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Part Three

RECENT APPRAISALS



THE ECONOMIC THEORIST*

By Milton Friedman¹

Wesley C. Mitchell is generally considered primarily an empirical scientist rather than a theorist. In my opinion, this judgment is valid; yet it can easily be misunderstood. The ultimate goal of science in any field is a theory—an integrated “explanation” of observed phenomena that can be used to make valid predictions about phenomena not yet observed. Many kinds of work can contribute to this ultimate goal and are essential for its attainment: the collection of observations about the phenomena in question; the organization and arrangement of observations and the extraction of empirical generalizations from them; the development of improved methods of measuring or analyzing observations; the formulation of partial or complete theories to integrate existing evidence.

In this sense, Wesley Mitchell’s empirical work is itself a contribution to economic theory—and a contribution of the first magnitude. His work on prices and on business cycles provides an invaluable body of tested knowledge about these phenomena for the formulation of new theories and the testing of old theories; his work on the construction of index numbers and on statistical techniques for analyzing data on business cycles furthers the accumulation of additional tested knowledge. These contributions are so important and far reaching that they have tended to obscure the significance of the work with which this paper is concerned—Mitchell’s contribution to economic theory in the narrower sense of the explicit formulation of theory.

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¹ I am deeply indebted to Dorothy S. Brady, Arthur F. Burns, Earl J. Hamilton, Lloyd A. Metzler, and George J. Stigler for helpful comments, suggestions, and criticisms. I owe a very different kind of debt to Wesley C. Mitchell for his part, as teacher, colleague, and friend, in my intellectual development in general, and in my understanding of his own scientific creed in particular.

There is of course no sharp line between the empirical scientist and the theorist—we are dealing with a continuum, with mixtures in all proportions, not with a dichotomy. “The most reckless and treacherous of all theorists is he who professes to let facts and figures speak for themselves.”² And, one might add, the most reckless and treacherous of all empirical workers is he who formulates theories to explain observations that are the product of careless and inaccurate empirical work. A so-called “empirical generalization” may integrate many narrower generalizations; it may have great predictive power. A so-called “theory” may integrate little and have small predictive power. Yet there is a distinction worth drawing between work that is concerned primarily with the description of phenomena and the discovery of empirical regularities and work that is concerned primarily with the integration of empirical knowledge through the abstraction of supposedly essential features and their formulation into a coherent system of relationships.

The absence of a sharp line between empirical and theoretical work is particularly evident in Mitchell’s work. His empirical work is throughout shaped by a thorough knowledge of existing theory and directed toward the construction of a better theory. It is always analytical, never aridly descriptive. His theoretical work is throughout interwoven with his empirical work and made a part of an “analytic description” of the phenomena under study.³ Even in the most explicitly theoretical parts of his major writings—Part III of the 1913 *Business Cycles* and Chapter II of the 1927 *Business Cycles*⁴—Mitchell did not state baldly the bare bones of his theoretical structure; they are concealed in a summary of descriptive evidence and an elaboration of qualifications to the theoretical core or deviations from it.

Any attempt to make a thoroughgoing separation of Mitchell’s theoretical from his empirical work would be artificial and would yield parts whose sum would be less than the whole from which they were extracted. In consequence, I have not attempted such a

² Alfred Marshall, “The Present Position of Economics” (1885), in *Memorials of Alfred Marshall*, ed. A. C. Pigou (Macmillan & Co., 1925), p. 168.

³ Quoted phrase from the Preface to *Business Cycles* (1913), p. vii.

⁴ *Business Cycles: The Problem and Its Setting* (1927).

separation. Instead, with one important exception, I have selected for discussion a few theoretical formulations that seem to me important and that happen to be relatively easily separable without distortion (Sec. II). The one exception is Mitchell's theory of business cycles. This is clearly his most important theoretical contribution. At the same time, it is so deeply imbedded in a summary of the empirical characteristics of business cycles as to make any attempt at separation subject to serious error. Accordingly, I have adopted the device of displaying this contribution indirectly. Section III presents a business-cycle theory compounded entirely out of elements to be found in his work yet in a synthesis that I cannot confidently say he would have accepted as his own.

The form and the direction of Mitchell's work reflect in some measure his conception of economic theory and of the kind of work currently most important for its further development. They reflect, too, the kind of work in which his own comparative advantage was the greatest as well as his own standards of workmanship. These factors, discussed in Section I as a prelude to an examination of his theoretical formulations, do not of course provide a complete explanation; nothing short of an understanding of the whole man could do so.

I FACTORS BEARING ON THE FORM AND DIRECTION OF MITCHELL'S WORK

"Economic theory" is often taken to be a label for an existing body of doctrine concerned primarily with the allocation of resources among alternative ends and the division of the product among the co-operating resources, and based on the hypothesis that economic events can be "explained" and "predicted" by supposing men to behave as if they sought single-mindedly and successfully to pursue their own interests and as if their interests were predominantly to maximize the money income they could wring from a hostile environment. Mitchell consistently designated this concept "orthodox economic theory." He recognized its value as part of economic theory and made extensive use of it. Yet he was wholly convinced that orthodox economic theory was too narrow and that preoccupation with its improvement impeded progress in the area of what to him were the (currently) important problems.

To Mitchell, economic theory was more than orthodox economic theory. It was a set of hypotheses explaining economic behavior in all its leading manifestations, and he was himself almost exclusively concerned with a part of economic theory that was largely outside the main stream of economic thought when he began his scientific work and that even today is least developed and least satisfactory—the dynamic adjustment of the economic system as a whole. Because we know so little about this part of economic theory, we tend to neglect it in thinking about economic theory, to use the term to cover what we have, rather than what we ought to have. This circumstance, I think, partly accounts for the widespread illusion that Mitchell was antitheoretical, or at least not concerned with “economic theory”; for Mitchell’s work was consistently and almost exclusively devoted to the development of a theory of economic change.

Mitchell’s emphasis on “process,” on dynamic change, is already clearly evident in his *History of the Greenbacks*,⁵ and more explicitly in a 1904 article on “The Real Issues in the Quantity Theory Controversy,”⁶ in which he listed as one of the real issues: “How does the quantity of money exert its effect on prices?” and went on to say, “Adherents of the quantity theory . . . have usually neglected to trace the process by which a change in the supply of money affects prices with the care required by the subject.”⁷

Thorstein Veblen, who was at the University of Chicago during Mitchell’s period there, doubtless had much to do with stimulating Mitchell’s interest in process and dynamic change. One of Veblen’s chief criticisms of “orthodox” economics was that it was not an “evolutionary science,” that it did not deal with the problem of “cumulative change.”

Mitchell’s experience in working on the *History of the Greenbacks* and its sequel, *Gold, Prices, and Wages under the Greenback Standard*,⁸ must have reinforced Veblen’s teachings and given them vitality. For here he found that existing theory, while helpful in organizing material and in suggesting explanations, was unable to explain some of the most striking features of the price

⁵ University of Chicago Press, 1903.

⁶ *Journal of Political Economy*, June 1904, pp. 403-8.

⁷ *Ibid.*, p. 407.

⁸ The University Press, Berkeley, 1908.

revolution during and after the Civil War. He found a rough correspondence between the premium on gold and the average level of prices—a correspondence that he attributed primarily to the influence of trade with foreign countries that were on a gold standard. But what explained the behavior of the premium on gold? Its broad movements might conceivably be explained by changes in the quantity of money—though Mitchell was unable to satisfy himself about even this point because of the absence of reasonably satisfactory data on the quantity of money. But it was clear that detailed movements could not be so explained—they were too rapid and violent and corresponded too closely with the changing fortunes of the Northern armies. The proximate cause was better described by saying that “the quantity of the greenbacks influenced their specie value rather by affecting the credit of the government than by altering the volume of the circulating medium.”⁹ But this was no final answer: “The problems remain to be discussed,” he wrote in the final chapter of *Gold, Prices, and Wages*, “What factors controlled the premium on gold? Were the fluctuations both of the premium and of prices a consequence of some common cause, such as the changes in the quantity of money?”¹⁰

Mitchell also found systematic and important differences in the behavior of different classes of prices. Wholesale prices tended to change more sluggishly and later than the premium on gold, retail prices than wholesale, cost of living than retail prices, and wages than the cost of living. Mitchell found a proximate explanation of these differences in the organization of the markets, the growing importance of “friction” and “custom” as one moved from the market for gold to the wholesale market, the retail market, the housing market, and the market for labor—factors that orthodox price theory treated as peripheral. The explanation of these phenomena required an understanding of process, of different capacities for adaptation; it could not be wrung from a theory of comparative statics. So the importance of the phenomena left unexplained by the theories he had studied must have impressed him forcibly and made him receptive to Veblen’s message. The quantity theory of money and orthodox price theory explain a wide range of important phenomena, but they are incomplete and need to be

⁹ *History of the Greenbacks*, p. 208.

¹⁰ P. 272.

extended and revised to explain other phenomena equally important and not less puzzling.

Mitchell might have approached his objective of broadening economic theory by accepting the phenomena themselves as largely known and devoting his efforts to the excogitation of plausible hypotheses that would account for them. And Arthur F. Burns tells us that, in fact, Mitchell started on this route by beginning in 1907 "a theoretical treatise on money—a study in which he at first saw no place for statistics."¹¹ But in a little over two years he had left it and turned to the kind of work that was to dominate his scientific activities—the large-scale collection, organization, and interpretation of empirical evidence on business cycles, whether from historical research, contemporary judgments, or quantitative records.

This shift and Mitchell's continued emphasis on providing an "analytic description"¹² of economic phenomena reflect in part his judgment about the kind of work that would contribute most to the development of a satisfactory theory of economic change. In concluding a summary of the existing theories of business cycles in his 1913 *Business Cycles*, Mitchell wrote:

One seeking to understand the recurrent ebb and flow of economic activity characteristic of the present day finds these numerous explanations both suggestive and perplexing. All are plausible, but which is valid? None necessarily excludes all the others, but which is the most important? Each may account for certain phenomena; does any one account for all the phenomena? Or can these rival explanations be combined in such a fashion as to make a consistent theory which is wholly adequate? . . . It is by study of the facts which they purport to interpret that the theories must be tested (p. 19).

If I understand Mitchell rightly, he was saying something like this: Granted that our objective is a theory of economic change that will explain observed phenomena and correctly predict phenomena not yet observed; granted, too, that, when attained, such a theory will abstract essential elements from the complex of economic phenomena and in that sense will be "unrealistic"; it does not follow that the best way to derive such a theory is to proceed

¹¹ See above, p. 20.

¹² Preface to *Business Cycles*, p. vii.

directly to its formulation. In the study of any class of phenomena, it is necessary first to examine the phenomena themselves, to describe them, and to find empirical regularities, in order to provide a basis for generalization and abstraction; and at this stage the orderly organization of empirical data is more important than the elaboration and refinement of abstract hypotheses. In his judgment the theory of economic change was at this stage; yet he felt that economists were treating it as if it were not, as if the phenomena were already sufficiently well known to provide a basis for generalization. In consequence, they were excogitating numerous theories "both suggestive and perplexing." He would be better occupied, he felt, in using these theories to suggest the empirical phenomena to be investigated, and then devoting the major part of his attention to describing these phenomena, only afterward formulating a rationalization of them.

On the whole, I think, Mitchell's judgment about the state of the theory of economic change at the time he began his work was thoroughly sound. Indeed, if we are at a somewhat more advanced stage today, it is in no small measure because of his work in adding to the body of tested knowledge about economic change. And, even so, we still seem to know so little about the empirical phenomena to be explained by a theory of economic change that we cannot adequately choose between widely divergent theories. If Mitchell erred at all in his judgment, it was in occasionally applying it too broadly—to economic theory as a whole rather than to the theory of economic change alone. I do not think the same judgment is valid for orthodox relative price theory, as Mitchell recognized on occasion.¹⁸

Mitchell's emphasis on "analytic description" probably reflected also his own comparative advantage. His great genius was in an unparalleled capacity for bringing together an enormous mass of material, putting it into systematic form, and giving an orderly, lucid, and meaningful account of it. This capacity is demonstrated in every one of Mitchell's major works. Its finest and fullest expres-

¹⁸ "The Rationality of Economic Activity," *Journal of Political Economy*, March 1910, p. 215; "The Prospects of Economics," reprinted in Wesley C. Mitchell, *The Backward Art of Spending Money and Other Essays*, p. 371; *Lecture Notes on Types of Economic Theory* (Augustus M. Kelley, 1949), Vol. I, pp. 11-15 (mimeographed).

sion is in the 1913 *Business Cycles*, particularly in Part II, whose 356 pages contain a brilliant presentation of "Statistical Data concerning the Business Cycles of 1890-1911 in the United States, England, France and Germany." Though his subsequent work would alone suffice to give him an unquestioned place in the front ranks of economists, none of it, in my view, rivals in quality or significance the 1913 volume. This volume treats the phenomenon that has come to occupy perhaps the major place in the work and strivings of economists. It describes this phenomenon with a completeness that has rarely if ever been equaled; and it presents hypotheses to explain the phenomenon that still provide the inspiration for much of the current work on business cycles. Its nice balance between breadth of conception and precision of detail is matched in none of Mitchell's other work, perhaps because of the narrowness of scope of his earlier work, the comprehensiveness of his later work.

Mitchell believed that economics could become a cumulative science only if each worker could build on what earlier workers had done, that there was no hope of constructing an adequate theory on a foundation of careless and inaccurate empirical work. So despite the magnitude of the task he undertook—the breathtaking variety of phenomena and evidence he considered relevant to his problem—he sought unceasingly for accuracy and exactness. A single example from the 1913 volume will illustrate the meticulous attention to detail that marks his work. While Mitchell was working on this book, A. Piatt Andrew published *Statistics for the United States, 1867-1909*, for the National Monetary Commission.¹⁴ This volume contains a detailed and excellent presentation of monetary and banking statistics, compiled directly from official sources. Yet Mitchell was not content simply to take them over. He discovered that Andrew had not taken account of revisions in the estimated gold stock made by the Director of the Mint; so he corrected Andrew's figures to incorporate these revisions. He was dissatisfied with Andrew's estimates of the amount of money held by banks. Irving Fisher had independently made similar estimates, but new data had since become available. So he rejected both Andrew's and Fisher's estimates and proceeded to construct

¹⁴ Senate Doc. No. 570 (61st Cong., 2d sess.).

independent estimates of his own. But he did not neglect to compare his estimates with the others, to point out the reasons for the differences, and to adduce evidence to support the superiority of his procedures. Similarly, he was unwilling to accept Irving Fisher's earlier estimates of the volume of deposit currency in the United States, again because additional data had become available. So again he made his own estimates, carefully comparing them with Fisher's. The final figures he compiled were better than anything else then available, and at least some of them are probably superior to the figures contained in the most recent compilation of banking and monetary statistics.¹⁵

Mitchell's high standard of workmanship and meticulous attention to detail help to explain why in every field he touched—whether economic history, business cycles, prices, or statistical technique—his work has tended to become authoritative. His work stands up to exacting scrutiny; it does not fall to pieces as does much shoddy work that passes for scientific. I think it also helps to explain why his theoretical insights are so deeply imbedded in his descriptive work, so frequently qualified by his empirical instincts and knowledge. He could not put to one side phenomena he knew existed, even in order to throw into sharp relief features he considered basic.

Even in his *Lecture Notes on Types of Economic Theory*, recently made readily available in mimeographed form, Mitchell does not concern himself primarily with technical economic theory. Instead, he takes the development of economic theory as itself a process to be described, interpreted, and explained. Even here his emphasis on process, on "analytic description," is evident. In consequence, the *Lecture Notes*, particularly Volume I, which ends with John Stuart Mill, are an absorbing essay in the sociology of knowledge organized about the great economists of the period much more than a critical examination of alternative theoretical formulations.

¹⁵ In particular, the figures on currency in circulation in *Banking and Monetary Statistics* (Board of Governors of the Federal Reserve System, 1943), p. 408, are identical with Andrew's, except for the addition of minor coin, and do not include the correction in the estimated gold stock made by the Director of the Mint.

II SOME OF MITCHELL'S THEORETICAL FORMULATIONS

a) *The influence of "money" on economic practice and thinking.*—To Mitchell, "money" was a symbol for a much broader range of problems than is ordinarily treated under that heading. It stood for the whole complex of modern pecuniary institutions, not for technical monetary and banking arrangements alone. His use of the word in this sense reflected one of the central hypotheses that emerged from his work—that the use of money was the dominant characteristic distinguishing modern systems of economic organization from earlier ones. "The money economy," he wrote, "is in fact one of the most potent institutions in our whole culture. In sober truth it stamps its pattern upon wayward human nature, makes us all react in standard ways to the standard stimuli it offers, and affects our very ideals of what is good, beautiful, and true."¹⁶

This hypothesis recurs repeatedly in Mitchell's writing. It is a leading theme of his 1910 article on "The Rationality of Economic Activity,"¹⁷ the basis of his interpretation of current developments in economic theory in his 1916 article "The Role of Money in Economic Theory,"¹⁸ and an important part of his interpretation of earlier classical writers in his *Lecture Notes*. It is most completely formulated in one of his last papers, "The Role of Money in Economic History,"¹⁹ a beautiful essay that summarizes the thoughts of a lifetime on "how monetary forms have infiltrated one human relation after another, and their effects upon men's practices and habits of thought."²⁰

"The use of money," Mitchell argues, "gives society the technical machinery of exchange, the opportunity to combine personal freedom with orderly co-operation on a grand scale. . . . It is the foundation of that complex system of prices to which the individual must adjust his behavior in getting a living."²¹ But while it enlarged man's freedom, it also required him to become

¹⁶ "The Prospects of Economics," in *The Backward Art*, p. 371.

¹⁷ *Journal of Political Economy*, February and March 1910, pp. 97-113, 197-216.

¹⁸ Reprinted in *The Backward Art*, pp. 149-76.

¹⁹ *Journal of Economic History*, Supplement IV, December 1944, pp. 61-67.

²⁰ *Ibid.*, p. 61.

²¹ *The Backward Art*, pp. 170-71.

more calculating, more self-reliant, and more provident. . . . Individuals who possessed superior aptitude for making money came to the fore in all walks of life. . . . The new leaders found many chances to exploit others and took advantage of them; but, broadly speaking, men who are trying to make money are the servants of consumers—that is, of the whole society. . . . In this sense, the money economy gradually put the task of making goods under the direction of men who provided most efficiently what solvent consumers wished to buy, and whose continued leadership depended on maintaining their efficiency.²²

It thereby accelerated changes in methods of production and distribution of goods and in the character of production, but at the expense of exposing nations “to a novel set of dangers arising from the technical exigencies of monetary systems. . . . I think,” Mitchell wrote, “money economy is responsible also for business cycles.”²³

Since money molds man’s “objective behavior, it becomes part of his subjective life, giving him a method and an instrument for the difficult task of assessing the relative importance of dissimilar goods in varying quantities, and affecting the interests in terms of which he makes his valuations.”²⁴ In this way, men’s minds become obsessed by monetary illusions. An objective counterpart is that “production in a money economy is directed toward wares that promise a profit to the makers, not toward goods that will be most beneficial to the consumers, whatever that should be taken to mean. Money economy fosters inequality in the distribution of income, and where inequality is marked no one contends that what pays best is what the community needs most.”²⁵ A subtler counterpart is that “we are prone to pay far more attention to the relatively few factors that influence our money incomes in a way we can readily trace than to the host of factors that influence our money expenditures,”²⁶ which, among other effects, makes us receptive to protectionist devices that promise to raise money incomes despite the losses they entail on the side of consumption.

Mitchell argues also that the use of money is a key to under-

²² “The Role of Money in Economic History,” *op. cit.*, p. 62.

²³ *Ibid.*, pp. 63-64.

²⁴ *The Backward Art*, p. 171.

²⁵ “The Role of Money in Economic History,” *op. cit.*, pp. 63-64.

²⁶ *Ibid.*, p. 64.

standing both the development of orthodox economic theory and its range of usefulness.

Because it thus rationalizes economic life itself, the use of money lays the foundation for a rational theory of that life. Money may not be the root of *all* evil, but it is the root of economic science.²⁷

It is the habit of mind begotten by the use of money that makes the pleasure-pain calculus plausible as an account of our own functioning. Thus the use of money lays the psychological basis for that philosophy of human behavior which Bentham and Mill, Marshall and Clark, represent. . . . Economic theory written from the private and acquisitive viewpoint becomes a system of pecuniary logic that exaggerates the importance of one institutional factor in behavior to the neglect of others.²⁸

Pecuniary logic is such a momentous factor in the economic situation, that a clear working-out of theorems along its lines of logical development is illuminating.²⁹

The assumption of economic rationality is not so much mistaken as inadequate. It applies to the work of the captains but not to the work of the rank and file in industry and business; it does not explain the activities of consumption; and it betrays the economist into neglect of his chief problem, [which is how economic rationality itself arose].³⁰

A man who realizes that he is studying an institution keeps his work in historical perspective, even when he confines himself to analyzing the form that the institution has assumed at a particular stage of its evolution. By so doing he opens vistas enticing to future exploration . . . [and is] eager to profit by any light shed upon his problem by any branch of learning.³¹

One need not agree with every detail of this sketch to recognize its value. Mitchell here offers a simple yet subtle and fruitful hypothesis to integrate a wide range of seemingly unrelated phenomena. In his celebrated article, "The Backward Art of Spending Money," published in 1912, Mitchell illustrated his general hypothesis by elaborating its bearing on consumption. The backwardness of the art of spending money, he argued, reflects both the failure and the success of the money economy in extending its

²⁷ *The Backward Art*, p. 171.

²⁸ *Ibid.*, p. 306.

²⁹ "The Rationality of Economic Activity," *op. cit.*, p. 215.

³⁰ *Ibid.*, p. 201.

³¹ *The Backward Art*, p. 256.

sway over the household. Our retention of the family as the basic unit for spending money sets narrow limits to the standardization of function, the division of labor, and the extensive use of labor-saving machinery in consumption—the means whereby the money economy revolutionized production. In consequence, “housewives still face essentially the same problems of ways and means as did their colonial grandmothers.”³² But while the money economy failed to alter means fundamentally, it succeeded in shaping the ends of consumption in a way that is

subversive of economical management. . . . The money economy forms in us the habit of extravagant expenditure for the unacknowledged purpose of impressing both ourselves and our neighbors with an adequate sense of our standing. . . . The housewife . . . must buy not only gratifications for the appetites and the aesthetic senses, but also social consideration and the pleasant consciousness of possessing it. The cost of the latter is an air of disregarding cost.³³

Mitchell completes his explanation of the backwardness of the art of spending money by adding three other factors to these divergent effects of the development of the money economy: (1) the backwardness of “physiology and functional psychology,” “the sciences of fundamental importance” for the art of spending money, by comparison with physics and chemistry, the most important sciences for industry;³⁴ (2) the absence of a common denominator like the dollar to value costs and gains; and (3) the indefiniteness of ultimate ends.

A more important application of Mitchell’s broad hypothesis on the role of money, and something of a test of its validity, is contained in his discussion of the origin of business cycles. The three pages devoted to this subject in the 1913 *Business Cycles* are obviously a concentrated summary of a good deal of thought and study. His empirical generalization is that “business cycles are much later in appearing than economic, or even strictly financial crises. In England itself they seem not to have begun before the close of the eighteenth century. . . . In proportion as the Industrial Revolution and its concomitant changes in the organization of commerce and transportation spread to other countries, the latter began to develop the phenomena of business cycles already familiar in Eng-

³² *Ibid.*, p. 5.

³³ *Ibid.*, pp. 15-16.

³⁴ *Ibid.*, p. 11.

land." His hypothesis to explain this generalization is that "business cycles . . . make their appearance at that stage of economic history when the process of making and distributing goods is organized chiefly in the form of business enterprises conducted for profit."⁸⁵

This subject receives somewhat fuller treatment in the 1927 volume. The empirical generalization is repeated, tested with more adequate data, and retained essentially unchanged. The hypothesis to explain the generalization is stated more fully and linked more closely to the broader hypothesis of which it is a part.

Communities slowly become subject to recurrent alternations of prosperity and depression as a large proportion of the people begin to rely upon making and spending money in a large proportion of their activities. . . . To suggest the differentiating features of that highly developed form of money economy within which business cycles occur . . . perhaps the combination "profits economy" or "business economy" is most suggestive and least misleading. . . . What seems to count in producing business cycles is the common practice of money-making and money-spending by the population as a whole, not merely by a limited class of businessmen.⁸⁶

b) The quantity theory of money.—Mitchell was deeply interested in "money," not only in the broad sense in which we have just been using it, but also in the narrower sense of technical monetary and banking arrangements. His first published article was on the quantity theory of money—a none-too-well-considered attack on a rigid form of the theory.⁸⁷ A later article, "The Real Issues in the Quantity Theory Controversy," published in 1904, is a much more satisfactory discussion of the same subject. In it he condemned his own earlier article and emphasized that one of the "real issues" was "how does the quantity of money exert its effect on prices."⁸⁸ This problem continued to interest him. On the one hand, the

⁸⁵ *Business Cycles*, pp. 584-85.

⁸⁶ *Business Cycles: The Problem and Its Setting*, pp. 62-63. See also Arthur F. Burns and Wesley C. Mitchell, *Measuring Business Cycles*, pp. 3, 5, and 113.

⁸⁷ "The Quantity Theory of the Value of Money," *Journal of Political Economy*, March 1896. Mitchell was at the time an undergraduate at the University of Chicago.

⁸⁸ *Op. cit.*, p. 407.

quantity theory of money even in its "orthodox formulation" that, "other things being equal, prices vary directly as the quantity of money in circulation" is both valid and important [for] the long-period relations between gold supply and prices at wholesale."³⁹ On the other hand, the quantity of money could not, Mitchell thought, be the primary "active" factor in the short-period changes of prices dealt with in the theory of business cycles. Substantial changes in prices and production occur during such periods despite small changes in the quantity of money. Yet the longer periods are composed of the shorter periods. How can it be that the apparently most important factor for the longer-run movements is quiescent during so large a part of the shorter-run movements which together comprise the longer movement?

His final resolution of this question is contained in a discussion in his 1927 *Business Cycles* on "The Monetary Mechanism" and in particular in a subsection on "The Quantity Theory and Business Cycles." None of this material appears in the 1913 volume. He writes here:

Time . . . is of the utmost consequence in considering the relations between prices and "the quantity of money." Relations which hold in long periods do not hold in short ones. Nor are all short periods alike; what is true in certain phases of business cycles is not true in all phases. Yet most of the seemingly contradictory statements which fill the long controversy over this problem can be reconciled when put in their proper relation to time.⁴⁰

The hypothesis that Mitchell presents to reconcile the dominance of the quantity of money in the long-period movement with its usual or frequent passiveness in short-period movements is that in depression, revival, moderate prosperity and mild recessions, the effective limit upon . . . transactions [of businessmen] is set by commercial demand. . . . But in intense booms, the commercial demand may become so active that transactions reach the limit set by the monetary and banking systems. Over long periods of time, prices and the physical volume of trade have tended to expand up to these limits—not steadily, but in recurrent spurts of activity. And that fact has given changes in

³⁹ *Business Cycles: The Problem and Its Setting*, pp. 138-39.

⁴⁰ *Ibid.*, p. 138.

the annual output of gold a dominant influence upon the secular trends of wholesale prices.⁴¹

This analysis is intermingled with and grew out of a theoretical contribution of the first importance to the quantity theory of money—a contribution that, like most really important scientific discoveries, is obvious and almost trite, once it has been stated. This contribution consists in emphasizing that the elements in the quantity equation ($PT = MV + M'V'$) must be regarded as dated and that different dates must be attached to the various elements for the equation to be an identity.

Of the payments ($MV + M'V'$) made today, the bulk are payments for goods transferred (T) some time ago, at prices (P) most of which were agreed upon still earlier; a considerable fraction are payments for goods transferred today at prices now agreed upon; a minute fraction are payments for goods which will be transferred later. . . . In other words, the day-by-day relations between $MV + M'V'$ and PT are indeterminate—the payments made today are most unlikely to equal the prices quoted today multiplied by the goods exchanged today.⁴²

This difference in dating is unimportant, Mitchell says, for reasonably long intervals, or, stated differently, for static problems in which an equilibrium position is defined by the temporal stability of the variables. So in analysis of problems of position, the quantity theory can be used without paying special attention to the dating of the variables on which it centers attention. On the other hand, in the analysis of process rather than position, the dating of the variables is likely to be critically important; it is precisely the lags reflected in differences in dating that must be the central elements of a dynamic theory. As Mitchell somewhat ironically remarks, “an expression which shows nothing about time gives slight help toward solving problems in which time relations are important.”⁴³

c) Alternative kinds of cycle theories.—Cyclical fluctuations in economic activity can be interpreted in three rather different ways: (1) as a reaction of the economic system to disturbing causes “outside” the system (e.g., variations in weather, political changes,

⁴¹ *Ibid.*, pp. 137-38.

⁴² *Ibid.*, p. 131.

⁴³ *Ibid.*

wars), the apparently cyclical character of the reaction being explained by the cyclical character of the disturbing causes (e.g., sun spots, Slutsky's cumulation of random events); (2) as a reflection of a fundamentally unstable economic system given to cumulative one-way movements that are brought to an end either by accidental outside events or by such internal limits as a maximum possible quantity of money; (3) as self-generating, in the sense that the adaptive mechanism of the economy is cyclical, so that both long-run dynamic change and accidental impacts are converted into cyclical movements.

In his 1913 *Business Cycles* Mitchell examines these various ways of interpreting cyclical fluctuations, though he does not list them explicitly as I have, and accepts the third.

Of course prosperity confers no immunity against disasters which interfere with the course of business; but over many such rocks the accumulated momentum of good times may run without serious mishap. The great shortage of the American corn crop in 1901 did not stop the "boom" then in progress, though it came soon after a spectacular corner in the stock market; the failure of Mr. Walsh's banks in Chicago, the San Francisco fire, and the great coal strike did not stop the "boom" of 1905-06, though they followed hard one on the other. . . . On the other hand, many periods of intense prosperity have ended in years of peace, plenty, and good fortune. The waning, like the waxing of prosperity, therefore, must be due, not to the influence of "disturbing causes" from outside, but to processes which run regularly within the world of business itself.⁴⁴

Mitchell never found any reason to change this conclusion on the basis of his further work.

It makes little difference for the kind of theory accepted by Mitchell whether the system is regarded as converting long-run dynamic change and "disturbing causes" into cyclical movements or whether the cyclical movements are internally generated so that even in the absence of "disturbing causes" they would continue indefinitely with approximately constant amplitude. In either case, the character of the cycle is determined primarily by the institutional organization of the economy, not by the nature of the "disturbing causes," and both prediction and control of the cycle are

⁴⁴ *Business Cycles*, p. 473. See also *ibid.*, p. 512.

to be sought in an understanding of the "processes which run regularly within the world of business itself."

Mitchell's remarks on the various kinds of theories are spread through Part III of his 1913 volume, and many are in the form of incidental comments on other issues. Yet it seems clear that he rejected the hypothesis that outside disturbing causes are the dominant explanation of cyclical fluctuations in the economic system primarily on the basis of evidence like that contained in the passage quoted in the second preceding paragraph together with evidence on the consistency in the behavior of various activities. There seemed to be no such concentration of unfavorable "disturbing causes" at the peaks of cycles, or of favorable "disturbing causes" at the troughs, as this type of theory would imply. Nor did the movements of various sectors of the economy in relation to one another seem consistent with their determination by the accidental impact of the particular "disturbing causes" that might be said to account for the particular cycle.

Quite apart from the victims of special misfortunes, however, certain trades and localities have a late or a minor share in the benefits of a business revival. Such is the case on the whole with the agricultural and grazing sections. . . . Even in those notable cases when the revival has begun with profitable crops for the farmers in certain sections, it has reached the other farming sections and the world of handicraft, small trade, and the professions, not by direct transmission, but indirectly by its effect upon the more highly organized world of business.⁴⁵

Mitchell rejected the hypothesis that cyclical fluctuations reflect a fundamentally unstable economic system given to cumulative one-way movements brought to an end by some barrier presumably because the turns in economic activity did not seem to be sharp, as might be expected if a theory of this type were valid, and because he could identify no barrier or set of barriers that seemed consistently to end expansion or contraction. He emphasizes the "slow growth of the volume of business" at the trough in the absence of "some fortunate circumstance [which] gives a sudden fillip to demand," the "slow accumulation of stresses within the balanced system of business," the fact that "the crisis merges into depression in the same unobtrusive fashion that it emerged from

⁴⁵ *Ibid.*, p. 456.

prosperity."⁴⁶ Further, under the gold standard in effect when Mitchell was writing his 1913 volume, there was an upper limit to the aggregate quantity of circulating medium, so that "in default of other checks, the inadequacy of cash reserves would ultimately compel the banks to refuse a further expansion of loans upon any terms. But before this stage has been reached, the rise of prices is stopped by the consequences of its own inevitable inequalities."⁴⁷ Hence even this fairly clear barrier did not seem to operate at all regularly. Limitation of the supply of money is an important factor in business cycles, but it operates through impeding cumulative movements rather than as a barrier.

Despite Mitchell's rejection of disturbing causes and of inherent instability combined with more or less rigid barriers as the prime movers in the cyclical process, he nonetheless found a place for these phenomena in his theoretical discussion. Some "propitious event" might hasten "this transformation" from "dullness into activity" which, "left to itself . . . is effected by slow degrees."⁴⁸ More important, accidental events are likely to determine whether a crisis degenerates into a monetary panic, though the possibility of their doing so "arises primarily from . . . banking organization and practice."⁴⁹ Mitchell places considerable emphasis on what he describes as "cumulative" processes in expansions and contractions (discussed in Sec. III below) and remarks that "the more vividly this cumulative growth of prosperity is appreciated, the more difficult becomes the problem why prosperity does not continue indefinitely."⁵⁰ He hints at a barrier at the bottom in a minimum level of consumption:

Current consumption requires current production. Clothing, furniture, machinery and other moderately durable articles which have been used *as long as possible* are finally discarded and replaced. Population continues to increase at a fairly uniform rate: the new mouths *must* be fed and the new backs clothed. [Italics added.]⁵¹

⁴⁶ *Ibid.*, pp. 579, 573, and 548.

⁴⁷ *Ibid.*, pp. 574-75.

⁴⁸ *Ibid.*, p. 571.

⁴⁹ *Ibid.*, p. 577.

⁵⁰ *Ibid.*, p. 473.

⁵¹ *Ibid.*, pp. 578-79. It should be noted that, as Mitchell doubtless recognized, the words I have italicized are by no means self-explanatory. The first italicized phrase cannot well refer to physical possibility, and conventional standards do not set a rigid limit. The second also does not describe a physical necessity and sets no rigid limit except through an answer to the unasked question, "How much?"

Mitchell's retention of elements from theories that he rejected as the primary explanation of cyclical fluctuations is characteristic of the man. It is of a piece with his personal tolerance; his capacity for comprehensive yet accurate description; and his wide-ranging interest in history, psychology, other social sciences, and the natural sciences. It gives his writing a highly realistic cast; yet it also blurs the sharpness of his theoretical formulations. It is a major reason why it is so difficult to assert with confidence what factors Mitchell considered basic, what factors subsidiary. It explains why at times his theoretical analysis seems to be a grab bag held together by expositional skill rather than the closely reasoned structure it really is.

I am inclined to believe that Mitchell's conception of the business cycle as a self-generating process is ultimately traceable to the influence of Thorstein Veblen, less, however, through Veblen's cycle theory than through his emphasis on the importance of studying the evolution of institutions and his conception of economic history as a process of "cumulative change" in which one phase of historical development can be understood only in terms of the conditions out of which it grew and itself becomes the source of further change. It seems to me likely that this notion was the source of Mitchell's view that "a theory of business cycles must therefore be a descriptive analysis of the cumulative changes by which one set of business conditions transforms itself into another set."⁵² Mitchell recognized and emphasized that these cumulative changes were themselves subject to cumulative change: "Business history repeats itself, but always with a difference. This is precisely what is implied by saying that the process of economic activity within which business cycles occur is a process of *cumulative change*."⁵³ But this was, from a broad view, a qualification rather than an essential part of his main work. He there adopted the working hypothesis that the business cycle could be regarded as a repetitive process, at least as a first approximation.⁵⁴ Veblen's "cumulative change" was thus largely restricted to the confines of a single business cycle.

⁵² *Ibid.*, p. 449.

⁵³ *Ibid.*

⁵⁴ This hypothesis was put to a searching test and emerged essentially intact in Chs. 10 and 11 of *Measuring Business Cycles*.

Mitchell was not, of course, the first to conceive of business cycles as self-generating. As he wrote in 1913:

The theory of crises has grown into the theory of business cycles. . . . The explanations in favor today ascribe the recurrence of crises after periods of prosperity to some inherent characteristic of economic organization or activity. The complex processes which make up business life are analyzed to discover why they inevitably work out a change from good times to bad and from bad times to good.⁵⁵

Barnett argues that this view goes back even farther than Mitchell claims. Barnett writes: "It is a conservative conclusion that most of the abler writers from 1860 to 1900 were concerned with the alternate upward and downward movements of business activity—that is, business cycles—rather than, as frequently thought, with crises and depressions considered as temporary departures from prosperity."⁵⁶

The existence of precursors does not detract from the importance of Mitchell's hypothesis that cyclical fluctuations in economic activity can best be interpreted as self-generating movements. Mitchell stated this hypothesis more explicitly and precisely than his predecessors, assembled a wider range of evidence bearing on its validity, and used it to organize and interpret a more extensive and comprehensive body of evidence. Prior to his work, the hypothesis was a conjecture accepted by a considerable number of students. He made it an integral part of economic thought.

III A THEORY OF BUSINESS CYCLES CONSTRUCTED FROM MITCHELL'S WORK

Careful study of Part III of Mitchell's 1913 *Business Cycles* induces in me both exasperation and admiration. It induces exasperation, because numerous significant theoretical insights are so carefully hidden under the smooth, casual-sounding exposition of descriptive material. Time and again Mitchell seems on the verge of making explicit abstract statements about an essential element

⁵⁵ *Business Cycles*, pp. 5 and 6.

⁵⁶ Paul Barnett, *Business-Cycle Theory in the United States* (University of Chicago Press, 1941), p. 121.

in the cyclical process, only to withdraw into a summary of empirical regularities or a listing of special cases or an elaboration of qualifications. It induces admiration, because the theoretical insights are there after one pierces their protective coloring and are significant and profound and because the summary of empirical evidence on business cycles is so thorough, so thoughtful, and so well organized. I do not believe one can be certain precisely what "the theory of business cycles presented in Chapters X-XIII" is, and whether it is solely "a descriptive analysis,"⁵⁷ as Mitchell designates it, or an integrated abstract "model" capable of accounting for the major characteristics of the business cycles we have experienced and having empirical implications susceptible to contradiction. Does it really account for the dominance of expansionary forces at certain times and of contractionary forces at others? Or does its appearance of doing so simply reflect expositional skill—the stressing of expansionary forces in his discussion of the rising phase of a cycle, of contractionary forces in his discussion of the declining phase?

A remark by Arthur F. Burns in his moving appreciation of Mitchell suggested how I could present Mitchell's contribution to business-cycle theory while avoiding these troublesome questions of textual criticism and interpretation. Burns remarks about Part III of the 1913 volume: "I venture the prophecy that if Mitchell's homely work of 1913 were translated into the picturesque vocabulary of 'propensities,' 'multipliers,' 'acceleration coefficients' and the like, it would create a sensation in the theoretical world."⁵⁸ I have followed the spirit rather than the letter of Burns' suggestion—I have neither translated the whole of Part III nor attempted a literal translation. The aim of the free rendering that follows is to show that an integrated business-cycle theory can be constructed from—or read into—Mitchell's work and to express it in terms that bring out its similarities and dissimilarities to other existing theories.

I am by no means confident that Mitchell would have accepted the product as his own. He might well have regarded it as a selection of some elements of his discussion to the neglect of equally important elements, as one of several possible variants among

⁵⁷ *Business Cycles*, p. 570.

⁵⁸ See above, p. 26.

which he might have felt he knew too little to choose confidently. Even greater doubts attach to the mathematical formulation I have appended; it has been constructed to prove some statements and illustrate others, not to provide a faithful translation of the verbal theory. Yet I do not think that it is wrong to regard the theory outlined below as displaying Mitchell's contribution—or part of his contribution—to business-cycle theory. The use others make of a man's work is as valid a test of its significance as the use he makes of it; what others read into his work may be as significant as his own interpretation of it.

At the very broadest level of generality, persistent self-generating fluctuations in economic activity can occur only in a world characterized by both uncertainty (in the sense of unpredictable change) and lags in response (in the sense of different timing of response).⁵⁹ In the type of theory accepted by Mitchell, cyclical movements in economic activity are regarded as dominated primarily by the institutional responses of the economic system rather than by the particular unpredictable changes that occur. It follows that lags in response are the central elements in theories of this type. Further, if "a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle,"⁶⁰ the lags in response must be pervasive, they must operate on a broad range of activities, these activities must be linked to one another and to the remainder of the system, and the whole must display consistent, though not identi-

⁵⁹ Uncertainty alone could produce cycles without lags in response in either of two ways: (1) if the unpredictable changes themselves came in cycles or (2) if the system were fundamentally unstable but expansion or contraction ultimately ran into barriers. But these correspond to the two kinds of theories Mitchell rejected. If neither (1) nor (2) is accepted, and lags in response are ruled out, the pattern of change in economic activity must be a direct reflection of the pattern of unpredictable change, and, since the latter is not cyclical, neither is the former. Hypothetical models can be set up in which lags alone produce persistent cycles in the absence of uncertainty—e.g., the "cobweb" cycle of constant amplitude produced by a lag in output adjustment will proceed indefinitely, once started, without the introduction of (further) uncertainty. But in this case it would seem untenable to suppose the persistence of the lags. Hence my rejection of this possibility. It should be noted that this is a highly dogmatic and incomplete treatment of a subtle and difficult problem.

⁶⁰ Burns and Mitchell, *op. cit.*, p. 3.

cal, responses in successive cycles. We can thus center our discussion on the specific lags that seem basic in Mitchell's discussion, the reasons why he thought them pervasive, and the linkages among different activities.

a) *The lag of induced expenditures behind receipts.*—Some expenditures can be regarded as linked more or less directly and mechanically to the receipts of a current or an earlier period. The lag of such induced expenditures behind the receipts that occasion them, which in recent years has been enshrined in the "multiplier process," is central in Mitchell's explanation of the conversion of revivals into what he describes as cumulative expansions and contractions of general activity.

A revival of activity . . . within a narrow range of industries . . . soon spreads to other parts of the business field. For the active enterprises must buy more materials, wares, and current supplies from other enterprises, the latter from still others, and so on without assignable limits. . . . There results an increase in family incomes and an expansion of consumers' demand, which likewise spreads out in ever widening circles. . . . Soon or late this expansion of orders reaches back to the enterprises from which the impetus to greater activity was first received, and then this whole complicated series of reactions begins afresh at a higher pitch of intensity.⁶¹

This lag leads to a pervasive movement in part because of "the lines of interconnection among business enterprises which were traced in Chapter II," in part, "by engendering an optimistic bias in the calculations of all folk who are concerned with the active direction of business enterprises and with the providing of loans."⁶²

Alone, the lag of induced expenditures behind receipts is not capable of explaining a cycle. At all times, an expansion in one place is felt in many other places; optimism breeds optimism. But, equally, a decline in one place is felt in many other places; pessimism breeds pessimism. Something else must be introduced to explain why, at certain times, initial expansions are more important than initial contractions and, at other times, contractions than expansions. Mitchell fully understands this point; he uses this lag only to explain how initial revivals or contractions are diffused and prolonged. Further, as is by now widely recognized, this lag

⁶¹ *Business Cycles*, p. 571.

⁶² *Ibid.*, pp. 453 and 455.

alone does not necessarily lead to a continued movement at a constant or increasing rate. The kind of movement that is generated depends critically on the particular relation between changes in receipts and in induced expenditures. Let there be an "autonomous" increase in the *rate* of expenditures, hence in someone's rate of receipts. If there are (positive) "leakages," induced expenditures within the system being considered will tend to be less than the receipts that occasion them. In this case, the multiplier process explains, as it were, why each successive "round" tends to be less than the preceding "round," so that the expansion slows down and a new, higher, but stable level tends to be attained. The expansion tends to proceed at a constant or increasing rate only if leakages are zero or negative; and this is likely to occur only as the result of some such phenomenon as the "optimistic bias" suggested by Mitchell.⁶³

b) *Lags and differential responses in the system of prices.*—Just as the lag of induced expenditures behind receipts leads to the diffusion and prolongation of any autonomous change in expenditures, so it leads to the diffusion and prolongation of the associated change in prices. These changes in prices add additional features of their own. The system of prices as a whole does not move synchronously with expenditures or the physical volume of trade, and there are systematic differences in both the timing and the magnitude of the response of component parts of the system of prices.

Mitchell finds that, at the trough of the cycle, prices tend to rise later than expenditures or the physical volume of trade. He argues that the existence of much unused capacity at that stage of the cycle means that an expansion in money demand leads to an expansion of output without an immediate rise in prices. Even after prices begin to rise, they are likely to continue to lag, at least for a time, because of the influence of public regulation, contracts, and custom.⁶⁴ I am not sure what Mitchell considered the relation to be between the physical volume of output and prices at the peak of the cycle—it is not clear whether he regards both as turning down simultaneously, prices as turning down first, or output as turning down first.

⁶³ See Note 1 in the Appendix to this section.

⁶⁴ *Business Cycles*, pp. 457, 458, 496, and 497.

Of course, the whole system of prices does not react synchronously; some prices systematically tend to lag behind others. But the particular lags that Mitchell regarded as reasonably well established are not at all crucial for the present theory. The differential magnitudes of response of different prices are much more important than differential timing of response; in particular, the differential rates of response of what business concerns regard as their selling prices and their buying prices. Here Mitchell notes contradictory movements. One crucially important buying price—wages—tends to move more sluggishly than selling prices, primarily, in Mitchell's view, because custom and friction tend to "impede the free working of supply and demand in the labor market . . . and tend to keep wages more stable than are prices in markets where pecuniary motives have unrestricted sway."⁶⁵ On the other hand, wages aside, "what must be taken as buying prices creep up on selling prices during a period of prosperity."⁶⁶

These differential rates of response are important because they affect profits, which, in turn, affect investment. The direction of their net effect on profits depends on the relative importance of the differential responses of wages and other buying prices. In Mitchell's view, the response of wages is the more important, so that during the early stages of expansion "in the great majority of enterprises, larger profits result from these divergent price fluctuations coupled with the greater physical volume of sales. For, while the prices of raw materials and of wares bought for resale usually, and the prices of bank loans often, rise faster than selling prices, the prices of labor lag far behind, and the prices which make up supplementary costs are mainly stereotyped for a time by old agreements."⁶⁷

Thus, taken by themselves, these differential movements of prices would provide, as it were, a reason for negative leakages and thus promote the continuance of expansions or contractions. Let an expansion get under way and be prolonged by the lag of induced expenditures behind receipts. The milder rise in wages than in selling prices will tend to increase profits and thereby lead to new expenditures for investment in addition to those directly linked to

⁶⁵ *Ibid.*, p. 466.

⁶⁶ *Ibid.*, p. 481.

⁶⁷ *Ibid.*, p. 572.

the higher receipts, thus adding a new force making for expansion. And the reverse would occur in contractions.

But the changes in per-unit prices cannot be taken by themselves. In the first place, different selling prices behave quite differently; in some lines selling prices are relatively rigid, in others, highly flexible; in some lines special circumstances will produce movements against the tide. In consequence, some firms will be experiencing declining profit margins, and the favorable effect of further increases in already large profit margins is likely to be less than the unfavorable effect of declines in none-too-wide profit margins.⁶⁸ In the second place, the changes in per-unit prices are accompanied by changes in the physical volume of output that spell changes in per-unit cost even at fixed buying prices. In expansion "equipment which is antiquated and plants which are ill located or otherwise work at some disadvantage are brought again into operation. . . . The efficiency of labor declines. . . . Finally, the numerous small wastes, incident to the conduct of business enterprises, creep up when managers are hurried by a press of orders demanding prompt delivery."⁶⁹ In short, cost curves rise (i.e., slope positively) after some point as output increases and ultimately rise steeply. Both the divergent experiences of different firms and the rise in unit costs operate to discourage investment, and so to offset the effect of the differential responses of wages and selling prices.⁷⁰

c) The lag of investment expenditures behind investment decisions.—Like most other business-cycle theorists, Mitchell attaches great importance to investment expenditures. Investment expenditures need bear no very close relation to prior receipts and are not in any way mechanically required by them. They are therefore ideally qualified to serve as the kind of noninduced expenditures required to set the multiplier process going. In addition, the volume of activity in construction and producers' goods industries fluctuates more widely than in most other industries, thus calling attention to investment as a potentially crucial factor in the generation of cycles.⁷¹

⁶⁸ *Ibid.*, p. 575.

⁶⁹ *Ibid.*, p. 573.

⁷⁰ See Note 2 in the Appendix to this section.

⁷¹ *Business Cycles*, pp. 471 and 483-84.

As I read Mitchell, he considered the chief determinants of the amount of investment that business enterprises decide to undertake to be prospective profits, costs of construction, and the availability of, and rates of interest on, loans. Prospective profits, in turn, he considered closely related to current profits and their distribution, and current profits, to the current profit margin and the physical volume of sales.⁷² The behavior of some of these determinants of investment has already been discussed: the differential movements of prices widen the profit margin during the early stages of an expansion and thus reinforce the direct effect on profits of the expansion in the physical volume of sales; the expansion in the physical volume of sales also tends to produce a distribution of profits unfavorable to further expansion of investment; it also brings higher costs at fixed prices that tend to inhibit the further widening of the profit margin and the further increase of profits or to produce declines. As to the other determinants, the same factor that tends to make unit costs rise in all expanding industries—essentially, a rising cost curve—operates with special force in investment goods industries because of the wider fluctuations in output. In this way, rising cost curves serve as a double deterrent to the continued expansion of investment—by inhibiting the widening of the profit margin and by raising construction costs. Finally, for reasons to be discussed in connection with monetary forces, after expansion has proceeded for a while, interest rates tend to rise sharply and loans to become less readily available.

Similar forces operate in a contraction. The differential response of selling prices and wages would by itself lead to a narrowing of the profit margin in a contraction, though with a lag, and thus reinforce the direct effect on profits of the decline in the volume of business. But the reduction of the level of output reduces unit costs, including construction costs, at fixed prices; interest rates fall; and loans become more readily available—all factors that tend to encourage investment.

If investment expenditures were simultaneous with the decision to undertake the corresponding investment, these reactions could explain the tapering-off of expansions or contractions, but not their reversal. Given a sufficiently vigorous expansion, the divergence

⁷² *Ibid.*, pp. 459, 460, 464, 486, 487, 499, 504, 557, 567, 572, and 573.

in profit experience, rise in unit costs, including costs of construction, and increased cost and reduced availability of loans could in time overpower the effect of the differential movements of buying and selling prices and the expansion in the physical volume of sales and in this way lead to a decline in investment expenditure. But any such decline could not go far enough to produce a decline in national income (i.e., aggregate expenditures). For the changes unfavorable to investment are supposed to occur without a lag; they are produced by a rise in current income and would not have occurred if current income had not risen. So long as investment is in turn affected by them without a lag, this means that current investment can decline only if current income rises; hence these forces cannot reverse the direction of movement.⁷³

To explain the reversal in direction of movement requires the introduction of another lag, one that is critical for the present theory, namely, a lag of investment expenditures behind investment decisions.

Much of the work [on contracts for permanent improvements] . . . requires a year, two years, three years, or even more to execute. . .⁷⁴

⁷³ To put the matter differently, suppose that investment expenditures are the only noninduced expenditures, that all other expenditures, which we may identify as consumption, are mechanically linked to the income (investment plus consumption) of current and prior periods, and that an expansion has been under way sufficiently long for current consumption to be linked solely to the income of periods that are part of the expansion. Consumption in the succeeding period will then tend to be higher than in the current period, since it is linked to a set of higher incomes. There is nothing in the forces so far discussed to prevent investment from being lower than in the current period, but it can be lower only if income is higher, since it will take a higher income to produce those unfavorable changes in the determinants of investment that simultaneously produce the lower investment expenditures. Any decline in investment expenditures must therefore be less than the rise in consumption, which itself is a delayed reaction to prior rises in income.

It should be noted that these conclusions rest on particular empirical hypotheses about the relations among the various price movements and their relative magnitudes. If the movements in buying prices other than wages were more important than the movements in wages, so that the profit margin narrowed during expansion and widened during contraction, or if wages were regarded as lagging behind prices, the forces so far described could alone produce a cyclical reaction to "disturbing causes." See Note 2 in the Appendix to this section.

⁷⁴ *Business Cycles*, p. 487.

Activity does not slacken at once in the trades which do contract work and furnish materials. . . . Indeed, the mills making structural steel, etc., may be working under high pressure to get out work on which bonuses for quick delivery are expected at the very time their order books for the coming quarters are scantily filled. . . .⁷⁵ The work of building and installing the elaborate equipment of today lasts months if not years.⁷⁶

This lag of investment expenditures behind investment decisions makes current investment expenditures depend on prior investment decisions, which in turn depend on prior income through the various determinants of investment. In consequence, there is no contradiction in supposing a rise in income to reduce investment undertakings to a level that would be inconsistent with the current level of income, for the current level of income is associated with the current level of investment *expenditures*, not of investment *undertakings*. The addition of this lag to the reactions so far considered therefore yields a system capable of accounting for reversals of movement and so for the complete cycle.⁷⁷

So far nothing has been said to explain the wider fluctuations in the output of the construction and equipment industries than in the output of other industries. Mitchell's explanation of this difference rests on what has since come to be called the "acceleration principle." In the absence of net new investment, these industries would be occupied primarily with producing replacements. To take a specific example, let us suppose that replacements require an annual output equal to 5 per cent of the existing capital stock. Let enterprises now seek to extend productive capacity to provide for an anticipated increase in demand of 5 per cent. Production of the required 5 per cent increase in available facilities in one year would call for a 100 per cent increase in the output of the construction and equipment industries. Thus, Mitchell writes:

Of course, the constant necessity for repairs and renewals provides a good deal of work for these construction trades at all times, and there is never a year when considerable extensions of old and construction of new plants are not undertaken. But when to this regular work . . . there is added the rush of orders from the many enterprises which see

⁷⁵ *Ibid.*, p. 488.

⁷⁶ *Ibid.*, p. 485. See also p. 574.

⁷⁷ See Note 3 in the Appendix to this section.

their own trade outrunning their facilities and from . . . numerous new projects . . . , then the construction trades have a season of activity which few of the industries for which they are working can match.⁷⁸

d) *The role of the monetary and banking system.*—We have already noted that Mitchell regards the cost and availability of loans as one of the important determinants of the amount of investment that business enterprises decide to undertake. Changes in the cost and availability of loans are themselves produced by differential responses in the monetary and banking sphere. These responses play identically the same role in the cyclical process as the differential responses in prices and costs discussed earlier—alone, they are incapable of giving rise to cyclical movements and rather explain why an expansion or contraction tapers off and ultimately ceases. The lag of investment expenditures behind investment decisions must be combined with them to explain how changes in the cost and availability of loans can go “too far” and produce cyclical movements in general activity.

Mitchell distinguishes between the “investment market” (the market for long-term loans) and the “money market” (the market for short-term loans). He regards the former and the long-term

⁷⁸ *Business Cycles*, p. 484. See also *ibid.*, pp. 471-72, 475, 483-85, and 557.

Mitchell gives a good deal of verbal prominence to a lag connected with investment that it does not seem to me desirable to include in the present theoretical sketch. He writes: “For a while their [the construction trades] demand for commodities is not accompanied by a corresponding increase in the market supply. What they are making in the way of equipment . . . does not come on the market as a factor opposing the advance of prices. . . . [But] when new industrial equipment is placed in active service both the demand for labor, materials, etc., and the current supply of products are enlarged. Hence the encroachments of costs and the difficulty of advancing selling prices are both aggravated” (*ibid.*, pp. 484 and 497).

This lag can obviously play a significant role only during expansion and at the peak. Here Mitchell regards it as (1) preventing product prices from rising as rapidly as they otherwise might toward the end of expansion and thus as a further factor inhibiting new investment and (2) operating differentially among industries and thus producing divergent profit prospects. Thus this lag is at best another reason for phenomena already accounted for. More important, it has significant offsetting effects: at least some additional resources required to operate the new equipment are released by the completion of the equipment; equipment is generally ordered to reduce unit costs, and the use of such equipment may widen the profit margin by impeding the advance of costs more than the increased output impedes the advance of prices.

interest rate determined in it as of primary importance for long-term investment undertakings; the money market and the short-term interest rate determined in it, for working capital and inventory investment.⁷⁹ These two markets are, of course, linked so that a change in the rate of interest or availability of funds in one market is communicated to the other. The main differences between them are, first, the greater inelasticity of demand for short-term loans, which Mitchell regards as the major factor explaining the wider fluctuations in short- than in long-term interest rates,⁸⁰ and, second, the much greater direct importance of banks in the short- than in the long-term market.⁸¹ Since Mitchell's analysis is more explicit and detailed for the banking system than for other lenders, I shall restrict the discussion largely to the banking system.

As I see it, three features of the monetary and banking system largely account for the cyclical role Mitchell assigns to it: the use of nondeposit currency for both a circulating medium proper and bank reserves, inelasticity in the total supply of nondeposit currency, and fractional reserve banking. To see how these interact, let us suppose that for some unspecified reason the pecuniary volume of business revives after a period of depression. The banks willing, the associated increase in the transactions demand for money can be met in part by an increase in the amount of currency in the hands of the public at the expense of bank reserves, even though the total does not increase, and in part by an increase in demand deposits under fractional reserve banking, even though bank reserves do not increase or even decline. And the banks are likely to be willing because "in times of depression bank reserves become larger in proportion to demand liabilities than bank managers think needful, so that periods of prosperity open with a considerable excess of lending power over current demands."⁸²

The increase in currency in the hands of the public leaves a smaller fraction of the limited supply of nondeposit currency in the vaults of banks; the increase in demand deposits means that this smaller fraction must serve as reserves behind a larger volume of deposits. Both therefore tend to reduce the reserve ratio of the banking system.

⁷⁹ *Ibid.*, pp. 486-87 and 489-90.

⁸⁰ *Ibid.*, p. 489.

⁸¹ *Ibid.*, p. 490.

⁸² *Ibid.*, p. 491.

Just where bankers will draw their line against further expansion of loans it is . . . impossible to say. But it is certain that they will draw such a line firmly somewhere within fairly definite limits. As these limits are approached the bankers put up their discount rates and become more exacting in their acceptances of new applications for loans.⁸³

The reverse occurs during a contraction—currency flows back from circulation into bank reserves, demand deposits decline, actual reserves exceed desired reserves, and so interest rates decline.⁸⁴

The operation of this central response of the banking system is somewhat modified by two associated responses: (1) Changes in liquidity preference—both banks and other holders of liquid funds have a lower desire for liquidity during expansions, when optimism is general, than during contractions. For banks, this is reflected in a decline in the desired reserve ratio during expansions and a rise during contractions; for nonbanks, in a shift from speculative and precautionary balances to transactions balances during expansion and conversely during contraction, i.e., in a rise in the velocity of circulation during expansions and a fall during contractions.⁸⁵

(2) Changes in the ratio of currency held by the public to deposits—Mitchell finds empirically that the ratio of currency held by the public to deposits tends to rise during contractions and to fall during expansions. He gives no satisfactory explanation for this phenomenon, which may merely be another manifestation of the changes in liquidity preference or may reflect still other factors, such as a change in the relative importance of different classes of transactions.

These associated responses tend to restrain the rise in the rate of interest during an expansion—the change in liquidity preference by reducing both the reserve ratio desired by banks and the extra amount of money required to support the larger volume of transactions; the change in the ratio of currency to deposits by limiting the drain of currency from bank reserves. Similarly, both responses tend to slow up the decline in the rate of interest during a contraction.

The rise in interest rates produced by the response of the banking system to an expansion in the pecuniary volume of business will

⁸³ *Ibid.*, p. 492.

⁸⁴ *Ibid.*, p. 561.

⁸⁵ *Ibid.*, pp. 491-92, 494, and 566-67.

tend, Mitchell argues, to discourage new investment undertakings, which, in turn, would restrain the expansion in the volume of business and hence the associated rise in the interest rate. The crucial question once again is: Why does not the expansion simply taper off; why does it turn into a contraction? And, again, the answer is: Because expenditures on investment lag behind decisions to undertake investment. Today's interest rate is linked to today's volume of business through the transactions demand for money and its effect on the reserve position of the banks. Today's volume of business is linked to today's expenditures on investment rather than to the investment undertakings currently decided on or initiated. But today's expenditures on investment depend on yesterday's investment decisions, which were affected by yesterday's interest rate. Thus a relatively low interest rate yesterday may have stimulated heavy investment expenditures today, and these may be little affected by the rise in interest rates they produce. There is nothing, therefore, to prevent interest rates from rising to levels at which new investment undertaken is inadequate to maintain the current level of income. And, of course, precisely the same argument applies in reverse to a contraction.⁸⁶

e) Summary of the preceding business-cycle theory.—Investment expenditures play the central role in the business-cycle theory just sketched. An expansion of investment expenditures sets in motion forces tending to discourage the undertaking of further investment; a contraction of investment expenditures, forces tending to encourage the undertaking of further investment. An expansion of investment expenditures is likely to continue even after new investment undertakings have ceased to grow because investment expenditures lag behind investment decisions. In consequence, the discouragement of new investment tends to go "too far," bringing about a reversal in the direction of movement; and conversely in a contraction. These movements are diffused through the economy and smoothed over time by induced expenditures and their lag behind income which give rise to the multiplier process.

According to the theory, two major sets of institutional responses affecting the desirability of undertaking new investment are brought into play by the expansions or contractions in investment

⁸⁶ See Note 4 in the Appendix to this section.

expenditures: first, responses in the structure of prices, including wages, and in unit costs at fixed prices; second, responses in the monetary and banking system. The first set of responses has offsetting effects. The changes in prices alone tend to widen the profit margin during an expansion and so to encourage investment; the changes in unit costs, which ultimately are dominant, tend to narrow profit margins and raise the cost of construction and so discourage investment; and conversely during a contraction. The responses in the monetary and banking system lead to a rise in the interest rate and a reduction in the availability of loans during an expansion, which discourages new investment, and to a fall in the interest rate during a contraction.

The changes in prices and costs and in the monetary and banking system occur at the same time and affect the volume of investment undertaken in the same direction; yet there is no direct link between the two, and either would alone be capable of producing cyclical movements when combined with the lag of investment expenditures behind investment decisions. We thus have, as it were, a theory of business cycles resting on two pillars, with a single keystone—the lag of investment expenditures—and a common mortar—the multiplier process.⁸⁷

f) Comparison of this theory with current theories.—The business-cycle theory I have constructed from Part III of Mitchell's 1913 volume contains practically every element that is significant in the business-cycle theories that are currently prominent. Here are the multiplier process, the acceleration principle, the Pigovian cycles of optimism and pessimism, the Marshallian and Hawtreyan drain of cash from the banking system and the resultant tightening of the money market, a decline in the expected yield from new investment at the peak that is the counterpart of the Keynesian "collapse of the marginal efficiency of capital" except that it is a continuous decline rather than a discontinuous "collapse," the Keynesian changes in liquidity preference. Here, too, is an attempt at a reasoned explanation and integration of these phenomena. The decline in the marginal efficiency of capital, for example, is not simply postulated, or attributed to unexplained changes in expectations or to a growth in the capital stock; it is

⁸⁷ See Note 5 in the Appendix to this section.

linked to consistent movements in prices and costs; and these serve equally to explain the subsequent revival in the marginal efficiency of capital.

By no means all the elements I have selected for special mention from Mitchell's theoretical discussion were new even when he wrote the 1913 volume; at least hints of most of them can be found in the theoretical writings Mitchell summarized in his Part I. The reasoned explanation and integration of the various elements and their linkage with empirical evidence contained in Part III are new, and they constitute the chief theoretical contribution of the 1913 volume.

The fact that the theory includes practically all current theories as special cases is by itself no virtue. Indeed, it would be an advance in business-cycle theory to demonstrate that so complex a system is either unnecessary or erroneous: that a simplified theory containing only part of the reactions encompassed in the broader theory is capable of rationalizing the available evidence and of yielding predictions that are not contradicted or that predictions derived from some elements of the theory are contradicted by available evidence. But the more limited theories that are now current represent an advance in neither respect. They are not simpler because it has been shown that the elements they stress are alone capable of explaining the observed phenomena or because it has been shown that other theories or component elements of theories have implications contradicted by experience. The only criteria to which they appear to have been subjected are, first, whether they are logically complete and attractive and, second, whether they are capable of producing cyclical movements whose broadest and most general features are like those observed. The important virtue of the theory I am inclined to attribute to Mitchell—and reflection on our progress in this field since 1913—is that, considered alongside current theories and judged entirely as a contemporaneous product, it is not clearly inferior to any.

I have found only two points of any consequence in Mitchell's theoretical discussion, at which it seemed to me the analysis—as distinct from the language—might have been changed significantly by full knowledge of the work in business-cycle theory that has been done in the intervening period. One point is in connection

with his discussion of the relation between savings and investment, when, for example, he says, "For a time, however, the fresh accumulations of capital are not accompanied by a corresponding volume of fresh investments in business ventures." This sentence can be interpreted so as to be entirely consistent with the Keynesian emphasis on the accounting equality between saving and investment, as usually defined, and the importance of distinguishing *ex post* from *ex ante* magnitudes. At the same time, I feel that the discussion from which it is extracted would be written differently and more meaningfully in the light of these developments. Yet, even here, Mitchell is not really led astray. A modern writer could disagree with the language but not with the substance of the comment, following close upon the sentence just quoted: "Certainly a considerable . . . share of the liquid capital provided by certain individuals in seasons of depression is used merely to cancel part of the losses incurred by other individuals. Such investments represent a redistribution of ownership, but no new creations of industrial equipment."⁸⁸

The other point is at the end of Mitchell's theoretical discussion. After showing how "depression paves the way for a return of prosperity," Mitchell concludes his theoretical discussion with the statement: "Such is the stage of the business cycle with which the analysis began, and, having accounted for its own beginning, the analysis ends."⁸⁹ Now this is clearly misleading; given that the process of cumulative change leads to a situation qualitatively like the initial situation, there remains the quantitative question of amplitude. The forces that Mitchell discusses might produce a cycle that was so strongly damped that it could not meaningfully be regarded as "self-generating" or a cycle so explosive that it could not be regarded as a meaningful description of empirically observed cycles. Mitchell does not explicitly refer to this problem; no one familiar with recent theoretical work, particularly that expressed in mathematical language, could fail to do so, though unfortunately it cannot be said that he would be equipped to solve the problem.

But after all these are relatively minor points. As Burns implied, the major difference between Mitchell's theoretical discussion and modern discussion is in language rather than substance. He uses

⁸⁸ *Business Cycles*, pp. 566-67.

⁸⁹ *Ibid.*, pp. 569 and 579.

none of the jargon we have grown so fond of—"propensities," "multipliers," "acceleration principle," etc.—and he uses no mathematics. The preceding sketch demonstrates, I hope, that this is almost entirely a difference in language, that his theoretical discussion can readily be translated into current jargon—as I have done to some extent in the text—or into difference equations—as I have done to a much lesser extent in the appended notes.

Mitchell's general conception of business cycles as reflecting cycle-generating responses of economic institutions to uncertain change has come to dominate business-cycle analysis and is today hardly questioned. It is much less clear how much influence should be assigned to the details of his work. The identity of details of other current theories with elements in Mitchell's discussion may well reflect primarily independent rediscovery or the influence of still earlier writings rather than Mitchell's direct influence.

Perhaps the most important reason why the details of Mitchell's discussion did not have a more direct, obvious, and far-reaching influence is the direction his own work followed. Mitchell essentially took the position that the 1913 volume was preliminary and superficial; that it needed to be reworked from beginning to end. The 1927 *Business Cycles* was a reworking of Part I of the 1913 volume; a lengthy unpublished manuscript that served as the starting point for many of the monographs undertaken at the National Bureau of Economic Research, of Part II; the volume published posthumously, *What Happens during Business Cycles*; the first instalment of a reworking of Part III. Mitchell's persistence in this task is a tribute to his tenacity and the standard of thoroughness he set himself. But I believe his subsequent work would have been more fruitful if he had devoted more of his energies to testing and improving the theory in his 1913 volume and less to purely factual analysis. At any rate, his concentration in recent years on the facts of business cycles has made people overlook the theoretical work he had previously done. Mitchell came to be regarded as a master compiler of fact, who—apart from his factual determinations—had nothing to contribute to economic theory at large or even to business-cycle theory.

In view of Mitchell's own attitude toward his theoretical work as expressed in his research program, its appearance just prior to

World War I, the elaborately casual language in which it is presented, and the extent to which its abstract elements are concealed, it is not surprising that economists may have had to rediscover its essential elements.

IV CONCLUSION

Mitchell's striving for theoretical explanations of the phenomena he studied was an essential element in his scientific work. It led to the contributions to the explicit formulation of economic theory that have been presented in the preceding sections of this paper—the development of a hypothesis about the role of money in shaping economic practice and thinking, the improvement of the quantity theory of money, the selection of one among several types of business-cycle theories, and the elaboration of a specific business-cycle theory. Equally important, it focused his empirical work on meaningful problems, made it analytic as well as descriptive, and prevented him from engaging in empiricism for its own sake. The ultimate fruits of his theoretical insights and objectives are as much in his empirical work as in the more explicitly theoretical writings with which this paper has dealt.

APPENDIX TO SECTION III

The following semiconnected notes contain a mathematical model of a business-cycle theory, the central elements of which are taken from the theory I have constructed from Mitchell's work and presented verbally in Section III. At the same time, they are not intended as an exhaustive or unique translation of that theory into mathematics, or as a version of the theory that Mitchell would have accepted as his own, or even as the mathematical formulation of the theory that I should regard as the most fruitful basis for further research and empirical verification. Their purpose is very different and much more modest: to prove some of the statements made in the text without rigorous proof and to illustrate others. Accordingly, I have not hesitated to omit from the model abstract elements of the theory that were not essential to the propositions needing proof or to select from alternative renderings of various elements of the theory the version that would make exposition easiest even though it might not be the most significant. The point on which the notes depart most from the spirit of the

verbal theory is in the treatment of lags. To keep the exposition and analysis in these notes manageable, I have adopted the highly restrictive assumption that all lags are of the same duration and equal to one time unit. This assumption clearly plays no part in Mitchell's theoretical discussion and would be an undesirable restriction in a formulation to be used as a basis for empirical research.

To facilitate reference, I have indicated the subsection of Section III to which each note should be considered as appended.

Note I (to Sec. III, a).—The multiplier process in its simplest form implies a division of all expenditures into two classes: (1) those linked mechanically and directly with receipts of the current or an earlier period—these are called “induced expenditures” in the text; (2) all other expenditures, some or all of which may be indirectly connected with receipts but are not directly linked with them—these are called “autonomous expenditures” in the text.

Consider only those receipts and expenditures that remain in a consolidated national income account. Let Y be total national income; C , induced expenditures; and I , autonomous expenditures.⁹⁰ Let the subscript $-i$ designate the value for the i th preceding time unit, say, year. Total expenditures, i.e., income, are then given by

$$Y = C + I. \quad (1)$$

The linkage between induced expenditures and prior receipts can be expressed by

$$C = f_1(Y_{-1}). \quad (2)$$

Substituting (2) into (1) yields the difference equation

$$Y = f_1(Y_{-1}) + I. \quad (3)$$

For a fixed value of I , there will be some value of Y for which $Y = Y_{-1}$. This is the stable solution. Now let I be changed. One can then use equation (3) to trace the subsequent reactions of Y . The character of these reactions depends on

$$\frac{dY}{dY_{-1}} = f'_1, \quad (4)$$

where the prime designates a derivative. The reactions can be cyclical, of the “cobweb” variety, only if f'_1 is negative. But f'_1 is positive, since an increase in receipts is taken as leading to an increase in expenditures. If $f'_1 \cong 1$, which is equivalent to saying that there are zero or

⁹⁰The letters C and I are chosen to conform to the conventional, though misleading, identification of induced expenditures with consumption and of autonomous expenditures with investment.

"negative" leakages, i.e., that an increase of \$1.00 in receipts leads to an increase of \$1.00 or more in induced expenditures, then the reactions will tend to lead to an indefinite expansion or contraction at a constant or increasing rate in response to a change in I . If $f'_d < 1$, there are positive leakages, and a change in I leads to a series of successively smaller changes in Y , thus to a one-way movement that tapers off. For example, let $C = .9Y$. Then equation (3) becomes

$$Y = .9Y_{-1} + I.$$

If I is 10, the equilibrium level of Y is 100, the "multiplier," 10. Let I change to 15. The new equilibrium level of Y is 150, and the successive values taken by Y in approaching this level are 100, 105, 109.5, 113.55, . . .

Note 2 (to Sec. III, b and c).—Let P represent selling price per unit of output; B , cost per unit of output, which is dependent on buying prices and technical cost conditions. The hypothesis that investment is a synchronous function of the profit margin (because the profit margin affects profits) can be expressed by the equation

$$I = f_2(P - B), \quad (5)$$

and the lag of prices behind output that Mitchell considers to exist by

$$P = f_3(Y_{-1}). \quad (6)$$

The effect on B of movements of wages and other buying prices can be taken into account by making it depend on the prior year's output; the effect on B of the technical conditions determining the marginal cost curves, by making it depend on the current year's output. This gives

$$B = f_4(Y_{-1}, Y). \quad (7)$$

In these equations, f'_2 and f'_3 are positive, and so are the partial derivatives of f_4 . Substituting from equations (6) and (7) into (5), and the result into (3), gives

$$Y = f_1(Y_{-1}) + f_2[f_3(Y_{-1}) - f_4(Y_{-1}, Y)], \quad (8)$$

an implicit difference equation,

$$g(Y, Y_{-1}) = Y - f_1(Y_{-1}) - f_2[f_3(Y_{-1}) - f_4(Y_{-1}, Y)] = 0. \quad (9)$$

From this equation

$$\frac{dY}{dY_{-1}} = \frac{f'_1 + f'_2 \left[\frac{df_3}{dY_{-1}} - \frac{\partial f_4}{\partial Y_{-1}} \right]}{1 + f'_2 \frac{\partial f_4}{\partial Y}}. \quad (10)$$

The separate influence of the differential rates of response of buying and selling prices can be isolated by setting $(\partial f_4)/(\partial Y) = 0$. I have attributed to Mitchell the empirical hypothesis that these differential responses alone would mean a widening of the profit margin during expansion and a narrowing during contraction because the milder movement of wages than of selling prices is more important than the sharper movement of other buying prices. This is equivalent to saying that

$$\frac{df_3}{dY_{-1}} > \frac{\partial f_4}{\partial Y_{-1}}.$$

It follows from equations (4) and (10) that $(dY)/(dY_{-1})$ is numerically larger if computed from equation (8) or (9) than from (3), which is a translation of the statement in the text that "taken by themselves, these differential movements of prices would . . . promote the continuance of expansions or contractions." The influence of the level of output on costs through the marginal cost curve can be included by setting

$$\frac{\partial f_4}{\partial Y} > 0.$$

The larger $(\partial f_4)/(\partial Y)$, the smaller is $(dY)/(dY_{-1})$ from (10), which is a translation of the statement in the text that this factor tends "to offset the effect of the differential responses of wages and selling prices." So long as all the derivatives in (10) are positive, and

$$\frac{df_3}{dY_{-1}} > \frac{\partial f_4}{\partial Y_{-1}},$$

however, $(dY)/(dY_{-1})$ from (10) is positive, which rules out the possibility of cyclical movements. This is a translation of the statement in the text that "these reactions could explain the tapering-off of expansions or contractions, but not their reversal."

If movements in buying prices other than wages were more important than the movements in wages so that the profit margin narrowed for this reason during expansion and widened during contraction, the converse of Mitchell's hypothesis, then $(df_3)/(dY_{-1})$ would be less than $(\partial f_4)/(\partial Y_{-1})$ and $(dY)/(dY_{-1})$ from equation (10) could be negative, so producing cycles of a cobweb variety. Alternatively, if wages were regarded as lagging behind prices, which again is not in agreement with Mitchell's conclusions, equation (7) could be replaced by

$$B = f_5(P_{-1}, Y), \quad (11)$$

which would give a final implicit equation

$$g(Y, Y_{-1}, Y_{-2}) = Y - f_1(Y_{-1}) - f_2 f_3(Y_{-1}) - f_5[f_3(Y_{-2}), Y] = 0. \quad (12)$$

The positive sign of the partial derivatives implies that

$$\frac{\partial Y}{\partial Y_{-1}} > 0, \frac{\partial Y}{\partial Y_{-2}} < 0$$

when computed from equation (12), which is compatible with either cumulative one-way movements or cycles that are not of the cobweb type, depending on the numerical values of the derivatives.

Note 3 (to Sec. III, c).—A lag in investment expenditures behind investment decisions can be expressed by replacing equation (5) by

$$I = f_6(P_{-1} - B_{-1}). \quad (13)$$

Combining equation (13) with (3), (6), and (7) yields

$$g(Y, Y_{-1}, Y_{-2}) = Y - f_1(Y_{-1}) - f_6[f_3(Y_{-2}) - f_4(Y_{-2}, Y_{-1})] = 0. \quad (14)$$

The positive sign of the partial derivatives together with the hypothesis that

$$\frac{df_3}{dY_{-2}} > \frac{\partial f_4}{\partial Y_{-2}}$$

implies that

$$\frac{\partial Y}{\partial Y_{-2}} > 0.$$

Nothing can be said definitely about the sign of $(\partial Y)/(\partial Y_{-1})$. These results are compatible with the generation of cycles by equation (14).

Note 4 (to Sec. III, d).—Let m be the total stock of currency eligible for use as reserve or as currency in the hands of the public, and assume it fixed.⁹¹ Let H be the amount of currency in the hands of the public; D , the amount of deposits; R , the actual reserve ratio of the banking system; R^* , the desired reserve ratio; and r , the rate of interest. Then, by definition

$$R = \frac{m - H}{D}. \quad (15)$$

The changing liquidity preference of the banks can be expressed by

$$R^* = f_7(Y); \quad (16)$$

the transactions and liquidity demand for currency and deposits by the public by

$$H + D = f_8(Y, r); \quad (17)$$

the relation between the level of income and the ratio of currency in

⁹¹ Mitchell discussed in considerable detail changes in m , but he concluded that they play little systematic role in the cyclical process. Increases in m , he argued, tended to prolong expansions and decreases to prolong contractions.

the hands of the public to deposits by

$$\frac{D}{H+D} = f_9(Y); \quad (18)$$

and the dependence of the interest rate on the reserve position of the banks by

$$r = f_{10}(R^* - R). \quad (19)$$

The empirical hypotheses about these functions I have attributed to Mitchell imply that

$$f_7' < 0; \frac{\partial f_8}{\partial Y} > 0, \frac{\partial f_8}{\partial r} < 0, \frac{Y}{f_8} \frac{\partial f_8}{\partial Y} < 1$$

(to assure that velocity changes in the same direction as income); $f_9 > 0$, and $f_{10} > 0$.

From equations (17) and (18),

$$D = f_8(Y, r) \cdot f_9(Y), \quad (20)$$

$$H = f_8(Y, r) [1 - f_9(Y)]. \quad (21)$$

Substituting from equations (20) and (21) into (15) gives

$$R = \frac{m - f_8(Y, r) [1 - f_9(Y)]}{f_8(Y, r) \cdot f_9(Y)}. \quad (22)$$

Substituting from equations (16) and (22) into (19) gives

$$r = f_{10} \left\{ f_7(Y) - \frac{m - f_8(Y, r) [1 - f_9(Y)]}{f_8(Y, r) \cdot f_9(Y)} \right\}, \quad (23)$$

an implicit equation connecting Y and r . From equation (23),

$$\begin{aligned} \frac{dr}{dY} &= \frac{f_{10}}{f_9 \left(f_9 f_8^2 - m \frac{\partial f_8}{\partial r} f_{10} \right)} \\ &\times \left[m f_9 \frac{\partial f_8}{\partial Y} + f_7' f_8^2 f_9^2 - f_8 f_9' (f_8 - m) \right]. \end{aligned} \quad (24)$$

From the conditions on the various derivatives, the fraction in front of the bracketed expression is positive, the first term of the bracketed expression is positive, and the other two terms negative. These last two terms reflect the changes in liquidity preference and in the ratio of currency to deposits. If these responses did not occur, the last two terms would be zero and $(dr)/(dY)$ definitely positive. The existence of these associated responses reduces the size of $(dr)/(dY)$ and, indeed, could make it negative. This possibility is ruled out only by Mitchell's empirical finding that short-term interest rates do conform positively to movements in aggregate activity.

Since no lags have been introduced into these equations describing the response of the monetary sector, they cannot alone generate cyclical movements. Of course, some lags are implicit in these equations, since otherwise a discrepancy between R and R^* would be impossible.

To generate cyclical movements, these monetary responses need to be combined with the lag of investment expenditures behind investment decisions. This lag, together with the dependence of investment decisions on the rate of interest, can be expressed by

$$I = f_{11}(r_{-1}), \quad (25)$$

where $f'_{11} < 0$. To keep this the only lag, suppose

$$C = f_1(Y), \quad (2)'$$

and substitute equations (2)' and (25) into (1), which yields

$$Y = f_1(Y) + f_{11}(r_{-1}). \quad (26)$$

But equation (23) gives r_{-1} as a function of Y_{-1} so (26) is a difference equation from which

$$\frac{dY}{dY_{-1}} = \frac{f'_{11} \frac{dr_{-1}}{dY_{-1}}}{1 - f'_1}. \quad (27)$$

From (24), $(dr_{-1})/(dY_{-1})$ may be taken positive. f is negative, and f'_1 can be taken less than unity, so $(dY)/(dY_{-1})$ is negative, a necessary condition for (26) to yield cobweb cycles.

Note 5 (to Sec. III, e).—We can combine the partial models of the preceding notes by replacing investment equations (13) and (25) by a single equation generalizing the two, say,

$$I = f_{12}(P_{-1} - B_{-1}, r_{-1}). \quad (28)$$

This yields a system of ten equations in ten unknowns consisting of (28), (1), (2), (6), (7), (15), (16), (17), (18), and (19). The final difference equation yielded by solving these equations is

$$Y = f_1(Y_{-1}) + f_{12}[f_3(Y_{-2}) - f_4(Y_{-2}, Y_{-1}), r_{-1}(Y_{-1})], \quad (29)$$

where $r_{-1}(Y_{-1})$ is given by (23). From this equation, and the conditions placed earlier on various derivatives, $(\partial Y)/(\partial Y_{-2}) > 0$ and $(\partial Y)/(\partial Y_{-1})$ is of uncertain sign, results that are compatible with the generation of cycles.

It should be noted that equation (28) does not allow for the influence on investment of changes in profits associated directly with changes in the physical volume of trade, or of changes in the cost of constructing capital goods reflecting changes in the level of output of the capital goods industries, or of the divergence among the profit

experiences of different firms—all factors that Mitchell stressed. The first of these could be taken into account by including $(Y_{-1})/(P_{-1})$ as an additional variable in f_{12} , the second by including I_{-1} . The first step would not change the order of the difference equation or the conclusion about the signs of its partial derivatives; the second would broaden the range of possible results. It is more difficult to take account of the third factor in any simple way.

Finally, it may be worth noting explicitly that the range of possible results, particularly with respect to the kinds of cycles that could be generated, would almost certainly be widened if the model were generalized by dropping the highly restrictive assumption that all lags are of the same duration and equal to one time unit.