expound it today. Whatever unity it has derives from the quest it represents. I have been trying over the years to piece together for myself a reasonably systematic understanding of the related phenomena of short-run fluctuations and long-run growth."

[25] "A Note on the Money Wage Problem", *Quarterly Journal of Economics*, May 1941, pp. 508–516.

[26] "Money Wage Rates and Employment", in S. E. Harris, ed., *The New Economics*, 1947, pp. 572–590.

Tobin's insistence on high standards of logical consistency. He was especially concerned that Keynes' use of "money illusion" on the part of labor supply be consistent with behavior exhibited elsewhere in the model by the same agents. Tobin was quick to note that the Keynesian proposition amounted to a denial of the 'homogeneity postulate' for only one relationship in the system; if that denial were generalized to, say, supply functions for other factors, then the independent effect of money wages on aggregate employment would be reinstated. He also recognized the importance of the Keynesian specification of real consumption being uniquely related to real income, independent of nominal prices. Here Tobin was also giving notice of the importance he attached to the interdependence of decisions and markets—the 'general equilibrium' approach that he has continued to stress and analyse—as well as (rather presciently) implicitly suggesting the importance of real balances for consumption demand, the heart of the Pigou–Haberler rebuttal of Keynes' argument.

In 1955 Tobin published a three-installment paper with Challis Hall[27] which provides remarkable reading 25 years later. Here a complete macroeconomic system is laid out with a full taxonomy of "special cases" on both the demand and supply sides. Explicitly derived, illustrated, and used are aggregate demand and supply curves, considered an innovation by many when used many years later. The missing equation, widely viewed as one of Milton Friedman's major contributions (1970), is clearly scooped here by fifteen years. The effects of closing the system by alternative models of aggregate supply (i.e., classical—or monetarist—and Neo-Keynesian) are analysed in detail. And the current fad, "supply-side economics" is also anticipated with a clear and careful analysis of the impact of taxes on labor supply in a neo-classical setting wherein output is constrained by factor supplies.

The focus on formal analysis of wages gave way over the next fifteen years to the development of his ideas in monetary economics as discussed above and to his public service in Washington, although his interest in the supply side did show up in his work on Negative Income Taxes and on the pressing social problem of poverty. During that period professional interest in the Phillips curve grew, and it had taken a central place in mainstream macroeconomics. Tobin had discussed the Phillips curve in many of his more popular writings.[28] In 1971 he used the occasion of his presidential

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[27] "Income Taxation, Output, and Prices" (with Challis A. Hall, Jr.), *Economia Internazionale*. In three Parts: August 1955, pp. 522–542; November 1955, pp. 742–761; February 1956, pp. 1–8.

[28] E.g. "Unemployment and Inflation: The Cruel Dilemma", in *Price Issues in Theory, Practice and Policy*, A. Phillips, ed., Univ. of Penna. Press, 1967. This piece, written in 1966 for a conference at the University of Pennsylvania and reprinted in his *Essays*, contains a prescient and balanced discussion of the accelerationist hypothesis including a statement that "On this view the Phillips curve would blow up if growth at a steady utilization rate were

address to the American Economic Association to return to the analysis of wages and aggregate supply, and to respond to the influential Phelps–Friedman natural rate hypothesis.[29]

Tobin's presidential address is a highly charged piece which can be seen as an attempt to reverse or at least resist what he saw as a swing in accepted wisdom. He made several salient points. First, he argued that there is nothing optimal, efficient, or even "natural" about the zero-inflation unemployment rate. At that unemployment rate, he maintained, the marginal product of labor would still be above the marginal value of leisure so that it would be an inefficient position at which to operate the economy; this point has been taken up by Phelps (1972) and Prescott (1965), and appears to be widely accepted. Tobin also addressed the notion of search directly, arguing persuasively that there is no reason to believe that the natural rate gives rise to optimal search.

Tobin also argued for a reconceptualization of the macroeconomy away from the notion of a single market for homogeneous labor towards a "multimarket" economy with many heterogeneous types of labor. His ideal model, similar to one proposed by Richard Lipsey (1960), involves a "theory of stochastic macroequilibrium": stochastic, because random intersectoral shocks keep individual labor markets in diverse states of disequilibrium; macroequilibrium, because the perpetual flux of particular markets produces fairly definite aggregate outcomes of unemployment and wages.

Unemployment in this model is a Keynesian-style disequilibrium phenomenon. Wage adjustment in any particular market has both an equilibrium component and a disequilibrium component. This, combined with the plausible view that the disequilibrium wage adjustment component responds in a non-linear fashion to excess demand, leads Tobin to a different view of the zero-inflation level of unemployment from the natural-rate hypothesis.[30] The zero-inflation unemployment rate, in this model, does

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maintained." *Essays in Economics: Consumption and Econometrics*, Vol. II, North-Holland Pub. Co., Amsterdam, 1975, p. 6. This he even described as the orthodox view since "The Phillips curve idea is in a sense a reincarnation in dynamic guise of the original Keynesian idea of irrational 'money illusion' in the supply of labor". He then outlined some basic reasons, institutional and otherwise, why the accelerationist hypothesis might not apply.

[29] "Inflation and Unemployment", *American Economic Review*, March 1972, Vol. LXII, No. 1, pp. 1–18. (Presidential Address at Annual Meeting of American Economic Assn., New Orleans, Dec. 1971.)

[30] Tobin also suggested that if some plausible restrictions on wage adjustment were admitted—e.g., a temporary lower bound of zero on wage adjustment in particular markets even in the face of large excess supply—the nature of a long-run trade-off between inflation and unemployment could be reinstated. This would *not* reflect permanent money illusion by any individual agent or market; the system would appear to exhibit money illusion, the stochastic equilibrium concept implying that the source of downward rigidity moves from market to market over time.

not mean zero involuntary unemployment. Higher prices or faster inflation can diminish involuntary, disequilibrium unemployment, even though voluntary, equilibrium labor supply is entirely free of money illusion. He concludes, then, that there are real gains to be achieved from expanding employment beyond the natural rate, and that these must be weighed in the social balance against the costs of inflation.

A related contribution of his presidential address is his eloquent exposition of Keynes' hypothesis that concern about wage relativities causes nominal wage rigidities. This "wage–wage" model does not, of course, depend on "money illusion". The dynamics of such a system are subtle and difficult, and a great deal of current work is attempting to extend our understanding of it. The model has particular relevance, it would seem, in the United States where the industrial-relations situation is one of long-term (up to three years), overlapping contracts.

This last development has led Tobin to adopt in recent years the view of inflation as being "inertial" in nature.[31] Inertial inflation is defined as:

> ... the self-replicating pattern of wage and price inflation with which we have all become familiar. Whatever the historical origins of the inflation, once it is built into the system in a consistent manner it continues very much on its own ... firms and employees relate their wage increases to recent settlements in other markets and to recent price trends. Employees mark up the increases in labor costs, with allowance for normal productivity gains. The mark-ups determine price trends that in turn feed into the wage increases.[32]

The inertial nature of inflation, which clearly arises in large part from the "wage-wage" phenomenon, means that changes in aggregate demand manifest themselves primarily in fluctuations in output rather than prices. Disinflation, in terms of contractionary monetary and fiscal policies, is then viewed as leading to large and sustained unemployment. This is true even in the presence of rational expectations since the inertial forces create an important distinction between the ability to form expectations and the ability to act immediately on the basis of them. Based on this view, Tobin has built an intellectually respectable case for the temporary use of "incomes policy" as a complement to orthodox demand-management policies if inflation is to be a target of policy.[33]

(*b*) *The Transmission Mechanism: Monetary Equilibrium, and Aggregate Demand*

Tobin's contribution here follows two particular lines of thought. He has focussed on the relationship between wealth and consumption spending,

[31] "How Dead is Keynes?", Invited Address at Western Economic Assn. Annual Meetings, June 1977, in: *Economic Inquiry*, Vol. XV, No. 4, Oct. 1977, pp. 459–68; and "Are New Classical Models Plausible to Guide Policy?", *Journal of Money, Credit, and Banking*, Vol. XII, No. 4, Part 2, Nov. 1980.

[32] "Diagnosing Inflation: A Taxonomy", forthcoming in volume of Conference papers (Israel, June 1979), Academic Press.

[33] This view of incomes policy during the disinflation process should not be confused with the Galbraithian case for permanent wage–price controls.

addressing both theoretical issues and empirical policy issues. A rather separate link, perhaps both the most important linkage and the heart of Tobin's most fundamental contributions, stresses the relationship between monetary/asset equilibrium and investment demand. As in other areas, he has contributed both to the development of the theory and to empirical and policy applications.

Wealth, Liquidity, and Consumption. Tobin's doctoral dissertation was on consumer behavior; in it he developed a theoretical analysis of intertemporal choice and then used pooled cross-section and time-series data to test the predictions of the model. This early research signalled an interest in consumer theory, and in the life-cycle model in particular, that has continued to the present. He has provided important theoretical expansions to the life–cycle model[34] and developed various applications of it including using simulation techniques to explore the aggregate effects of individual households in a growing population each pursuing life-cycle goals.[35]

Tobin's work on the wealth-consumption relationship constitutes an important part not only of his own work but also of the development of the modern theory of consumer behavior. Two aspects of Tobin's work, however, set it apart from the mainstream.

First, he has been unwilling to adopt unquestionably the convenient assumption of "perfect capital markets" which renders the extension of the consumption/income relationship into a fairly straightforward intertemporal choice problem. Rather, Tobin has argued that capital market imperfections meant that many households would, in fact, be liquidity constrained. This, of course, ties current consumption closely to current income, the intertemporal calculus notwithstanding. He was equally critical of Permanent Income and Life-Cycle approaches on this account.[36] Foregoing the assumption of perfect capital markets obviously makes the analysis a good deal more difficult; a number of papers[37] then use both analytical and simulation methods to explore the implications of such liquidity constraints. One important such consequence is that monetary policy can influence demand directly by altering the liquidity constraint as well as indirectly via the conventional wealth/interest rate channels.[38]

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[34] E.g. "Savings, Capital Gains, and Asset Values", in *Savings in the American Economy*, A Symposium, edited by W. W. Heller, F. M. Bodd, and C. L. Nelson, 1953, pp. 220–223.

[35] E.g. "Life Cycle Saving and Balanced Growth", in *Ten Economic Studies in the Tradition of Irving Fisher*, Wm. Fellner, ed., New York: J. Wiley & Sons, Inc., 1967, pp. 231–256.

[36] E.g. (with Walter Dolde), "Wealth, Liquidity, and Consumption", in *Consumer Spending and Monetary Policy: The Linkages*, Federal Reserve Bank of Boston, Conference Series No. 5 (Nantucket, June 1971).

[37] E.g. "Wealth, Liquidity, and the Propensity to Consume", in *Human Behavior in Economic Affairs* (Essays in Honor of George Katona), eds., B. Strumpel, James N. Morgan, and Ernest Zahn, Elsevier Scientific Publishing Co., Amsterdam, 1972, pp. 36–56.

[38] In "Consumer Expenditures and the Capital Account" (with Harold W. Watts), *Proceed-*

Second, Tobin was extremely careful in distinguishing between the effects on consumption of an *exogenous* increase in wealth and those of an *endogenous* increase in wealth induced by prior saving. The former, which he called the "static wealth–spending relationship" is at the heart of the Pigou effect; the latter he called the "dynamic wealth–spending relationship". Tobin's care in modelling this relationship shows up in his contribution with Willem Buiter to the "long-run crowding-out" debate as well as in specification (and comments on other specifications) of dynamic econometric models. In such models, saving is often related to the gap between target and desired wealth. Target wealth, in turn, depends on, among other things, income. But the act of saving leads to an increase in income on asset account; if this is allowed to feed into desired wealth, then there is a possibility that the process will be unstable since the higher desired wealth leads to higher saving. Hence Tobin was always careful to specify desired wealth in a manner that does not depend on asset income—usually he related it to wage income, along life-cycle grounds.

Finally, it is worth noting that Tobin has consistently been careful to distinguish the "C" of the intertemporal theories from the "E" of Keynesian theories (i.e., consumption from expenditure).[39]

Asset Equilibrium and Investment. The determinants of aggregate investment remain as one of the most challenging puzzles facing macroeconomists. The basic framework central to most macroeconomic enquiries on investment, e.g., Foley & Sidrauski (1971) and Sargent (1979) is due to Tobin, who in turn has built extensively on Keynes' notion of the supply price of capital.

The supply price of capital is that rate of return which is required for asset holders to be willing to hold the existing stock of capital. In the Tobin framework this supply price of capital is determined in asset markets by conditions of overall portfolio equilibrium. This, in turn, determines the desired flow of investment expenditure in accordance with what is essentially the Keynesian notion of comparing the internal rate of return with the market interest rate.

Tobin presented a first formal statement of this key stock–flow relationship in his "Dynamic aggregative model".[40] In following papers he built on his own analysis of portfolio selection to refine the notion and implications of asset equilibrium. Money was the only asset available as an alternative to holding capital. With the inclusion of government interest-bearing debt as a

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ings of the Conference on Consumption and Saving, Vol. 2, edited by Irwin Friend and Robert Jones, University of Pennsylvania, 1960. Tobin examined the related hypothesis that the composition, rather than just the level, of wealth influences consumption.

[39] See e.g. the concluding discussion in "The Consumption Function", *International Encyclopedia of the Social Sciences*, Vol. III, 1968, pp. 358–368.

[40] *Journal of Political Economy*, April 1955, LXIII, pp. 103–115.

third asset, the analysis is somewhat more complicated. In fact, the impact of an increase in the stock of interest-bearing debt has, in principle, an ambiguous effect on the supply price of capital and hence on the flow of investment. Reasoning from the risk-diversification implications he developed earlier, Tobin was able to argue persuasively that bonds are likely to be a closer substitute for capital than for money so that the increase in the supply of bonds drives the supply price of capital up, reducing the flow of investment.[41]

While these two papers were widely read and, apparently, very influential, they were nonetheless primarily only informal discussions of what are, in fact, complex relationships. In 1969, Tobin used the occasion of the inaugural issue of a new journal (*The Journal of Money, Credit, and Banking*) to present a formal summary of the framework which he had been using for over a decade. The result was his classic "A general equilibrium approach to monetary theory", perhaps now his most widely read and cited piece. That paper spells out a complete model of asset equilibrium, paying special attention to substitution relationships and balance sheet constraints, and relates the ensuing equilibrium determination of asset yields to the flow of investment.

Of particular historical interest is the substitution of the relative price of capital goods (Tobin's q) for Keynes' rate of return concept (the supply price of capital) as the key variable on which to focus. The two, of course, are monotonically related. Tobin's use of the supply piece of capital reflected a specification of capital accumulation responding to a gap between the supply and demand prices of capital, a gap analogous to the Wicksellian gap between market and real interest rates. In his dissertation Brainard had instead been stressing the relationship between the market value of capital and its replacement cost, the ratio of the two being q. Tobin was evidently persuaded of the merits of this formulation and q apparently made its first appearance in 1968 in the joint Brainard–Tobin "Pitfalls" paper;[42] its central role in the Yale model was confirmed the next year when Tobin also couched his "General Equilibrium Approach" in terms of q. Besides having the advantage of being observable in principle, q perhaps conveys the spirit of the model better than does the supply price of capital. The basic model is one of the demand for a stock of capital and the supply of a flow of investment; the relative price and the equilibrium rates of return are deter-

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[41] "Money, Capital, and Other Stores of Value", *American Economic Review* (*Papers and Proceedings*), Vol. LI, No. 2, May 1961, pp. 26–37. In his masterly essay, "An Essay on the Principles of Debt Management", *Fiscal and Debt Management Policies*, Commission on Money and Credit, Prentice-Hall, Inc., 1963, pp. 143–218, he extends this reasoning to a world in which a wide range of maturities of government debt instruments exists.

[42] "Pitfalls in Financial Model Building" (with Wm. C. Brainard), *American Economic Review* (*Papers and Proceedings*), May 1968, pp. 99–122.

mined in the asset markets, the level of investment is that flow called forth from suppliers at that relative price.

Tobin's q became the organizing principle for a number of empirical studies, both by Tobin himself (in collaboration with various other Yale colleagues) and by others, e.g., Ciccolo (1978).[43] q becomes a single statistic which is used to describe the current expansionary stance of policies; Tobin himself demonstrates its usefulness in this regard.[44] Tobin's q is also extremely valuable as an easy way to explain to students why the stock market matters!

(c) *Money and Economic Growth*

Tobin's early work on macroeconomic growth results in large part from his puzzlement over the Keynesian model which treats the capital stock as constant but gives rise to an equilibrium with non-zero saving and investment. In "A Dynamic Aggregative Model",[45] he integrated the ideas central to Keynesian short-run macroeconomic models into the growth literature due to Harrod, Hicks, Goodwin, and others. In retrospect, this paper was far ahead of its time. It is now widely viewed as the precursor to the literature of the 1960s and 1970s on "Money and Economic Growth", a literature to which Tobin himself has contributed a great deal. In this article Tobin did accomplish important objectives in terms of reconciling ideas prevalent in the Keynesian short-run macroeconomics literature with the growth literature's longer-run dynamic perspective.

According to the Harrod–Domar model, expansion at full employment was impossible if the savings–investment potential of the economy was so great that the stock of capital would grow faster than the effective labor supply. Capital would become redundant in production; its rate of return would collapse; investment would decline, taking income and employment with it.

This "knife-edge stability" arose from two factors. First, due to the assumption of fixed-coefficient technology there was only one "warranted" growth rate. Second, for reasons of Keynesian liquidity preference, the interest rate is determined by monetary factors; Harrod was concerned that the interest rate would then get determined at a rate which would cause entrepreneurs to choose a capital–output ratio inconsistent with full-employment, steady-state growth. This interaction between liquidity prefer-

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[43] A refreshing reminder of the Schumpeterian influence in Tobin's work is provided in "Asset Markets and the Cost of Capital" (with 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 Publishing, Amsterdam, 1977, pp. 235–262.

[44] "Monetary Policies and the Economy—The Transmission Mechanism", in *Southern Economic Journal*, Jan. 1978, Vol. 44, No. 3, pp. 421–431.

[45] Op. cit.

ence and investment was also at the heart of the macroeconomic debate about the tendency of the economy to move to full-employment equilibrium, and Tobin sought to integrate the two analyses. In so doing he introduced formally and carefully liquidity preference and conditions of monetary equilibrium into the rather mechanical dynamic models of the growth literature, and at the same time recognized the importance of the capital-stock dynamics in that literature for the structure of short-run macroeconomic models.

In reference to the latter issue, he addressed the then pressing question of whether it is the level or the rate of change of the capital stock which is related to the interest rate.[46] He was led to a formulation whereby the investment theory of Keynes—which essentially called for flow adjustment in response to a disequilibrium between the actual level of the capital stock and that desired at the prevailing interest rate—was replaced with an equilibrium model whereby investment resulted from growth in the desired level of the capital stock. This, of course, led to the notion of stock or asset equilibrium which was to evolve into the portfolio framework central to Tobin's later contributions.

His dynamic model also introduced the possibility of substitution of labor for capital in production, thus allowing, in Harrod's terms, for many alternative "warranted" rates of growth.[47] If capital were becoming redundant, either the rate of interest would fall or, if that were prevented by liquidity preference, the equilibrium capital-intensity of production would rise so that the high level of savings and investment would be consistent with a steady-state.

This interaction between equilibrium in financial markets and the rate of private sector accumulation is a central theme to which Tobin has returned many times. Its importance is well recognized in the short-run macroeconomic literature, but is perhaps still far-too-often overlooked in discussions pertaining to longer-run issues.

Tobin's Fisher Lecture[48] returned to the same topic, and initiated the formal analysis of money and economic growth. There the key issue was the role of government debt as an alternative store of value to physical capital. Tobin demonstrated that this alternative store of value might cause the economy to choose a lower capital stock than it would have in the absence of such 'money'. More importantly, he argued that an increase in the rate of growth of money would lead to an increase in the equilibrium

[46] In this, he was extending Abba Lerner's (1946) distinction between the marginal efficiency of capital and the marginal efficiency of investment.

[47] This paper antedates the "neoclassical" growth models of Solow and Swan as well as the "neoclassical" investment literature spawned by Jorgenson and his co-workers.

[48] "Money and Economic Growth", Irving Fisher Lecture for Econometric Society Meetings, Zurich, September 11, 1964.

rate of inflation causing individuals to substitute away from money toward capital in their portfolios. The model is an extreme neoclassical one in the sense that investment responds passively to saving so this portfolio shift leads in the long run to an increased steady-state capital intensity in the economy and, consequently, a lower real interest rate. This issue of "superneutrality" (i.e., the neutrality of a change in the rate of growth of money) is still a widely disputed one. The model also provided the framework for the ensuing literature on the optimal quantity of money and the welfare economics of inflationary finance.[49]

IV. Stabilization Policy and the Debate on Monetarism

I believe that the previous two sections indicate clearly that James Tobin's contributions to economic science have been immense. Yet to leave the discussion at that would result in an incomplete view of his role in shaping the current state of economics. He has in fact been a vocal participant in the public and professional discussions on economic policy. In particular, he has carried the Keynesian banner in numerous "skirmishes" with monetarists, and in particular, with Milton Friedman. As I shall document below, engaging Milton Friedman in public debate has often been a thankless and frustrating task. Yet the debate has nevertheless proceeded. The antagonists have not, as one could argue has happened in England, simply withdrawn to their own corners and proceeded as if the other were not there. This alone is highly commendable. It has kept the research programme of the two groups flexible, open for criticism, and developing in the light of new theoretical and empirical knowledge.

Macroeconomics, perhaps more than any other branch of economics, is intrinsically tied to issues of economic policy. Pieces of pure theory are rare—although Tobin himself has contributed a number. Instead, the norm is that any paper claiming to be on macroeconomics includes a section—sometimes one rather disjoint from the rest of the paper—on the policy implications of the analysis.

It is not surprising then that James Tobin has contributed enormously to the theory of stabilization policy and has been actively involved in debates about the actual conduct of policy. His deep convictions about the tremendous waste inherent in Keynesian unemployment and about the potential for squandering the opportunity to do good that is involved in letting recessions run their course, have naturally led him to speak out in public debates on policy. Similar forces have involved him in the professional

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[49] The influence of these articles is also evident in the recent book by Thomas Sargent (1979) as well as in the important role of the "Tobin effect" in criticisms of the "super-neutrality" property of recent rational expectations models.

debates about the intellectual and empirical foundations of "monetarist" policies.

His views on policy reflect the analysis conducted over his life-time on the central macro relations, as discussed above. His views on how policy objectives should be achieved are guided by his analysis of the monetary mechanism and the determination of consumption and investment. His involvement in controversies, however, has been more often associated with his views on the formulation of policy objectives; on these, his views have been guided more by his analysis of wage formation and aggregate supply.

Tobin has consistently advocated the use of active demand management. (He has also stressed the need to complement these policies with guide posts, incomes policies, negative income taxes, labor market policies, etc.) Recently, the phenomenon of supply-shock induced stagflation has caused the debate to centre not only on "whether to use demand policy", but also on the desired *direction* in which to adjust policy. In these debates, Tobin has stood squarely and steadfastly in the camp of those advocating expansionary policy. Partly, this can be attributed to his views about the relative welfare costs of inflation and unemployment. In his words, "it takes a heap of Harberger triangles to fill an Okun's gap!"[50] But partly it can be attributed to his view that the self-correcting mechanisms work only slowly; that it is wasteful to wait for recessions to "work themselves out".

Worse still, in his view, is the policy of deliberately engineering recessions in order to combat inflation. In his address to the Royal Economic Society[51] he argues that this is precisely the case with each of the three recessions experienced in the United States since 1970. A particular complaint with these policy mistakes is that they were inspired by the monetarist rallying-cry that "inflation is everywhere and always a monetary phenomenon". A more reasonable view of the 1973–74 take-off into double-digit inflation was that it was induced by supply shocks. In this case, Tobin is in the ironic position of arguing supply-side considerations against conservative economists. The blinders imposed by monetarist, demand-oriented analyses of inflation led to a contractionary rather than an expansionary policy being followed in response to the OPEC shock.[52]

Skirmishes with the "monetarists" were not new to Tobin; he had for a long time taken up the Keynesian banner in both the public and professional debate on monetarism. His explicit participation in the debate probably

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[50] "How Dead is Keynes", op. cit.

[51] "The Monetarist Counter-Revolution Today—An Appraisal", Paper given before The Royal Economic Society, July 1980, *The Economic Journal*, Vol. 91, 361, Mar. 1981, pp. 29–42; Discussions, pp. 43–57.

[52] Blinder (1980) presents a detailed analysis of the Keynesian case for accomodation of supply-shocks.

starts with his review of Friedman's voluminous joint work with Anna Schwartz, *A Monetary History of the United States* (henceforth F–S).[53] For the most part, there is little in this review to suggest the bitter exchanges that were to follow. The tone of the review is balanced and temperate; there is much that is critical but also much that is laudatory. The review divides the Friedman–Schwartz analysis into two aspects: that concerning the determination of the stock of money and that concerning the determination of velocity. On the first Tobin presents a careful and scholarly discussion of the research strategies chosen by F–S in their choice of definition, and attempts to offset their lack of discussion of alternative possible definitions by outlining a case for these alternatives. This query of "What is money?" or, more precisely, "If money is so important as to be placed at the centre of the analytical framework, why is it so hard to agree on a definition?" is one which Tobin has posed many times, and to my knowledge no satisfactory response has yet been given by the monetarist camp.[54]

Tobin's discussion of the F–S analysis of the determination of velocity draws the lines much more sharply. The F–S explanation of the secular decline in velocity in terms of money being a luxury with an income elasticity of demand greater than one is sharply criticized. The analogy is found wanting on both empirical (firms hold most of the money) and theoretical grounds (it is the services of money that are desired). An alternative, Keynes–Latané explanation in terms of liquidity preference interest rate theory, is preferred.[55]

In retrospect, it is also not surprising to read of the rather sharp disagreement concerning the stability and independence of velocity, the interpretation of the monetary events surrounding the great depression, and the general prognosis of and prescriptions for monetary policy. Tobin's interpretation of these events in terms of Keynesian liquidity preference had been carefully spelled out and documented more than fifteen years earlier in his empirical work on the U.S. demand for money and in his exchange with Clark Warburton (whom he refers to as one of the early monetarists).

The "stability and independence" of velocity mirrors a debating point which arises many times—the reverse causality argument concerning the causal interpretation to be attached to the F–S and Friedman–Miesleman evidence on the correlation between money and income. Tobin presented

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[53] Although mention should be made of his discussion of Friedman's consumption function in 1958, a discussion apparently unpublished until it was included in his collected essays (Ch. 31).

[54] There is also an interesting and still relevant discussion of the merits of focussing on the liability sides of the financial institutions' balance sheets, i.e., money, rather than on the asset side (i.e., credit).

[55] Tobin invokes the original quantity theorist, Irving Fisher, as a likely critic of the F–S analysis.

an ingenious example which showed how an extreme Keynesian model could generate the timing relationships which Friedman had claimed supported his monetarist view. Tobin first constructs an ultra-Keynesian model wherein movements in money are merely a side-show, yet timing relationships are as reported in F–S. He then constructs an ultra-Friedman model wherein desired money is related to permanent income, and money plays a central role; yet in that model the timing relationships cited by Friedman do not arise. Tobin did not present either extreme model as serious models of the economy; his point was essentially a methodological one concerning "the dangers of accepting timing evidence as empirical proof of propositions about causation".[56] The exchange between Tobin and Friedman following the publication established the tone for many subsequent exchanges. Friedman's comment denied the relevance of Tobin's analysis for his own analysis or prescriptions. In his reply, Tobin expressed his frustration at the inability of the debate to resolve the issues: "I am continually perplexed by Friedman's propensity in professional debate to evade by verbal quibbling the responsibility and the credit for the characteristic propositions of 'monetarism' associated with his name."[57]

Shortly thereafter, an exchange transpired in the *Journal of Political Economy* on the occasion of the special issue pertaining to Friedman's "Theoretical Framework for Monetary Analysis". Again, the exchange was disappointing as Tobin and Friedman were unable to agree on what divided them.[58] Tobin in particular rejected Friedman's claim that the key difference dividing monetarists from Keynesians was that the former assumed aggregate supply to be vertical in P–y space while the latter assumed it to be horizontal. Tobin also was highly critical of Friedman's second model which asserted that the interest rate is constant. His criticism adopted an oft-used Friedman ploy of pushing his opponent's view to a logical extreme; Tobin showed that this second model implied fiscal policy was all powerful while monetary policy was rendered impotent! Tobin insisted that the key factor dividing them was the interest-elasticity of the demand for money—in textbook terms, the slope of the LM curve.

Friedman's reply that fiscal effects are "certain to be temporary and likely to be minor" led to the next round of the debate—the alleged crowding-out over time of fiscal expansion unless that expansion is fi-

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[56] "Money and Income: Post Hoc Ergo Propter Hoc?" *Quarterly Journal of Economics*, Vol. LXXXIV, May 1970, p. 303. It is ironic to note that the recent "rational expectations" inspired revolution *within* the monetarist camp has led to additional arguments which seriously undermine any causal interpretation of timing relations.

[57] "In Defense of the New Economics", *Fortune*, Oct. 1969, p. 329.

[58] In his reply, Friedman also expressed disappointment at their inability to communicate, and offered an interesting conjecture that this was due to his own Marshallian orientation as opposed to Tobin's implicit Walrasian methodological stance.

nanced by money creation.[59] Tobin's contributions to this debate returned to the same themes. They stressed the link between short-run macro-models and longer-run "growth" models, being highly critical of other work which examined deficit-induced wealth dynamics while not tracking evolution of the stock of physical capital.[60] Tobin and Buiter also stressed the need to relate short-run and long-run behavior of agents, formulating the problem so as to impose more structure on the latter than other papers dealing with this issue. He and Buiter explored alternative aggregate supply simplifications, but were still able to argue the importance of the shape of the liquidity preference function.

Friedman appears to have retired from the debate; his "orthodox monetarist" approach has given way to the rational expectations inspired "new-classical" economics arguing against policy activism and favoring Friedman-type k percent rules. Tobin has been actively involved in the ensuing professional debate; expectations themselves are argued to be a potential red-herring. Tobin focusses on the assumed Walrasian, perfect price-flexibility, full-employment assumptions inherent in their models, arguing that rigidities and inertias would support the use of stabilization policy even in the face of rationally formed expectations.

V. Summary Overview

The preceding three sections have attempted a detailed discussion of a selection of the specific contributions of James Tobin. The selection was necessarily incomplete, and many significant papers were mentioned only briefly, if at all.[61] In this section I turn to a short discussion of some broader, more general issues that arose in my attempt to assess the overall contribution embodied in this impressive collection. First I shall highlight a number of "themes" which recur throughout Tobin's work, then I shall attempt a brief evaluation of how his work has ultimately influenced the current state of economics.

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[59] Friedman has never presented a formal analysis of his first-round versus longer-run distinction; his public-domain comments often can be interpreted as asserting velocity is constant: borrowing by the public sector means an *a priori* equivalent reduction in funds available for private sector investment (e.g., Friedman, 1972, p. 914).

[60] "Long Run Effects of Fiscal and Monetary Policy on Aggregate Demand" (with Willem Buiter), in *Monetarism, Studies in Monetary Economics,* Vol. 1, Jerome L. Stein, ed., North-Holland Pub. Co., 1976 (1974 Conference), pp. 273–336. For further discussion of the problems raised by this procedure, and of the Tobin–Buiter results, see Purvis (1980).

[61] One particularly regrettable omission which I see no way of rectifying within the confines of the structure of this paper is the lack of discussion of Tobin's role in the international economics literature. Not only has he made a number of direct contributions, but the revolution embodied in the asset approach to balance of payments and exchange rate analysis that occurred during the 1970s can be seen as an extension of Tobin's general equilibrium framework.

Cyclical and Secular Phenomena. Of course, the broad themes that pervade his macroeconomic contributions reflect his own judgement that the analysis of the interaction between short-run economic fluctuations and long-run growth is one of the central questions to be addressed by aggregate economic analysis. His most direct contributions to this issue are his two major papers on money and growth discussed in detail above. The theme is also reflected in his focus on the role of private sector accumulation in macroeconomic equilibrium, of the interaction between wealth and consumption, on the role of financial intermediation, and indeed on his attention to wage formation and aggregate supply. There are a number of other papers, not previously discussed for reasons of space, which also explicitly illustrate the point. For example, the "neoclassical modes of analysis"[62] are shown to hold even if there is neither *ex ante* nor *ex post* scope for factor substitution, as long as output is limited by the availability of resources (a long-run condition) rather than by effective aggregate demand (a short-run Keynesian condition). His contributions to the long-run crowding out debate and to the "burden of the public debt" literature also provide excellent examples.

This theme is important partly because, on his own account, it provides a unifying theme to much of his writings. In my view it is also important because the constant care that he has given to the relationship between short-run fluctuations and long-run growth is one feature which sets Tobin's work apart from that of other contemporary macroeconomic theorists.

General Equilibrium Approach. The "general equilibrium" (henceforth GE) approach or analytical framework is one that Tobin has consistently used and stressed. This approach shows up in both his formal work on financial intermediation and on asset equilibrium and the flow of investment expenditure; and in his applied work on consumption and flow-of-funds analysis. The essence of this approach is to stress the interdependence of agents' various decisions and to pay careful attention to sectoral budget constraints and the implied adding-up conditions. For example, in the famous "pitfalls" paper Tobin and his co-author William Brainard stressed that, when specifying a GE model, care must be taken to ensure that the behavior specified for the equations explicitly represented in the model does not imply nonsense behavior for the equation omitted via the budget constraint. The stress on this approach has been most important in the development of the "Yale School's" analysis of the transmission mechanism and of the important interactions between the monetary and real sectors of the economy.

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[62] (With R. Solow, C. von Weizsacker, M. Yaari), "Neoclassical Growth with Fixed Factor Proportions", *Review of Economic Studies*, April 1966, pp. 79–115.

The GE approach was formally given the "general equilibrium" label in 1969,[63] but it in fact formed the basis for many earlier contributions, including most notably "Money, capital, and other stores of value" and "An essay on the principles of debt management". The explicit treatment of balance sheet constraints, and the arrangement of the 'flow-of-funds' matrix with a row for each sector within the economy and columns representing alternative assets and liabilities, was a natural development from his earlier theoretical analysis of portfolio selection, and reflects his interest and skill in generating *positive* theories. The framework led naturally to the focus on the substitution relationship amongst the various assets as a key determinant of the results of comparative statics analyses of the effects of various disturbances and policies. The GE approach has resulted in a rich analytic framework which remains the heart of most modern macroeconomic analyses of the financial sector.

Theory, Evidence, and Policy. An important theme in Tobin's work is the application of theoretical principles, based on the available evidence, to the theory and practice of stabilization policy. His theoretical work, as discussed above, focusses on key relationships on which policy formation hinges. A central feature of his theoretical arguments, and this is especially true of the GE approach, is that it provides a useful organizational framework for empirical work. And, as also mentioned earlier, he has been both directly and indirectly involved in the empirical evaluation and testing of virtually all of the behavioral relationships involved in mainstream macroeconomic models.

His contribution to economic policy, however, far outstrips these important, but indirect, contributions which generated important theoretical and empirical results. He has been directly involved in the policy formation process, having served on President Kennedy's Council of Economic Advisors and having testified often before key Congressional committees and agencies. He has continually participated in the public debate about specific policy proposals and general principles of economic policy. And, as discussed in detail in the previous section, he has been a prominent figure in the professional debate on monetarism.

His role in the various debates about stabilization policy has not been uncontroversial, and he has been willing to defend unpopular positions. Given his frequent advocacy of policies to reduce unemployment—even at the expense of creating further inflation—he has, I think, developed a reputation as an "inflationist" during a period when public opinion has turned strongly against inflation. As a liberal and an advocate of policy activism, over the last decade he has seen many of the ideas he supports

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[63] "A General Equilibrium Approach to Monetary Theory", *Journal of Money, Credit, and Banking*, Vol. 1, February 1969, pp. 15–29.

come under strong attack in many quarters. In the light of new theories and evidence he has no doubt changed his views on many issues, but others he has defended openly and honestly, at various levels and to various audiences. The persistent theme running through his policy analyses is that democratically elected governments must not abrogate their responsibility to act in the interests of the economic welfare of their constituents. Policies of letting recessions "run their course" or of deliberating inducing recessions to combat inflation are not likely candidates for Tobin's support.

This position is illustrated by Tobin's participation in the rational expectations inspired debate about the efficacy of short-run Keynesian stabilization policy—often referred to pejoratively as "fine-tuning". Keynesian policy prescriptions are often blamed for the growth in the role of government in today's industrialized economies. Keynesian economics is often associated with a "pro-government" stance while monetarism is just as often associated with an anti-government stance. The two issues of policy activism and the size of government are logically separate. Tobin himself has always been careful to distinguish between arguments for changing the stance of fiscal stabilization—as roughly measured by the adjusted full employment surplus—from arguments for changing the role of government in the economy as roughly measured by the share of government expenditure in GNP. Further, he has been critical of the new classical macroeconomics for failing to provide a long-run argument against the use of Keynesian stabilization policies. As he notes, "the message of the new classical macroeconomics is not so much that Keynesian policies do Evil as that they do nothing".[64]

Broader issues. In attempting to provide an evaluation of the contributions of someone as productive as James Tobin, an approach alternative to that pursued in this paper is to try and assess his overall impact on the discipline rather than to discuss particular contributions. Three possible venues of influence that then might be documented are influence on subsequent literature, influence on students, and influence on the methods the profession uses in analytical and empirical problems. It is clear that Tobin's contributions score well on all three issues. His influence on the subsequent literature has been profound; he has defined many of the questions we ask, and provided a framework in which they may be analysed. His influence on students is pervasive: his own students, many of whom have been mentioned above, are numerous and productive; but more importantly, all students of modern macroeconomics are, in an important sense, also stu-

[64] "The Monetarist Counter-Revolution Today—An Appraisal", op. cit., p. 14. He goes on to note that this is not quite accurate, since "... an alleged evil is that capricious shifts in policy rules confuse private agents and cause allocational distortions". This, Tobin quips, has the same lay appeal as that of the shoe-leather costs of economizing on cash balances during anticipated inflations.

dents of Tobin. His influence on how economists do things is also significant: his GE approach has already been cited as a central building block; his early application of comparative statics techniques to portfolio problems set new standards for macroeconomic theorizing; his development and application of statistical techniques and use of simulation methods have expanded the toolkit available to economists.

A final theme, common in the work of all important scientists, is the persistent challenge of orthodox ideas and opinion, and the unwillingness to accept superficial answers to substantial questions. Thus, for example, Tobin refused to accept the mechanical nature of traditional formulations of the transactions demand for money. And he reformulated Keynes' liquidity preference theory to resolve certain anomalies of that theory and to give new life to its basic implications. Similarly he challenged the widely accepted properties of the so-called "natural" rate of unemployment. These and other examples of Tobin's attacks on orthodoxy followed by the development of original and plausible alternatives are events that I am confident his teacher Joseph Schumpeter would have been exceedingly happy to call examples of the "process of creative destruction".

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