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INTERVIEW AND OTHER SURVEY TECHNIQUES AND THE STUDY OF INVESTMENT

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1. *Introduction: An Epistemological Warning*

The contemporary conviction that business investment or capital formation is of great importance in economic life has coincided with the major development and use of polling techniques in various of the social sciences. To many economists this coincidence has reinforced a traditional American methodological precept to "get the facts." The consequences have frequently been interesting; they have also been disconcerting in a variety of ways. In this paper I shall survey the work done and in process in this area and shall attempt to suggest points of empirical interest and notes of jarring theoretical discord. I shall then indicate some of the results of my own interviews of business executives in generally giant-size industrial firms, in connection with the Merrill Foundation research project in "Expectations and Business Fluctuations."

Economists asking questions are in some danger of grasping a new tool from psychologists without being forewarned of pitfalls. Certain serious methodological questions should be faced in any evaluation of findings obtained by interviewing individual business-

Note: Preparation of this paper has been facilitated greatly by a faculty research fellowship of the Social Science Research Council. Section 4 is based largely on interviews of executives of large manufacturing corporations undertaken in 1951 and 1952 as the writer's contribution, while on the faculty of the University of Illinois, to the Merrill Foundation research project in "Expectations and Business Fluctuations" under the direction of Franco Modigliani. Gratitude for valuable and generous advice and assistance in various phases of this work is due to V Lewis Bassie, Howard R. Bowen, Jean Bronfenbrenner Crockett, Jack Feldman, Robert Ferber, Paul M. Green, Richard B. Heflebower, C. Addison Hickman, Bert G. Hickman, Dexter M. Keezer, Ruth P. Mack, Owen H. Sauerlender, Robert P. Ulin, and in largest measure, Franco Modigliani. I have also benefited considerably from comments of discussants of this paper as it was presented at the Conference on Research in Income and Wealth, October 9–11, 1953, and particularly from the comments of the formal discussants, Walter E. Hoadley and Charles B. Reeder, and James N. Morgan.

men or by subjecting them to questionnaire inquiries. These questions have frequently been ignored or handled in perfunctory fashion.

First it is clear that one cannot accept respondents' descriptions or explanations of what they do at face value without further examination. It is quite possible that the individual businessman does not really know, in any sense satisfactory to the economist, what determines his investment decisions. We may add that if he did know he might not tell!

However, the businessman's possible lack of knowledge as to what (in some sense satisfactory to the inquiring economist) determines his actions may actually induce him to tell things that are not quite true. One may wonder for example whether the rather numerous indications of formulas and calculations, brought into evidence in the pages to follow, may not betray above all a wish to satisfy (in fact, spuriously) the *economist's* desire for method and system. The businessman may be quite right in his original impulse to see his decisions as essentially particularistic in motivation and apparently almost random in character. Finding of common causes, generalizing, and theorizing by the economist may still be very useful and indeed essential. But the businessman's explanation of why he does things may not be the economist's.

One may wish to increase the weight attached to this last point when one considers certain problems of moving from the individual firm, on which individual businessmen focus their attention, to aggregative relations which receive major attention from economists. It is entirely possible that causative factors that loom large in individual decisions wash out in the aggregate. This point may perhaps be seen most clearly by considering the approach that an investigator should take to the problem of explaining or predicting the number of applicants accepted in medical schools. He might interview carefully selected samples of accepted and rejected applicants. Those rejected might ascribe their rejection (correctly!) to such factors as poor undergraduate grades, lack of good letters of recommendation, having studied at a relatively unknown college, or racial or religious discrimination. Those accepted might conversely explain their good fortune (also correctly!) in terms of good grades, good letters, good schools, and desirable social attributes. Yet the aggregate number of students admitted to medical school must depend in the short run on the facilities of medical schools and in the long run on factors such as the effective demand of the community for medical services. Clearly the replies of accepted and rejected applicants in an interview (or questionnaire) survey of this kind might give information as to why certain applicants were accepted

rather than others but it would tell us little about why so few (or so many) were accepted in the aggregate.

The contrived illustration above finds some real parallels in the study of determinants of investment. For we are interested in factors determining the aggregate of investment rather than what may cause capital expenditures to be made at a certain time by one firm rather than another. A case in point may well be the answers received by the writer from executives of several firms on the role of accelerated depreciation of capital assets for tax purposes. As we shall note, some indication was found that businessmen considered such tax advantages an inducement to capital expenditures. Yet it should be clear that one would not be warranted in asserting on the basis of such a finding that an extension of accelerated amortization for tax purposes, or any similar tax concessions, would raise the aggregate of investment. It might well be that higher depreciation charges and their resultant effects upon income distribution, tax incidence, total tax receipts, and/or governmental expenditures might lower aggregate demand and its investment component. In any event this is a problem for the economic analyst; the business respondents can furnish at best only a part of the material for a solution.

An example of exaggerated reliance upon interview findings to decide a major issue in the theory of investment is afforded by much discussion of the role of the rate of interest. For, as we shall note, one of the most popular refrains of investigators who have reported the businessman's explanations of his own motivations as if they were the causes of economic phenomena has been the "debunking" of the rate of interest. I do not wish to argue that fluctuations in the rate of interest *are* an important cause of fluctuations in the rate of investment. But the contrary conclusion to which many investigators point, that the rate of interest is quite *un*important, is frequently unwarranted by *their* findings.

We may make this clear by positing a model in which there are only two variables which may influence individual investment decisions: the aggregate rate of sales (or changes in the aggregate rate of sales) and the rate of interest. We may then postulate further that while sales of individual firms may fluctuate by a substantial amount—say 10 per cent—from year to year, there is no change in the aggregate rate of sales. Thus what one firm or industry gains, another firm or industry must lose. Fluctuations in the rate of interest may be of similar magnitude—say 10 per cent, as from 5 per cent to 4.5 per cent—but, being occasioned largely by actions of

national monetary institutions, show little difference in relative magnitude when looked at from individual and aggregative points of view.[1] If in such a situation businessmen were asked what makes them alter their investment, or indeed if a cross-section or time series analysis on an individual firm basis were made, what answers might be expected as to the relative roles of interest rates and sales, demand, or profits? Clearly interest costs would be a relatively minor factor in contemplated new investment by businessmen faced with changes in sales in the order of 10 per cent and probably greater consequent changes in profits. Yet just as clearly, on the aggregate level (as would be confirmed by statistical analysis of aggregative time series data for an economy conforming to our assumption), changes in the rate of sales would have nothing to do with changes in the rate of investment; there would be no aggregative change in sales. On the other hand fluctuations in the rate of interest, which on the individual firm level seemed of too minor weight to merit mention, are the only factor with any significance in the aggregate.

Now, of course, in the real world we do not have economies in which there is no aggregative change in sales or in which sales and interest rates are the only variables significant in investment decisions.[2] However, essentially the rate of interest is one of those variables whose effect, whatever it may be, tends to be an aggregative phenomenon and not, by its nature, a factor in which variations in experiences of one firm (such as a gain in sales at the expense of a competitor) are canceled substantially by similar changes in an opposite direction for another firm. The economic theorist is concerned precisely with those variables that help him explain the economy rather than with the particular actions of individual firms. Hence it is not in itself decisive for economic theory that so many businessmen indicate that they do not consider the rate of interest in making investment decisions.[3]

[1]Of course there may be certain changes in the structure of interest rates. However, the consequent variation in incidence as between firms would be relatively small.

[2]In the real world aggregative changes in sales, in the opinion of this writer, are certainly a major determinant of the aggregate of investment. Hence the issue of methodological propriety in establishing this point is all the more important.

[3]An understanding of marginal concepts is significant here. For the individual firm, investment expenditures tend to represent discrete, "lumpy" projects. In only a small proportion of such projects would it be reasonable to expect profitability to be at the margin of acceptability, where a variation in interest costs would prove significant. This general point is

More generally the sophisticated investigator must expect to find that the great bulk of explanations, descriptions and rationalizations offered by his respondents are irrelevant to his model. This should cause no alarm and rush to discard the model. It is exactly because it is a model and has the capacity to be useful as an explanatory device that it abstracts from the great body of data which, while perhaps significant to the individual businessman, are irrelevant to *its* purpose.

This does not mean that models and theories must be impervious to interview and questionnaire findings. These findings can be very useful in enriching the model and offering links between empirical data and theoretical formulations which will make the latter more fruitful in empirical and substantive prediction. Thus, for example, statements by respondents that they do not consider the rate of interest but that they are seriously concerned with ratios of debt to equity and the effect of new stock issues upon the price of existing securities may suggest (for empirical testing and fitting into our theoretical formulation) certain variables which are importantly related to interest rates, money markets, and/or cost of capital in general. On the other hand, complaints of difficulties in securing credit from banks may be related more basically to other variables, such as profit prospects, than to availability of capital itself. Thus a firm with uncertain sales and profits prospects might well find it difficult to finance a contemplated capital expenditure and might ascribe the role of investment inhibitor to availability of funds. Yet in this case the banks or capital markets would merely be reacting to other variables which the economist might more properly consider relevant.

Above all, the investigator must avoid what may be called a public opinion poll mentality which would decide issues of economic theory by a meaningless majority vote. Much of our theory relates to marginal considerations. The traditional role of the interest rate in influencing the level of investment may be quite consistent with a situation in which only 5 per cent of firms pay any attention to the interest rate. Ubiquitous rules of thumb by which businessmen appear to operate in 90 per cent of the cases reveal highly significant information in just the 10 per cent which are exceptions. And businessmen's descriptions, rationalizations, and explanations of what

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treated at greater length in a comment by the writer in *Short-Term Economic Forecasting*, Studies in Income and Wealth, Volume Seventeen, Princeton University Press for National Bureau of Economic Research, 1955, pp. 484-488.

they do may enable us to complement economic theory; they are certainly no substitute for it.

2. *Studies in Recent Years*

1. One of the early and still best known interview studies in the field of capital formation was that of the Oxford Economists' Research Group, reported by J. E. Meade and P. W. S. Andrews.[4] The Oxford group consulted thirty-seven businessmen, including manufacturers in a wide range of industries (covering both capital and consumers' goods), merchants, and financial institutions, and "also had the benefit of the advice of an accountant and of two American Professors, one of business administration and the other of accounting." Each meeting was preceded by a questionnaire which gave a general idea of the questions to be asked in the interview. The role of interest rates in capital expenditure and inventory decisions received prime consideration. Attention was also given to other factors affecting investments such as undistributed profits, the desire to maintain dividends out of reserves during a depression or to maintain a liquid position, expected changes in prices or constructional costs, the state of demand, and abundance or scarcity of liquid resources.

2. A second report by Andrews[5] involved 313 replies to a questionnaire addressed to 1,308 businesses in February 1939. Managing directors were asked to indicate which, if any, of half a dozen matters relating to the rate of interest or the availability of money had "ever effected" (1) expenditure on plant extensions, (2) expenditure on maintenance and repairs, and (3) the size of stocks.

3. Perhaps the most far-reaching interview analysis on record was that published by Ruth P. Mack[6] in 1941. This involved eighty-six personal interviews with fifty-six firms in some eleven industries[7] and "conversations held with someone of at least vice-presi-

[4]J. E. Meade and P. W. S. Andrews, "Summary of Replies to Questions on Effects of Interest Rates," *Oxford Economic Papers*, October 1938, pp. 14–31 (reprinted in part in Oxford Studies in the Price Mechanism, T. Wilson and P. W. S. Andrews, editors, Oxford University Press, 1951, pp. 27–41).

[5]P. W. S. Andrews, "A Further Inquiry into the Effects of the Rate of Interest," *Oxford Economic Papers*, February 1940, pp. 32–73 (reprinted, in part condensed, in Wilson and Andrews, *op. cit.*, pp. 51–67).

[6]Ruth P. Mack, *The Flow of Business Funds and Consumer Purchasing Power*, Columbia University Press, 1941.

[7]The sample which was used in Mack's statistical analysis, and which was in substantial part identical or similar to that of the interview study, included firms in the steel, construction, machinery, automobile, petroleum, textile, clothing, shoe, cigarette, meat-packing, and baking industries.

dential rank and frequently with several of the minor executives as well" (page 212). The firms approached were generally important and included many if not most of the nation's industrial giants. The interviews were part of a larger statistical work; thirty-two of the firms interviewed were included in a study of the sources and uses of funds in fifty-four companies between 1932 to 1935, and 1938.[8] Therefore Mrs. Mack was not pushed so much into using subjective opinions of respondents where actual statistical data were required.

4. The Minneapolis Project[9] was an interview study of capital formation involving twenty-five interviews with executives of thirteen manufacturing firms ranging in size from those of a few hundred employees to General Mills, Inc., with some 12,000 workers in the Minneapolis-St. Paul area. The study was carried on by Walter W. Heller, Arthur R. Upgren, Carl L. Nelson, and Francis M. Boddy of the University of Minnesota. It "relied chiefly on intensive interviews with key decision makers in the leading firms," and "explored the anatomy of decisions to invest in plant and equipment."[10]

5. George Katona and James N. Morgan have reported on an interview study involving executives of 188 manufacturing plants in Michigan in 1950.[11] Firms of less than twelve employees and the large automobile manufacturers were excluded. The sample was further structured to include "all 'large' plants...as well as many 'small' ones." Introductory letters were sent to head officers of the firms selected, or to top executives of plants with head offices outside of Michigan. "In the majority of cases interviews were obtained with the selected top executives (often together with other executives drawn into the discussion); in a minority of cases the interviewer was referred to a vice-president or treasurer."[12] Only one interview was held with each firm; the average length of interviews was one hour. Reflecting the experience and specialized training of the staff of the Survey Research Center at the University of Michigan, the study raises several pertinent methodological questions involved in the application of survey techniques in addition to its report of substantive findings in the areas of industrial mobility and investment decisions.

[8]These firms are listed by Mack (*op. cit.*, pp. 29–31).

[9]*The Minneapolis Project—A Pilot Study of Local Capital Formation* (including three appendixes), University of Minnesota, 1950 and in Walter W. Heller, "The Anatomy of Investment Decisions," *Harvard Business Review*, March 1951, pp. 95–103.

[10]Heller, *op. cit.*, p. 95.

[11]George Katona and James N. Morgan, "The Quantitative Study of Factors Determining Business Decisions," *Quarterly Journal of Economics*, February 1952, pp. 67–90.

[12]*Ibid.*, p. 70.

Katona and Morgan studied factors associated with investment decisions by combining "the direct question of why" with "correlation analysis" of "information . . . concerning a number of factual and attitudinal variables . . . and the firms' investment plans" (pages (82–83). They have reported thus far however only information obtained by direct questions and by correlation with attitudinal (not factual) variables. The authors apparently confined their analysis to investment decisions explicitly related to expansion.

6. Michael Gort interviewed executives of twenty-five electric utility companies in the Northeast, East Central and North Central regions (by Federal Power Commission regional classifications) during the spring and summer of 1950.[13] Forty interviews were conducted with five presidents or board chairmen, fourteen vice presidents, five chief planning officers on the engineering level, and sixteen others. Interviewed companies accounted for roughly two-thirds of the generating capacity in the regions studied.

Gort supplemented a relatively unstructured interview with examination of unpublished records, memoranda, and various firm documents for fourteen of the twenty-five firms. In this way he endeavored to avoid "some of the errors in interpretation arising from the tendency to rationalize past decisions on the part of the person interviewed" and to obtain information on the duration and flexibility of investment plans.

7. Melvin G. de Chazeau interviewed executives of forty-nine firms "of widely varying size and industry classification" between 1946 and 1948 as part of a study of what individual companies could contribute toward stabilizing the economy.[14] "Interviews varied," de Chazeau reported, "from a single contact to contact with practically all members of the top management staff" (page 85, footnote.) In a few instances interviews were supplemented by an examination of case materials. For each class of capital outlays (including repairs and maintenance) efforts were made to trace the initiation, perfection, and implementation of plans, the determination

[13]Michael Gort reported his work in "The Planning of Investment: A Study of Capital Budgeting in the Electric Power Industry," *Journal of Business*, April and July, 1951, pp. 79–95 and 181–202.

[14]Melvin G. de Chazeau, "Regularization of Fixed Capital Investment by the Individual Firm," *Regularisation of Business Investment* (Princeton University Press for National Bureau of Economic Research, 1954, pp. 75–106), offers observations based on that study. Further information on the nature of the research was made available in a preliminary mimeographed version of the paper cited above, presented to the Universities–National Bureau Committee for Economic Research Conference in November 1951.

of the amount and timing of expenditures, the approval and revision of budgets, and the imposition and alteration (if any) under varying market prospects of criteria for approval of capital expenditures.

8. Andrews and Elizabeth Brunner reported on an intensive study, conducted by repeated interviews and an examination of firm documents, of the United Steel Company, Ltd. Although this work falls somewhat in the case study category, which has generally been excluded from consideration in this paper, it is listed because it specifically involves research into the determinants of investment.[15]

9. Several continuing questionnaire surveys of capital expenditure plans, while undertaken largely for forecasting purposes, prove prolific sources of data bearing on the determinants of capital expenditures. The most extensive of these are the quarterly and annual surveys of actual and anticipated plant and equipment expenditures conducted jointly by the Securities and Exchange Commission and the Department of Commerce. As reported by Irwin Friend and Jean Bronfenbrenner Crockett,[16] the sample firms regularly responding in the survey consist of close to 1,000 registered corporations in all industries reporting each quarter to the SEC and more than 1,100 nonregistered manufacturing companies, noncorporate as well as corporate, reporting to the Department of Commerce.[17]

[15]P. W. S. Andrews and Elizabeth Brunner, *Capital Development in Steel*, Oxford University Press, 1952.

[16]Irwin Friend and Jean Bronfenbrenner, "Plant and Equipment Programs and Their Realization," *Short-Term Economic Forecasting*, pp. 53–98. Information on these surveys and certain closely related studies may be found also in a similar article by the same authors in *Survey of Current Business*, Dept. of Commerce, December 1950, and in press releases and periodic reports appearing in *Survey of Current Business*. Particularly worthy of citation for their technical notes on the nature of the surveys are articles in the *Survey of Current Business* by Lawrence Bridge, "Capital Expenditures by Manufacturing Industries in the Postwar Period," December 1951, and by Bridge and Vito Natrella, "Capital Expenditures by Nonmanufacturing Industries," August 1952.

[17]Irwin Friend and Jean Bronfenbrenner, "Business Investment Programs and Their Realization, *Survey of Current Business*, December 1950, p. 11, footnote. A recent copy of the "Report Form for Plant and Equipment Expenditures Survey" used by the Department of Commerce includes requests for information on actual expenditures for plant and for equipment (listed separately) for the previous quarter and (periodically) for the previous year, as well as anticipated expenditures for these items for the quarter in progress (a sort of "semiforecast") and the next quarter and (periodically) for the coming year. It also requests the preceding year's actual figures and coming year's anticipated figures for "net sales and receipts from operations." (Sales information was *not* requested in early surveys. Even while preserving the anonymity of respondents, these data should permit further analysis of the relationships among actual and anticipated sales and sales changes and developing investment plans. A considerable

Early in 1950 a special follow-up questionnaire was sent to 440 companies whose 1949 capital expenditures had differed by more than 25 per cent from their anticipations at the beginning of the year. Responses were received from 368 firms and the authors reported on replies from 305 manufacturing firms.

10. One of the most complete surveys of capital expenditures and capital expenditure plans from the point of view of coverage is that being carried on by the Canadian government as a joint endeavor of the Dominion Bureau of Statistics and the Economics Division of the Department of Trade and Commerce.[18] Coverage in the Canadian survey involved 17,000 establishments of all types including mines, manufacturing plants, utilities, and retail stores. Data were also gathered for institutions, government departments, and housing.[19] Units covered by direct survey were estimated to account for some 85 per cent of all capital expenditures (literally, capital expenditure intentions) and coverage among the groups actually surveyed was estimated at 76 per cent for 1950 and 81 per cent for 1951.[20]

The Canadian survey involves year-end estimates of actual expenditures in the preceding year and of expenditures anticipated for the coming year, midyear reports on actual expenditures of the preceding year, and revised estimates of anticipated expenditures for the current year.[21] The midyear questionnaire requests comments on changes in anticipated capital expenditures when any major change from the previous estimate is made.[22] As in its United

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source of further data could be utilized by relating the questionnaire returns to available published information, generally of a financial nature, of many of the respondent firms.

[18]A detailed report on this work may be found in O. J. Firestone, "Investment Forecasting in Canada," *Short-Term Economic Forecasting*, pp. 113–249. Further recent accounts of data obtained may be found in *Private and Public Investment in Canada, Outlook for 1952* and *... for 1953*, Canadian Dept. of Trade and Commerce, 1952 and 1953.

[19]*Ibid.* p. 1.

[20]Firestone, *op. cit.* Canadian surveys are conducted on an establishment basis (United States government surveys are on a firm basis) and corporate financial statistics are not available for analysis in connection with the investment information. This tends to restrict the information bearing on the accuracy of anticipations to the material obtained from the subjective answers to questions relating directly to discrepancies between anticipated and actual expenditures.

[21]It should be noted that responses in these surveys permit analysis of changes in expenditure anticipations or plans as well as the transition from anticipation to actuality.

[22]*Ibid.*, "Midyear Survey Form," Appendix B, p. 248. Firestone classifies responses to the question asking for explanations of discrepancies between year-end anticipations of the subsequent year's expenditures and corresponding midyear anticipations of current year's forecasts under

States counterpart, the Canadian survey requests information separately for "expenditures on new building and other structures" and "expenditures on new machinery and equipment." In addition, however, the Canadian inquiry requests information on "repair expenditures" in each of these categories.[23]

11. Since 1948 the McGraw-Hill Publishing Company has been conducting annual surveys, chiefly by questionnaire, of business plans for investment in new plant and equipment. Although data are again collected largely for forecasting purposes and for release in popular and semipopular media, they present a particularly fruitful source of material for economic analysis. Coverage is described as follows in a recent report:

"The companies cooperating in this survey employ more than 60% of all workers in industries where capital investment is highest, including chemicals, oil, railroads, machinery, autos, utilities, and steel. These industries account for two-thirds of all spending for capital goods. The companies included in the ssmple were mostly the bigger companies in these industries.

"In other industries coverage was not so complete. But the participating companies were carefully picked to make up a representative cross section.

"In all, the sample includes companies employing over five million workers, about one-quarter of the total employment of all industry...."[24]

Although other questionnaires differed in various details, items included in the 1953 survey (carried out at the end of 1952) should give an adequate idea of the nature of the McGraw-Hill surveys. The following information was requested:

a. Actual 1952 investment in new plants and equipment (This included all purchases charged to capital accounts whether for replacement and modernization, expansion, or other reasons.)

b. Percentage division of 1952 investment between (1) expansion and (2) replacement and modernization

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headings roughly similar to those of the Friend–Bronfenbrenner analysis of reasons for discrepancies between planned and actual capital expenditures by firms in the United States (cf. footnote 43, below). Thus Firestone sets up twelve categories for the (open-end) replies: sales outlook; plant and equipment supply situation; plant and equipment costs; change in competitive conditions; new products; technology; routine underestimates or overestimates; inadequate storage facilities; carry-over from previous year; projects added, deferred, or canceled; firmer estimates; and miscellaneous.

[23] *Ibid.*, "End-of-Year Survey Form," Appendix B, p. 249.

[24] *Business' Plans for New Plants and Equipment, 1953–1956*, McGraw-Hill, 1953, p. 12.

c. Percentage change in capacity, measured in terms of physical volume, from the end of 1951 to the end of 1952

d. Information similar to the above as to planned expenditures and expected capacity increase for 1953

e. Corresponding information for the years 1954–1956, with only total capital expenditures listed for the individual years, and number of years ahead company usually plans its capital expenditures

f. 1952 dollar volume of sales

g. Expected change in physical volume of sales by the end of 1956 for company and industry

h. Information as to any new machines or processes in the industry which will require particularly large capital expenditures during the next few years

i. Minimum anticipated annual capital expenditure in years 1953-1956 even if sales decline substantially

j. Maximum annual expenditure, 1953-1956, if full advantage could be taken of all technological developments

k. Actual depreciation allowances, 1952, and anticipated allowances yearly, 1953-1956

l. Information on past and expected uses of depreciation allowances.[25]

12. Several other continuing surveys touch upon investment decisions. Firestone mentions (pp. 165–168) surveys of business investment intentions in Belgium, Sweden, and Australia, and surveys securing information on capital expenditures in the United Kingdom, Norway, and the Netherlands. The "Forum of Executive Opinion" for "Executive Forecast" carried on and published by *Fortune* magazine, in this country, is reported by Franco Modigliani and Owen H. Sauerlender[26] to relate questions on sales, profits, selling price and purchase price expectations, expected change in investment and

[25]The writer is engaged in an intensive analysis of several years' raw data of McGraw-Hill returns (coded in such a manner at to preserve completely the confidential nature of individual company responses), supplemented by appropriate statistical material obtained from independent sources. A preliminary report of this study was presented to joint meetings of the American Statistical Association, American Economic Association, and Econometric Society in Washington, D. C., in December 1953 in a paper entitled, "Expectations, Plans, and Capital Expenditures: A Synthesis of *Ex Ante* and *Ex Post* Data." An abstract of the paper was published in the *Journal of the American Statistical Association*, June 1954, p. 356.

[26]Franco Modigliani and Owen H. Sauerlender, "Economic Expectations and Plans of Firms in Relation to Forecasting," *Short-Term Economic Forecasting*, pp. 261–351. In addition to Firestone's list, see also H. Theil, "Recent Experiences with the Munich Business Test (An Expository Article)," *Econometrica*, April 1955, pp. 184–192.

inventories, etc. The Dun and Bradstreet surveys of business trends and business expectations, begun in 1947, have continued on a quarterly basis since 1949. According to Modigliani and Sauerlender, these surveys have involved personal interviews with samples of about 1,000 firms from some 54,000 firms regularly visited by Dun and Bradstreet interviewers in the course of collecting financial information.

13. Lastly we may mention some of the work now in progress. Joel Dean is conducting studies in the field of planning and control of capital expenditures from the point of view of improving management's decisions and projections of capital expenditures. Michael Gort has been engaged in a survey of capital formation in the petroleum industry similar to his study on electric utilities. The Oxford Economists' Research Group is conducting interviews in business firms along lines indicated earlier in this paper. These are only scattered pieces of work which have come to the attention of the present author. It might be well if some reporting system were set up so that those at work in this field might have a fuller notion of the efforts of their colleagues.

3. *Findings of Recent Studies*

General Management Attitudes and Motivation

De Chazeau sees a complicated pattern of political, economic, and psychological influences that impinge on the capital expenditure decisions of management. He finds that every aspect of a firm's operations affects its investment requirements and plans, both with respect to timing and amount.[27] The businessman is probably quite rational in refusing to omit from consideration intangibles which could not be reduced to dollars and cents. These run the gamut from maintenance of a firm's competitive position to the adoption of policies designed to woo public approval or ward off undesirable political action. Business mores which penalize the bucking of trends also impinge on capital expenditure decisions. Thus expenditures are approved in good times and mistakes are condoned. However, the businessman who makes a capital outlay in the face of a weakening market is not unfortunate when the investment turns out badly; he is incompetent.

[27]de Chazeau, *op. cit.*, p. 87. References for other authors refer likewise to the works by them cited in section 2 above.

Andrews and Brunner stress demand trends and their profitability "broadly estimated," prestige factors sometimes involved in entering new markets, and the general policy of the business as prime determinants of capital expenditures. Gort notes that broad estimates, such as those just cited, are shaped, among other things, by informal social and business contacts of senior officials, economists, security analysts, and others (page 183).

Mack sees capital expenditures stimulated in large part by basic cultural values which make businessmen want to be connected with larger and more successful firms, although these values vary in intensity in different periods and different industries. She feels that psychological factors influence a small amount of potential equipment purchases (page 271). And in discussing the role of irrational or nonrational attitudes in inhibiting investment, she writes: "When the point was narrowed down to specific examples, however, reasons for refraining from the venture seemed based on a perfectly reasonable judgment about business advantages. The unreasonableness lay only in the motive ascribed for the decision" (page 270). Yet she suggests a caution and susceptibility to fear in regard to capital expenditures: "For some curious reason saying 'yes' seems to give the feeling of involving more responsibility than saying 'no'; insofar as fear causes a wish to avoid responsibility, it will foster the 'no' answer" (page 268). And further: "Declining population growth rates and increasing business competition tend to reduce the tendency for time to correct errors in anticipation. Accordingly, errors may tend to become more costly, more feared, and less willingly risked" (page 282).

Katona and Morgan offer the hypothesis for further study that the behavior of certain optimistic but nonexpanding firms may be explained by the fact that abstaining from applying traditional rules of thumb requires deliberate decisions (page 89). They suggest that while certain investment decisions, such as "utilization of available funds in a customary manner," "are routine or habitual," "there are, however, investment decisions... based on definite expectations and on careful weighing of alternatives" for which "strong motivational forces are required" (page 90).

Gort mentions the "role of inertia" or "the cost of managerial effort, both monetary and subjective, of planning capital expenditures" (page 196). And Heller finds that investment is sometimes inhibited by a shortage of engineering and managerial "brains" to handle further capital expenditures.

Nature and Extent of Forward Estimates and Capital Expenditure Plans

A rational model would relate today's capital expenditures to tomorrow's expected returns. What therefore is the nature of business thinking about the future? And how, in the realm of capital expenditures, do businessmen plan their future activities?

Gort reports that there is no single horizon for capital expenditure plans but rather a series of successive points or approximations, each serving a different purpose and characterized by different degrees of clarity (page 81.) When asked for their long-range capital expenditure plans in various surveys, some officials candidly admitted that they offered the best estimate available but did not attach much significance to such estimates. The planning of investment seems to be more significantly concerned with a period of approximately five years. The shorter the forecast the more important it is because substantially greater commitments are required for the first two years of a capital expansion plan than for the fourth year. Immediate action is necessary if additional capacity is to become available in two years; but plans for the fourth year may he altered under the impact of changing economic conditions (pages 81–82).

Gort warns of the distinction between "informal long-term planning" and "the formally approved construction budget with a schedule of expected installation dates," and of the further distinction between the latter and "the 'work order' or 'job estimate' which constitutes the authorization to proceed with actual expenditures for specific projects" (page 82). The median length of construction program involved expenditures for a three-year period. One out of four companies in 1949 scheduled additions into the fourth year but a "falling-off of planned outlays" at the approach of termination dates of plans "reflected the fact that future needs could not be fully foreseen that far in advance." He also notes some correlation between the length of the budgetary horizon and the amount of capital expenditures because large expansion programs are frequently undertaken at the same time throughout the industry; suppliers then tend to become pressed and deliveries are delayed.

He discovers that the electric utilities follow generally similar procedures in planning capital expenditures, in part because of exchange of information in an essentially noncompetitive industry and in part due to the use of consulting firms of common identity. He also observes that various classifications of items are included in capital expenditure budgets, such as additional capacity for load

growth, elimination of hazards, and equipment to effect operating economies. Occasionally a separate classification is made according to criteria such as "essential," "desirable," and "contingent" (page 89).

The existence of such classifications, we may suggest, may make possible more subtle analysis of determinants of the various components of planned and actual capital expenditures. Thus in testing the acceleration principle, data on a firm's changes in sales might be related particularly to the amount of investment directed explicity to additional capacity; discrepancies between planned and realized investment may be observed more clearly in the carrying through of "contingent" planned expenditures.

Mack writes that authorizations may be granted or refused in the light of an annually formulated plan of expenditure. Some sort of periodic budget procedure was used in a number of the corporations interviewed. Most large companies, as well as a considerable number of smaller ones, used annual capital expenditure budgets. Even when budgets were used, each expenditure required separate authorization at the time that it was made and amounts actually spent could vary substantially from the amounts budgeted. The budgetary techniques served to assure periodic and comprehensive review of plant facilities and an integration of the requirements of various plants in a company (page 241). However, she finds that there is significance to some kind of advance plan or authorization because: "A commonplace in business management is the authorization for an equipment purchase which has been passed and then stored away with a tickler for 'when we think we are getting close to an upturn'" (page 284).

De Chazeau notes that long range plans "for up to twenty years in advance were admittedly little more than directional guides for development to be successively altered as specific projects were perfected and authorized" (page 85). But firm, well-integrated plans for modernization and expansion of even a relatively short-run nature seemed to be a rather "exceptional" result of the immediately postwar situation.

On the length of forward plans, McGraw-Hill reported in 1953 that all manufacturing companies plan capital expenditures more than one year ahead, 63 per cent plan ahead more than two years, 16 per cent plan ahead more than four years, and 2 per cent plan ahead more than five years. The length of formal forward plans in capital expenditures is decreasing, it was reported, but "the number of firms able to give *preliminary* figures four years ahead has in-

creased" (page 9). In 1952 McGraw-Hill had stated that 61 per cent of all manufacturing firms answered that they regularly plan capital expenditures several years in advance. Of these, 93 per cent were reported planning ahead more than two years and 45 per cent more than four years; as in 1953, 2 per cent of the firms were reported planning ahead more than five years.[28] Apparently, in the beginning of 1952, 43 per cent of all manufacturing firms indicating that they had capital expenditure plans extending more than one year ahead specified five years as the length of these forward plans. But one year later this figure had shrunk to 14 per cent. No explanation of the sharp change is offered and one may wonder how seriously the replies underlying these figures are to be taken. McGraw-Hill also reports that management reviews plans frequently but, in reporting on its June 1952 checkup on business plans for new plants and equipment, McGraw-Hill declared that the great majority of firms indicated that they had not changed their plans at all or much since the beginning of the year. And in its 1953 report, supporting the assertion that capital expenditure plans are more flexible upward than downward, McGraw-Hill found that:

"All manufacturing companies have preliminary plans to spend an average of about $9.3 billion a year in the period 1954–56.

"Compared to this, the minimum annual expenditure they say they would make even *if sales declined substantially* is about $6.0 billion. In a business recession therefore, manufacturers do not expect to cut their investment in new plant and equipment by more than one-third" (page 10).

Any implication in the above that plans are relatively stable and, particularly, strongly resistant to downward pressures, may strike the reader as unwarranted.[29] In this case he will agree with Heller, who reports that "quick and unpredicted changes" in capital investment plans "are the order of the day."

Firestone notes that Canadian investment predictions, unlike those of the United States government, point to a greater accuracy in forecasting construction (plant) than equipment expenditures. "Among the reasons are the need to make advance plans because of the seasonality of construction in this country [Canada] and the greater difficulty encountered by Canadians in estimating machinery and equipment purchases since substantial quantities of capital

[28] *Business Plans for New Plants and Equipment, 1952–55*, 1952.

[29] One may wonder to what extent the McGraw-Hill conclusion, if not the company replies, exemplifies the type of fallacy of composition discussed in section 1 above.

equipment are imported from abroad." Like the American surveyers, the Canadians find that large companies show less discrepancy between anticipated and actual capital expenditures. Firestone ascribes the "better record of large companies" to: "(A) The preparation of capital budgets, (B) Availability of greater resources to make careful advance plans, (C) The practice of making blanket capital allowances for exigencies, (D) Greater financial resources to see projects through with less likelihood of failure."

He concludes from Canadian data that anticipations are indicated in terms of (correctly) anticipated future prices in periods of rapid price change, although anticipations may be expressed in current prices in times of moderate price fluctuations. The former judgment is in conflict with the findings of Department of Commerce and Securities and Exchange Commission data, which are held to indicate that anticipations are generally expressed in current prices.

Manner of Decisions: Formal Aspects of Approval of Capital Expenditures

Because the businessmen interviewed in the several surveys revealed an almost infinite number of details, of doubtful economic relevance, relating to the approval of capital expenditures, just a few of the more suggestive findings of analytical interest will be mentioned.

Mack states that: "The number of people in a given organization, who will have something to do with an order for equipment either in its germinal or final stages is typically large. Signatures on an authorization blank may number as many as five or six and are seldom fewer than three in companies using this formal procedure. The number of people who, at some stage of the process, may have some influence on the decision is, of course, far larger than the number whose signatures are required" (page 239).

She also notes: "There are always a considerable number of ideas involving the purchase of plant or equipment which are likely to start in the head of one of the chief executives, rather than in the department byways.... This is true of any major expansion or change in product or process. It is also true of minor changes when machinery salesmen are routed to the central office, rather than to plant managers.... Having once been set on its way, the recommendation must traverse a route lined with ... many company potentates—the plant superintendent, the plant or a district manager, the head of standards or time study, head engineers, company vice-presidents, and for the more impressive outlays, president and even

board of directors. A frown anywhere along the line may end its journey, a nod will pass it on to the next proving ground. However, before the suggestion is ready to be transformed into an authorization, it probably will have been passed by someone interested in getting work out on time without undue spoilage, running an efficient plant with a reasonable maintenance cost, turning out goods of an attractive price and quality, and last but not least, keeping the company solvent. These various interests may well be guarded by the same person or they may all have different champions, in which case a conflict of interests may result in battle" (pages 240–241).

De Chazeau finds: "... an exaggerated caution in the formal procedures concerning capital expenditures. Not only must the proposed expenditures run the gauntlet of an ascending series of potential vetoes, but executives who may commit the firm to other purchases and sales involving many thousands of dollars have a niggardly freedom of action in this area. Executive authorization, even for the president of a large corporation, is extremely restricted —$5,000—$10,000 was a not uncommon limit, and in one leading firm in its field, projects requiring more than $500 could not be initiated without the approval of the board of directors. While limits such as these are not to be interpreted as domination of policy by the board—they are often imposed primarily for control and accounting purposes at varying levels of management—they do reflect a general conservatism in capital expenditures" (page 94).

He also notes that "smaller projects cannot be known and appraised directly by top management" and hence "must be culled by formula" but that: "As the investment became larger and more important, the weight of imponderables in the decision was usually greater.... Important projects will usually have been evolved, studied, and worked over for years. They will be generally familiar to management and their final authorization may carry no more detailed written justification than 'needed to meet competition'" (pages 94–95).

He indicates that formal procedures are altered where appropriate. Thus when the economic outlook is stormy, "standards for new capital outlays (e. g. 'pay-out periods') are tightened and even internal requests for replacement dry up" (page 88).

Heller views administrative or management problems as offering bottlenecks but rarely contributing "thrust." Gort also refers to differences in broad orientation toward construction expenditures by

officials on various levels of the company's hierarchy (page 191), and reveals a tendency for top management to assume the role of pruners of proposals coming up from below, particularly those of the engineering staff. He observes differences of procedure, however, between recommendations for replacement expenditures, which almost always emanate from one of the engineering departments (page 85), and for capital expansion, which stems from load forecasts and is planned jointly by sales and engineering departments.

Demand and the Role of Expansion

Mack reports that an extremely important factor in most decisions to purchase plant was the prospect of increased sales (page 301). She writes also that one of the most important reasons for equipment purchases arises from the need to produce additional goods that can be sold at profitable prices (page 276). However, she points out that equipment purchased because of the need for expanded facilities is often difficult to isolate and might be classified as primarily for replacement (page 251).

Important as expansion-motivated investment may be, it is not begun lightly. Mack thinks that because of the greater risk involved in new ventures, expansion is typically undertaken when it offers somewhat more than the usual rate of return either directly or indirectly through more efficient plant operation. "Except for brief periods of anticipation of perhaps a few months (in which case the forecast is more in the nature of an exaggeration of current demand than an anticipation of the future) company officials wait for sales to materialize and often for them to have materialized for some time, before risking capital investment.... In general, it would seem that businessmen would want to minimize their chances of loss. Since anticipation involves more risk than does the supplying of an assured market, it seems likely that building for anticipated demand would be a matter of necessity rather than choice" (page 281).

Gort reports: "The most important single factor affecting decisions to spend on plant and equipment in the electric utility industry is the expected demand" (page 181). The sales department, however, tends to be more optimistic than some of the other departments with which it may serve on interdepartmental committees designed to forecast sales and particularly to anticipate peak load. Utilities are, of course, under a peculiar obligation to meet all

demand and the only substitute for available capacity of one's own is the possibility of purchasing power from adjacent utilities.[30]

He also observes that sales forecasts "represent a compromise between views that frequently diverge" (page 181) and that peak loads are generally assumed to have a fixed relationship to expected sales. Forecasts were based frequently on linear extrapolations of trends in past sales, usually accomplished by freehand methods and rarely employing complex mathematical techniques. In short-term forecasts, in particular, surveys of the plans for use of electricity by major industrial consumers are frequently used.

All companies subscribe to a number of business services, some of which were taken more seriously than others (page 183). "Officials on the senior management level customarily check forecasts of demand by using their general judgment as to what they consider are reasonable assumptions regarding future growth" (page 184).

Andrews and Brunner confirm the emphasis on the significance of demand and the trend of demand. They note examples "of the parallel importance of 'policy' and earnings considerations" but find that in any event "we come to the demand side as the one containing the general influences affecting investment decisions." They add that "the most important single factor in the determination of the current level of capital expenditures in individual businesses—and, therefore, the one which should predominate in any general analysis—[is] the level of demand.... This will be valid for all types of projects, whether simple replacements, improvements or reconstructions and extensions; but... that a substantial proportion of replacement expenditure and indeed, of other investment may be necessary, or regarded as necessary, if the business

[30]Capital expenditures for capacity expansion or "load growth," Gort finds, "completely dominated all others in the budgets seen." Where capacity expansion was the motivating factor in capital expenditures, calculations of expected earnings were generally nonexistent or irrelevant. This can be explained in large part by the character of the public utilities industry. For one thing companies were generally expected to provide for whatever level of demand developed. Secondly price inelasticity of demand coupled with commission control of rate structures made it possible for production to meet demand at fixed prices always to be profitable. Thus earnings calculations in relation to capacity-expanding projects frequently were designed chiefly to provide "necessary information to the financial community if there is need for external financing." While applications for rate increases were sometimes "based principally on the argument that need to attract permanent capital for construction necessitated such increases... construction projects were pushed forward prior to favorable action in the rate cases. It was generally felt that sympathetic consideration by a commission would be more likely if construction were not held back" (p. 189).

is to carry on at all in its present form. Despite this qualification, the total of capital expenditure will be strongly sensitive to changes in demand. In the case of new products and major extensions, it will probably be the trend of demand, as determining expectations, which will have most influence rather than the absolute current level of demand" (page 359).

Katona and Morgan indicate a fairly substantial correlation between evaluations of both present and expected future business and plans "to build new plants or additions to plants" but no similar correlation with plans "to add new machinery" (page 87). The authors do not make clear whether this apparent lack of correlation may be due to a misleading element in their classification, in that plans to build or add to plants may in themselves involve plans to add machinery with which to equip the new plants.

They also note that "current demand and current orders," "cost or efficiency considerations," and "change of product" are major factors in the expansions of over a quarter of the firms interviewed. Eight per cent of them explained past expansion and 13 per cent of them explained contemplated expansion by referring explicitly to expectations of future demand. They warn, however, that respondents may have assumed implicitly that "current demand and current orders" meant that past increases in demand would be followed by future increases, and orders on hand refer in any event to future shipments. Explaining the responses of a small number of executives who cited only general expansion policies as motivating factors, the authors noted that "some firms reported that they made the decision after the war to expand their facilities and are doing something every year, the limits in some cases being determined by available funds" (page 85).

They conclude that "in some cases plant expansion is not a proposition governed by definite and carefully scrutinized expectations but a quasi-automatic response to certain circumstances, or a habitual action." And in some cases "respondents said they were compelled to expand because their competitors had cut their costs by building new, more efficient plants" (page 85).

"Detailed analysis of correlation cells," in conjunction with substantive responses of the firms, suggests to Katona and Morgan that expansion plans of firms with unfavorable expectations either "represent parts of continuous programs decided some time ago" or are entertained because circumstances, for instance actions by competitors, compel the firm to expand. In firms which are expanding despite unfavorable evaluations of current business, they report:

"The executives are found to argue in most instances that they will expand their facilities—or will introduce new products or new designs, or purchase cost-cutting equipment—in order to improve their situation or competitive position. In certain instances, then, it is not an improvement of one's business prospects but rather deterioration of business trends which provides the incentive for investment decisions" (page 88).

However, Mack considers it unlikely that the "sort of anticipation of demand" based on modernization and introduction of new products to secure "differential advantage" over competitors would be likely to "account for very great amounts of equipment purchase." It seems possible, rather, that we may find investment adversely affected by "the increasing tension of competition" (page 282, footnote). She argues that "the purchase of plant or equipment primarily because of competitive situations" has been most conspicuous in the past in railroad building and still is significant in oil well drilling and public utility construction, but "a trend toward decreasing importance would seem to be clearly present as the basic industrialization of a new country is accomplished" (page 294).

Heller feels that "profits emerge... as the key variable to which investment plans are geared. Profits supply not only investment funds but also the evidence of profitability which makes the game worth the candle." He also presents the "impressionistic" conclusion that it is current rather than expected profits which are basically relevant, for forecasted profits are only slightly adjusted projections of the profits realized in the immediate past (page 98). In spite of his emphasis on the importance of current profits, however, he ties profits to "satisfactory or growing markets" and relates these in turn to "orders—adjusted for hunches regarding future market prospects," which would appear to involve profits expectations rather than current profits (page 100).

Discussing the circumstances reducing capital expenditures "when demand for product is weak relative to production capacity," de Chazeau sees a situation where inefficient factors of production have been discarded. There is then little advantage in new equipment designed to replace the highly efficient existing equipment and labor to which the firm is already limiting itself.

He notes: "Overhanging and intensifying the gloom are the conventional 'realities' of business prudence. A firm must preserve and strengthen its 'liquidity' in a weakening market.... To go to the capital market for funds (either for debt or equity capital) in the

face of curtailed earnings would be to increase the cost of capital, to jeopardize the freedom of management, and to violate the judgment of directors and financial advisors. Thus, capital outlay commitments are abrogated as far as industry custom and sunk costs will permit, new orders are canceled, plans are deferred..." (page 88).

On the other hand, he suggests that the injection of long-term" considerations, if used as a guide in planning capital outlay programs may be...devastating for the theory of derived demand and the marginal efficiency of capital in the field of private investment." He indicates that in the face of tremendous uncertainty as to the savings or profitability involved in proposed capital expenditures, businessmen may find "immediate market prospects...secondary to...broader purposes" (page 90).

Mack refers to a "psychological bent toward retrenchment during a depression...as related to a mental epidemic of fear and flight." She cites a statement of "a member of the production staff of a large organization" that "when times are bad we leave the production business and get into the cost reduction business" (page 296). In this context, cost reduction does not seem to involve capital expenditures. She concludes that "the obstacles to achieving any considerable amount of private investment during depression seem indeed formidable" (page 298).

At least indirectly corroborative evidence on the significance of sales and expansion may be obtained from the analysis of several surveys undertaken primarily for forecasting purposes. In its 1953 report, McGraw-Hill asserted that capital expenditures were then about evenly divided between expenditures for "expansion" and "modernization" but that businessmen thought their firms would devote smaller and smaller proportions to expansion in the years immediately ahead. In its 1952 report, McGraw-Hill had declared that 48 per cent of all manufacturing firms indicated that they would make capital expenditures in order to acquire more capacity for present products, and 33 per cent wanted capacity for new products. Thirteen per cent of the firms planned expenditures to serve new market areas.

Friend and Bronfenbrenner report: "...changes in sales and earnings subsequent to the formation of the investment plan influence the extent to which the plan is realized. However, the correlation betweeh per cent deviations from anticipated expenditures in 1949 and per cent changes in sales either from expectations or from

sales in the previous year was found to be quite low. The same result holds in 1948 and in 1947.

"A rather large proportion of firms shows an increase in capital outlays above anticipations in spite of a fairly substantial decline in sales.... It appears that when the competitive situation is an important factor, the investment response to a decline in sales is opposite in direction to what ordinarily occurs" (page 21).[31]

Little or no correlations were found when the variables of unfilled orders to sales or changes in profit rates were compared with the discrepancies between plans and actual expenditures. However, they further explain that: "In evaluating these results it should be recalled that the period studied was unusual in the existence of a large backlog of demand for plant and equipment, and this may have diminished the influence of changes in sales and earnings upon investment.[32] On the other hand, changes in earnings cannot be expected to exert a direct influence on the realization of investment plans except insofar as the current profit movements influence fairly long-run profit expectations. Even when the investment under consideration represents expansion, the current fluctuations in sales and profits may not have a predominant influence on the expected rate of return. When cost-cutting or the replacement of obsolescent machinery is involved, the influence will be even less, since in this case the expected rate of return is likely to be quite unrelated to over-all profit rates on existing investment" (page 22).

Summarizing their results, Friend and Bronfenbrenner find: "A change in sales outlook was by far the most commonly mentioned... reason for a decrease in expenditures below the level anticipated at the beginning of the year" (page 19).

For the firms mentioning a change in sales outlook as a principal factor, they found "a strong positive correlation between changes in expenditures and in sales; i. e., the larger the discrepancy in

[31]It should be noted that, as in some of the other survey findings reported, Friend and Bronfenbrenner are here discussing factors influencing realization of expenditure plans. These may be different from the factors shaping the original plans and those determining actual expenditures.

[32]Cf. R. F. Harrod, "An Essay in Dynamic Theory," *Economic Journal*, March 1939, as reprinted in Harrod's *Economic Essays*, Harcourt, Brace, 1953, p. 269, and "Supplement on Dynamic Theory," *ibid.*, p. 278. Harrod maintains that changes in sales operate to increase ex ante investment. The existence of backlogs of demand for plant and equipment inhibits the adjustment of ex post investment. However, the resultant discrepancy between ex ante and ex post investment, while making empirical confirmation of the acceleration principle difficult is in fact an instrument of the major influence of change of sales on the course of investment.

sales relative to anticipations the larger the corresponding discrepancy in expenditures. In contrast, there was no such correlation between discrepancies in expenditures and sales for the firms specifying other reasons for a divergence between acutal and anticipated outlays. For the firms not sent the special follow-up questionnaire, there was only a slight positive correlation between discrepancies in expenditures and sales" (page 19).

Explaining factors in the excess of actual expenditures over those planned, Firestone posits, in effect, a heterogeneity over time of determinants of capital expenditures: "Among the 12 groups [of factors] the sales outlook ranked only eighth in importance, and capital expenditure intentions per company were just below the average for all companies. This suggests that there were not many opportunities manufacturing firms had overlooked six months earlier that suddenly seemed important enough to induce them to go ahead and expand their plant facilities in a hurry. In a way this reflects the [moderate business optimism] ... at the time the sample survey was undertaken.... A year later, by mid-1951, the situation was quite different, with changes in the sales outlook given as a leading reason" (page 221). In an analysis of reasons expressed for downward revisions of investment plans, Firestone lists "the sales outlook" as "significant" because it is mentioned in 17 per cent of replies; 35 per cent mentioned "projects cancelled or deferred" (pages 222-223).

Mack feels: "The development of new products is a very usual form for expansive forces to take. It represents a particularly forceful drive, since very typically the profit margins on new products are higher than on the more competitive lines.... Moreover, it affects competitors as well as the innovators. When once a new product has become popular, any company wanting to 'keep its trade position' must install the facilities necessary to provide it" (page 253).

However, she feels that new products have a limited effect in stimulating capital expenditures during a depression. "Often the manufacture of additional products...occurs...either to utilize by-products, to reduce idle time due to seasonal or cyclical irregularity, or to utilize natural resources" (pages 253 and 254). In the meat-packing industry, the desire to expand geographically, forced by the growth of truck-fostered local competition, was an important element.

Bridge and Natrella suggest another factor responsible for the large volume of aggregate capital expenditures in the immediate

postwar period: the large number of new businesses springing up after the termination of wartime depressants on the size of the business population. "The fixed investment needs of these firms," they explain, "Were superimposed on the existing large volume of demand by established firms. In some industries—particularly in trade, services, and construction—the initial capital investment by new firms in the 1945-48 period accounted for a very significant part of total plant and equipment expenditures in those areas.[33]

While there are scattered references to capital expenditures for new products and "to meet competition" in spite of an unfavorable trend in business, the more dominant view appears to be that falling sales and a general business decline are decisive investment inhibiters. Gort states (page 190) that in difficult times, or even in times of contracting demand, management becomes economy-minded. The planning horizon tends to contract in relation to expenditure commitments. Pressures emanate from the general pessimism in the business community against what looks like extravagance. The desire to maintain dividend payments and the need to justify expenditures to the stockholder cause a stiffening in the criteria used for approving construction.

Heller observes that though business executives strongly desire greater stability, the size and nature of the enterprises "do not appear to offer an incentive to stabilize their own activities in the interests of a more stable economy.... Quite logically, the profit motive dictates that 'general business conditions' should be viewed as a determinant—not a resultant—of their actions" (page 102).

McGraw-Hill, in its 1953 report, stated: "Industry is planning new products and new processes to weather stiffening competition" (page 3). One might see corroboration in de Chazeau's remarks "... the action of rivals is always a potent factor in capital outlay decisions. And when it threatens to undermine the status of the firm with important customers, it is a determining consideration" (page 97).

However, it seems improbable that considerable "competitive" outlays would be made in the event of a serious business decline. With de Chazeau, one may acknowledge the occasional "new product whose market promises to counter the general trend" but there is no denying that the traditional pessimistic reaction to a fall in demand has been characteristic of investment plans (page 88).

[33]Lawrence Bridge and Vito Natrella, "Capital Expenditures by Nonmanufacturing Industries," *Survey of Current Business*, August 1952, p. 20.

The Role of Replacement

Gort finds replacement and expansion expenditures inextricably interwoven in the electric utility industry and suggests that questionnaire surveys such as those of McGraw-Hill, which ask for the percentage of expenditures devoted to "replacement and modernization," are unanswerable wherever a similar situation exists (page 196–197). He points out that "replacement" expenditures which are not justifiable on the basis of operating economies alone are approved frequently because they will entail providing additional reserve capacity to be held against increases in demand. The "replaced" equipment is "progressively shifted to serve high loads of short duration or to serve as peak-load reserve" (page 196).

Similar observations are made by Mack in some detail (pages 251–252). She notes that factors related to expansion may be found in supposedly nonexpansionary investment (page 249). She states that increased profits can be obtained through decreased cost per unit of sales or increased sales. One way of obtaining increased sales, still an important business objective, is cost reduction through equipment purchases.

De Chazeau, impressed by the overriding influence of the general business outlook, states that in bad times "standards for new capital outlays (e. g. 'pay-out periods') are tightened and even internal requests for replacement dry up" (page 88). Consistently with this, one learns: "Labor cost savings were always a significant element in machine replacement (often the only element that was quantified) but this element was considered more important in determining the trend of investment than in determining its cyclical manifestation" (page 98).

"This traditional pattern is sometimes violated—in the case of a project that has gone so far that it must be completed; a change in technology or processing that forces replacement and modernization to maintain one's competitive position in the market; an occasional firm with sufficient financial strength and confidence in the future to take advantage of lower equipment and construction costs in a depressed market, a new product whose market promises to counter the general trend—but there is no denying that it has been characteristic" (page 88).

Andrews and Brunner write: "Strict replacements, the substitution of more efficient plant, departmental reconstructions, and new ventures, all will be more attractive on a rising market than they will be if markets fall" (page 357).

Heller sees a major "thrust" toward investment in "advanced technology, which produces new products, new processes, and cost-saving improvements in machinery and equipment" (page 100). He observes that "replacement" is not usually involved in capital expenditures in any simple fashion as "replacement is seldom made without improvement" (page 100). Rapid advances in techniques, however, seem to have a mixed effect insofar as they raise fears of rapid obsolescence and general uncertainty as to innovations. The pressure of competition, it is noted, "works in diverse ways," encouraging investment to keep up with competitors or to capture new markets before they do, but hindering investment to the extent that this may involve temporary interruptions of production and loss of markets (page 100).

Mack touches on a point neglected by most of the writers: "The decision to manufacture rather than purchase materials used in a product will also frequently involve the purchase of capital equipment" (page 254) especially where "delivery problems are important." We may observe that such a situation would be most likely in a period of high and rising demand.

McGraw-Hill apparently ascribes an important role to replacement, broadly conceived. Its 1953 report emphasized that "industry is planning new products and *new processes* to weather stiffening competition." Referring to manufacturing, the report also declared: "The maximum expenditure businessmen feel they could make in the period 1954–56, to take full advantage of all technological developments, amounts to about $13.8 billion... almost half again as high as the preliminary plans for expenditure during this period" (page 10).

A negative note of an unusual nature is struck by Mack, regarding the influence of competitive cost considerations on capital expenditures. She writes: "The vice-president of an automobile company told me that they could, through tooling, cut costs a great deal further if they wanted to, but that there was no use in doing so since it would simply be copied by the other companies and taken off selling price. Perhaps this remark was not meant to be taken seriously .... This introduces an interesting set of problems relating to quasi-monopolistic and oligopolistic situations in which cost reduction would not necessarily be held advantageous" (pages 248–249).

She also observes that "physical decrepitude" is seldom the sole reason for "replacement" rather, she declares: "The need for replacement due to physical decrepitude seems to be a minor factor in equipment purchase in most American industries. To become meaningful or realistic, the concept of replacement must be thought

of in connection with cost reduction, improved operating efficiency, and increased capacity. This fact is of fundamental importance to the understanding of the process of net and gross capital formation; it places large obstacles in the way of measurement and even meaningful definition of 'net capital formation'" (page 296).

Heller reports investment inhibited by insufficient "adoption of more scientific methods of calculating business advantage—of discovering the opportunities for cost savings, and hence profits, in replacement, improvements, and modernization" (page 103). He writes: "The predominant motive behind the purchase of equipment is the desire to reduce costs. The methods by which different firms figure cost savings, and the rate of savings they demand, vary widely" (page 100). He discovers considerable but far from universal use of "payoff formulas," but diversity and irrationality "in the method of calculation (for example, in the treatment of income taxes and interest)" (page 101). In similar vein, de Chazeau refers to "the stubborn resistance of businessmen to 'scientific' economic formulas for the timing of capital outlays" (page 90).

Gort contributes highly interesting, if preplexing, details about such calculations. He notes: "A decision to replace equipment for operating economies theoretically necessitates estimating operating costs through the economic life of the old and the new equipment. As a practical matter, economies are frequently estimated on the basis of next year's costs" (page 193).

"Gross annual operating savings" are calculated as a percentage of costs of prospective installations. "Load duration curves" estimating the prospective intensity of use of the new installations are relevant to the calculation of saving. Gort remarks: "Much new equipment cannot produce economies that are fairly large as compared to the required investment unless it is fully used 60 or 70 per cent of the time." Then real estate taxes and depreciation charges are deducted from gross operating savings on the new installation. Next, return on the investment is calculated after income taxes are deducted and allowance made for permissible deductions of bond interest from taxable income. Finally, comparison of the resulting percentage is made "...with the cost of capital to the company. Here, there is a tendency on the part of the engineering staff, who are likely to be more enthusiastic than management regarding the recommended replacement, to compare the saving with bond yields. However, the latter normally takes into consideration a composite yield, including the yields on common and preferred stock, which the company finds it necessary to pay. Special consideration may

be given to situations in which cash is available from depreciation accruals. Net income after taxes was in a few cases compared only with the return from immediately alternative uses of the funds, which consisted of debt redemption" (page 194).

The handling of depreciation charges in these calculations is theoretically crude and involves certain mathematical inconsistencies. As Gort points out, depreciation allowances are deducted from the flow of savings but not from the capital costs to which these savings are compared. This, with the concentration on "economies... estimated on the basis of next year's costs" (page 193), involves a failure to include discounted future returns and results in a general underestimate of true expected rates of profit and in a rather complex bias for assets of various durabilities.

Within relevant ranges of the variables, the indicated method of calculation underestimates the true rate of profit or yield, based on consistent discounting, for virtually all projected capital additions. (Only properties to last one year, which would be expensed anyway, and properties to last forever, and hence with no charges for depreciation, would show yields by the described method which were equal to the true rate of profit. In all other cases the calculated yields would underestimate the true rate.) For example equipment with an expected life of five years and a profit rate of 10 per cent, (by the calculations described by Gort) entails a true profit rate of some 15 per cent. Similarly plant expected to last thirty years with an apparent profit rate of 10 per cent would have a true rate of profit of 13 per cent.[34] To the extent that appropriate decision-makers do not, explicitly or implicitly, allow for this underestimate (for example in comparing the expected profit rate with *ex post* earnings on already invested capital), the underestimate of expected profit rates may tend to discourage capital expenditures generally. However, if these calculations are merely empirical rules of thumb of an ordinal nature for screening and ranking proposed capital expenditures, the acceptable cutoff point may reflect the average true rate of profit desired by a firm on new investment regardless of the nominal rate indicated by the calculations. Without necessarily (or probably) knowing the reasons, a firm wishing to raise its *ex post* profits on capital in the future over some present figure, say

[34]These figures have been calculated from equation 2 in footnote 35 below. A table relating a variety of expected lives and "apparent" and "true" rates of profit is to be found in Robert Eisner, *Determinants of Capital Expenditures: An Interview Study*, Bureau of Economic and Business Research, University of Illinois, 1956, p. 32.

12 per cent, might thus be moved to lower its nominal profit requirement to 10 per cent (or below). For it would discover by experience that, where expectations were realized, expenditures promising 10 per cent did actually tend to raise *ex post* profits above 12 per cent.

It may be demonstrated also that assets with given profit ratios, as through the calculations described by Gort, reveal a true rate of profit which is lowest for properties expected to last either one year or forever (assuming straight-line depreciation over the life of the property for all assets whose expected lives are one year or more). Maximum true rates of profit on invested capital are actually required by these calculations on properties whose expected lives are quite short—in the neighborhood of five years.[35] It follows of course, that for any given expected profit rate set by businessmen as necessary before a capital expenditure can be approved (or in many cases, even considered by top management), the true rate of profit required is actually less if the proposed expenditure is for a long-term project or for an extremely short-term one. Since properties of extremely short lives are frequently expensed (not treated as

[35]Let p = the expected profit rate as per the Gort-described calculations.
Let n = the number of years the asset will last.
Let r = the rate of discount that will equate the sum of expected future returns to the present value of the asset.
Assume, for simplicity, that the present or original value of the asset is unity.
Then the expected return must equal $(1/n) + p$, annually, for n years.
But the real rate of return must involve discounting each annual return by r^t where t is the number of years which separates the date of the expected return from the present.
To solve for r we must set

$$1 = \left(\frac{1}{n} + p\right) \sum_{t=1}^{n} r^t \tag{1}$$

whence

$$\frac{r(r^n - 1)}{r - 1} = \frac{1}{\frac{1}{n} + p}. \tag{2}$$

It may then be observed that,

$$\text{when } n = 1,\ r = \frac{1}{1+p}, \tag{3}$$

$$\text{and as } n \longrightarrow \infty,\ r \longrightarrow \frac{1}{1+p} \tag{4}$$

However, for reasonable values of p (where $0 < p < 1$), r reaches a minimum [and $(1/r) - 1$, the "true rate of profit," reaches a maximum], when

capital expenditures at all), it may be inferred that the effect of the profit rate criterion, as calculated in the manner described by Gort, is to discriminate in favor of long-term projects.

This apparent discrimination in favor of long-term investment, which would seem among other things to violate usual considerations of discounting future expectations for uncertainty, may be counterbalanced by the effects of calculations involving the "pay-off" or "pay-out" period, which involve a clear bias *against* long-lived properties.[36] For assuming, as is reasonable, that depreciation charges are included in the returns estimated for payoff of invested capital, shorter-lived assets have a better chance of meeting any given payoff requirements than have longer-lived assets, in which annual depreciation charges are of course relatively less.

Gort reports further: "The companies surveyed did not consistently employ a definite pay-off period applicable to all investment but left the matter largely to management discretion in the individual case. In answer to a question as to the number of years in which the investment would have to be recouped if it were to be justified on grounds of operating economies, most officials felt they would be reluctant to undertake expenditures if the indicated period exceeded ten years" (page 194).

However, the allowed period was seldom this long. Most of the projects initiated for operating economies showed gross savings in excess of 25 per cent, and some of them allowed the investment to be recouped in two or three years (page 194). Gort finds that "required pay-off periods appear to be considerably shorter than the

$1 < n < \infty$; the exact value of n at which r is minimum depends upon the value given for p. Extensive calculations of the "true rate of profit" have been undertaken for values of p of 10 per cent, 25 per cent, 30 per cent, and 50 per cent (see footnote 34, above). The value of $(1/r) - 1$ reaches its maximum for each value of p at values of n, respectively, of about 7, 5, 4, and 4, at which points the value of $(1/r) - 1$ are respectively 15.4 per cent, 34.9 per cent, 41.1 per cent, and 64.8 per cent as indicated in the following brief table.

Apparent Rate of Profit, p	*Value of n which Maximizes (1/r) − 1*	*True Rate of Profit, (1/r) − 1, for Maximizing Value of n*
10%	7	15.4%
25	5	34.9
30	4	41.1
50	4	64.8

[36]This bias of course need not be considered irrational. It may well offer a convenient rule of thumb with which to discount for the greater uncertainty of the distant future.

number of years during which the new property may be expected to contribute a respectable return" (page 195). He attributes this to an attempt to discount for various kinds of risk and to the "role of inertia" or "the cost of managerial effort, both monetary and subjective, of planning capital expenditures" (page 196).

Andrews and Brunner find estimates of expected future earnings to be of secondary importance for replacement expenditures essential to "keeping the company's 'producing machine' going." However, replacement expenditures which are largely for improvement or modernization must usually show "earnings or savings of at least 20 per cent of the expenditure that is involved," though there is considerable variability "and smaller projects, in particular, generally show substantially greater rates of earnings." Lower rates of earnings might be accepted where expenditures involved replacement of labor and higher rates might be required if "risks of obsolescence are thought to be substantially greater" (page 354).

Mack notes that criteria for approval of expenditures are varied to suit the situation in which the firm finds itself: "When it seems advisable to spend only a relatively small amount of cash on equipment... a proposition has to be far better than it would otherwise need to be: The number of years in which capital needs to be returned through savings is decreased... executives get more critical and cautious" (page 265).

"The calculation of the amount of cost reduction necessary to the justification of a purchase is made with varying degrees of precision.... The unknown factor of future volume makes the calculation little more than an informed guess.... Saving has to be high in order to be safe—the large majority of equipment was only deemed worthy of purchase if it could return the capital cost through savings in from one to three years; for heavy and very durable equipment or equipment in the textile, baking, or packing industries, a period of four or five years was sometimes tolerable.... It means that the judgment as to expected volume of orders is probably the most important single element in the entire calculation and decision" (pages 296–297).

Mack maintains that "whatever the ostensible basis, current or immediately anticipated volume seemed to be the real basis of most of the calculations" (page 257). "The entire calculation was seldom made with the help of a complicated formula. The use of refined calculations did not seem necessary in the face of all of the unavoidable inaccuracies in the figures...." The tempering with current experience of even the simple formulas is indicated by her

observation that "a good many of the companies required a higher rate of return in poor years than in good ones in spite of the fact that frequently this percentage was calculated at current volume" (page 256). She explains that "direct labor cost" was fundamental to all calculations. There was also some application of "a burden expense," maintenance costs, costs of materials, and rent differentials. She adds: "Depreciation was also typically figured on the old and new equipment; since the equipment to be replaced was fully depreciated in many cases, depreciation might represent a heavy charge against the new equipment unless, as was frequently the case, depreciation of the old equipment was figured at its group rate regardless of whether or not its estimated life was over." And finally: "Inclusion of interest as an element in the cost comparison occurred in some companies, although it certainly was not the general rule." In regard to investment for purposes of expansion, Mack feels that projects for expansion purposes are undertaken "when it is felt that they will provide well over the usual rate of profit, unless for competitive reasons the move is forced by the need to maintain trade position" (page 259).

Capital Supply Considerations

De Chazeau states: "... with partial exceptions among railroads and electric utilities, neither the price of equipment nor the installed cost of facilities was considered a controlling factor and seldom even an element in the timing of capital outlays. The quality of the equipment, the reputation of the firm for servicing, and importance of delivery dates far outweighed the impact on the production costs of the prices of durable equipment whose cost was capitalized and spread over time" (page 98).

Mack observes that while price variation of capital equipment "might conceivably" affect the timing of equipment purchase, "by and large, machinery manufacturers seem to have judged that price reduction in depression will not sell equipment" (page 275). Price concessions seemed effective only in certain isolated cases of companies with extra cash which might be induced to buy cheaply equipment that they knew their competitors would have to buy later at higher prices.

Gort states that physical investment in electric utilities "appears to have a very low elasticity with respect to construction prices, and capital expenditures are undoubtedly positively related to them" (page 191). He points out also that while some officials expressed considerable interest in the possibility of scheduling capital ex-

penditures in years when construction costs were low, apparently very little had actually been accomplished.

Meade and Andrews note considerable "divergence of practice" concerning the influence of construction costs but cite two respondents who deny that factory building is influenced either by costs or by the rate of interest (page 30). Both argue that if trade is good, increased costs do not matter (page 24).

Gort and those dealing with forecasts—Friend and Bronfenbrenner, Firestone, and McGraw-Hill—find changes in costs of plant and equipment a significant positive factor in errors in anticipation of the dollar value of capital expenditures. We may infer from this that the demand for investment goods in relatively price-inelastic over the period from estimates based on some sort of plans to execution of plans.

Thus McGraw-Hill reports that firms forecast well the amount by which they will expand their capacity, year by year, but do not do as well in anticipating the dollar value of their capital expenditures. It is asserted that "... higher costs have helped boost the spending total. But they haven't kept companies from going ahead, except in a few lines—like machinery—where higher construction costs have put a further squeeze on cash resources."[37]

Firestone reports that 8 per cent of the firms explaining increases in anticipations ascribed the changes to cost increases "although costs were rising only slowly in the first half of 1950." He also reports that among "significant reasons for downward adjustments of investment plans were: ... plant and equipment costs, 9 per cent ... " (page 63). It is not clear, in this latter case, to what extent the result should be ascribed to a reduction of both the physical and dollar volume of projected expenditures because of rising costs (elastic demand for investment goods) and to what extent to a decline in only the dollar volume of projected expenditures because costs proved less than expected.

Gort notes that unanticipated price changes (on items for which demand is highly inelastic) have had substantial effects on dollar values of expenditures, particularly because anticipated expenditures are generally based on the assumption that current prices will continue. However, he sees "questions relating to construction costs, capital costs, labor savings, and other comparable calcula-

[37]Report on June 1952 checkup on business plans for new plant and equipment (McGraw-Hill Dept. of Economics, mimeographed release, 1952).

tions" entering into various kinds of capital expenditures not related or only indirectly related to capacity expansion (page 190).

Price movements appear to be a factor in inventory investment according to Meade and Andrews, who report: "A considerable number of businesses seem to relate their purchases of raw materials to expected changes in their price to or expected difficulties in obtaining delivery" (page 30). However, de Chazeau, among the few investigators in this area who comment on inventory considerations, raises some doubt as to the particular effect of price expectations. He feels that there was probably no opinion in which manufacturers were more unanimous than the conviction that necessary inventory investment for a going business should be kept as low as production scheduling will permit. "Dubious profits from inventory speculation were eschewed for more assured profits in manufacturing operations because experience demonstrated a marked difference in managerial competence in the two areas. But production scheduling was harassed by shortages of key materials and components and by uncertainties in delivery dates. Thus many inventories were admittedly long despite inventory controls. How differentiate between the effects of uncertainty and those of confident expectation of a rising price level?"[38]

Andrews has been one of the most persistent writers on the subject of the significance of cost and availability of capital. With Meade he declares:

"1. There is almost universal agreement that short-term rates of interest do not directly affect investment either in stocks or in fixed capital." In some cases, however, "the willingness of the

[38]This statement on investment in inventories, appearing in the preliminary, mimeographed version of de Chazeau's paper, was not included in the published version, which related exclusively to investment in plant and equipment. Andrews has commented as follows to this writer on the apparent contradiction between the statement by de Chazeau and his own report of findings of the Oxford Research Group: "I think when you compare this evidence with those which we had on the Research Group, you must remember the difference in dates. Businessmen learned a lot about the disadvantages of commodity speculation in the thirties and therefore do tend nowadays to stress that they are not speculators. This is quite consistent with the broad social effects, showing that businessmen have in the aggregate behaved in a speculative fashion. In the condition of extreme shortage with rising prices, the maintenance of future business may require piling up stocks. When prices are coming down, the cutting of stocks to the bone can be justified simply in terms of avoiding losses. In other words I am not convinced that the practice of the businessman yet reflects nonspeculation morality, but I think there has probably been a change in outlook."

banks to lend, as distinct from the rate charged, was an important consideration."

2. Few businessmen noted any direct effect of the long-term rate of interest although there was some indication of indirect effects, such as a rise in liquidity with a fall in the market rate of interest in the cases of firms holding bonds (pages 28–29).

Reporting on his subsequent questionnaire study of business views on the relevance of cost and availability of capital, Andrews states that of 309 firms that submitted replies which could be tabulated, 57 found at least one of the matters raised pertinent in plant expenditure decisions (of which 16 referred only to items relating to the availability as distinct from the cost of capital). Eighteen firms felt that cost and availability of capital were relevant to maintenance and repair expenditures and 48 (of which 8 referred only to capital availability items) that they were relevant to investment in inventories.

Andrews observed that responses "broadly confirm the conclusions reached in the earlier papers," referring both to the interview findings reported by Meade and Andrews, described above, and to a companion article by H. D. Henderson,[39] which placed the findings in a broader economic context, leaving considerable room for "indirect" interest rate effects (page 43). The comments, (reported and analyzed by Andrews), which 209 businesses returned with their questionnaires suggest that many, if not most, of the negative responses on the effect of interest and capital availability questions reflect the position of firms whose capital expenditures were internally financed.

Finally, writing with Brunner about the United Steel Company Ltd., Andrews declares: "No evidence has been found that the decision to make or not to make a... capital expenditure has been affected by the level of the rate of interest or by variations in that level.... The interest burden, due to finance raised by the Company previously, *has*, in circumstances of greatly reduced trade, been a factor affecting capital expenditure. This, however, is but one example of the working of an extremely important factor—the current and prospective availability of cash resources.... [While] the Company's capital expenditure has not been affected by changes in the rate of interest [this] does not, of course, imply that it has been in-

[39] "The Significance of the Rate of Interest," *Oxford Economic Papers*, Number 1, October 1938, pp. 1–13 (reprinted in Wilson and Andrews, *op. cit.*, pp. 16–27).

different to the terms on which it could get additional finance" (pages 347–348).

On the effects of availability of finance, Andrews and Brunner write: "Provided that a business is reasonably prosperous... the limits imposed by the availability of financial resources have no practical significance. In the 1920's and early thirties, however, the non-availability of outside finance whether through loans or fresh share capital, restricted the capital expenditure of United Steel to lower levels than would have been maintained otherwise. This applies both to long range 'policy' expenditure and to replacement expenditure.... This limitation of cash resources... cannot be treated as the basic limiting factor which was at work. The fundamental circumstance was the low overall profitability of the Company, which not only limited the resources coming to it directly but also made it impossible for it to look outside to the general capital market for assistance. The shortage of cash was, however, the influence most directly impinging on decisions, since the Company would have done more, despite the circumstances of the time, had the resources been available to it" (page 349–350).

Mack finds that the bulk of capital expenditures are financed by retained earnings and that there is a tendency to devote relatively constant proportions of earnings to dividends and capital expenditures. Business executives are constrained to answer the question, "Can we spare the cash?" (page 263). She quotes numerous statements of corporation officials which appear to indicate that the depreciation allowance is a major boundary in determining the volume of capital expenditures. Expenditure of less than the amount of depreciation charges generally appears safe to officials and "banking interests" alike and does not threaten to cut into working capital. She observes that general caution about expenditures and a desire to conserve cash is particularly marked in treasurers' offices.

Gort's findings may suggest that cost of capital has some significance for capital expenditures in terms of stock prices and yields, debt-equity ratios, and other factors more subtle than the simple rate of interest, about which investigators receive generally negative responses from businessmen. Observing that "a prime purpose of long-range planning of capital outlays is to facilitate financial planning," he declares that management is considerably concerned with maintaining optimum ratios of equity, bonded indebtedness, and cash (page 184). Possible disadvantages of increased bonded indebtedness include "the weakened credit position of a company... and its consequent effect upon the cost of subsequent

financing" (page 185). The question of whether the company's stock was selling at unduly depressed levels was emphasized and a reluctance shown toward common stock financing when the market price might suggest some resulting dilution of equity. He found a conviction that the United States Treasury would not permit any significant changes in interest rates and declares: "Not one case was reported by any of the companies where construction had been postponed, or items deleted from the budget, in expectation of a future drop in the general level of money rates" (page 186). He argues further that the absence of well-defined limits for the debt-equity ratio made possible a wide range in which debt financing could be used and in which the cost of capital would consequently not bulk large. Adding more weight to this argument, he points to the preponderant use of internal sources for funds and declares that funds available from internal sources greatly reduce the importance of financial factors affecting investment decisions. He notes that "the electric utilities, since 1930, have met the bulk of their capital requirements from debt, depreciation accruals and retained earnings," securing about $170 million from stock issues as compared with over $1.5 billion from bonds and notes in the 1932-1945 period (page 186). He finds relatively few cases in which construction was curtailed primarily for financial reasons and these were characterized by both a high debt-equity ratio and difficulties in common stock financing. "...changes in security yields are a more important consideration in the planning of replacement expenditures...[where] capital costs enter explicitly into calculations" than they prove in planning of expansion (page 187). However, he warns in a passage which may merit quotation in full: "An attempt to trace the significance of variations in security yields on individual decisions to invest or to examine cases in which capital could not be obtained does not reveal the full importance of financial factors. When a drop in earnings reduces the amount of cash available from internal sources and when external financing becomes more difficult, a strong pressure toward retrenchment develops even though the company is able to obtain funds, if necessary. It is frequently difficult to cite specific projects which have been eliminated or deferred, since these pressures manifest themselves in more subtle ways. For example, the tests applicable to the approval of capital expenditures become more rigid. Replacement and maintenance expenditures tend to be postponed even though construction costs are lower, and junior staff becomes less inclined to recommend improvements which may be vetoed at top management

levels. Doubtless, other than financial factors enter here, and it is frequently not possible to isolate the precise role which each has played" (page 187).

In commenting on the aggregate over a year of a firm's capital expenditures, de Chazeau could reach: "... only the negative conclusion that it seemed not to be governed by the cost of new capital to the firm.... With a strong management bias against the use of external funds, projects which might force such financing may be deferred, even though they promise higher net returns than the cost of new capital, unless they are urgently needed to activate even more important sunk costs or to meet a critical competitive threat" (page 95).

He finds that availability of funds is more important than their cost: "For the small firm, these are probably controlling factors, and qualitative standards of credit extension may impose far greater restriction than the nominal interest rate would imply. But for most of the firms interviewed, excepting railroads and electric utilities, the cost of capital was alleged to be an insignificant factor in capital outlay decisions. Most firms denied that availability of funds had ever been a limit on decision and several executives asserted that interest rates had never even been discussed throughout their managerial experience" (page 96).

This last is attributed at least in part, however, to the strong cash position and predominant use of internal funds in the particular sample of firms selected, as well as to a reluctance "to embark on important capital projects in a weakening market." However, de Chazeau reported also that current decisions so reflected a catching-up process that they generally involved more of capital rationing than economic investment.

For most firms, Heller reports: "The amount set aside for plant and equipment spending is in the nature of a residual, especially where they cannot or will not resort to outside financing. This residual is based on fairly firm estimates of depreciation, taxes and dividends; less firm predictions of working capital developments; and often highly uncertain profit forecasts" (page 98).

In discussing "financial and management barriers" to investment, he notes that unwillingness of firms in good financial positions "to become beholden to creditors, to share control with new stockholders, or to dilute per-share earnings induces them to skim off only the cream—and many profitable plant and equipment projects gather dust on the shelf" (pages 101–102). "Both the fetish of prosperous companies for internal financing and the inability of

limping companies to get outside financing are major curbs on capital investment" (page 102). Among inhibitors of investment are "what businessmen regard as too-hard requirements—not in terms of interest rates but in terms of control—imposed by banks and other private financing agencies" (page 103), and "the greater risk believed to be involved in making commitments that are not geared to profits already made or easily in sight" (page 102).

Mack finds availability of outside financing, but not the rate of interest, of some significance. She notes, however, the difficulty of securing statistical confirmation of the connection between the securing of funds and their utilization in capital expenditures. For one thing, in many instances where outside funds were acquired, sufficient finances for capital expenditures were available internally; the additional funds were then used to improve the firm's general financial situation. "About all one can say of issues of this sort is that the funds were thought to be needed to maintain the desired working capital at the same time that expenditures on the new plant were made" (page 261). And secondly securities were issued on many occasions because the market seemed right for them rather than because of an immediate need for more cash. The proceeds of the security sales were then invested in other stocks and bonds or on the call market until the firm found it advantageous to make use of them in its own operations.

Mack states that whenever she inquired about the importance of interest rates in the decision to purchase new equipment the answer was invariably: "... that it was not really a question of what you had to pay for it but whether or not you could get it. This seems to mean that there was a range of feasible cost of capital, considerably wider than the usual interest rate fluctuations, above which capital was generally interpreted as being unavailable; whereas within this range the question of a higher or lower cost was more or less immaterial. It stands to reason that this would be the case where investment is undertaken because of unwillingness to lose a trade position or because of an expected return of anywhere from over 50 to 15 or 20 per cent....

This thought-framework will yield different results as the content changes. For the type of equipment purchase in which interest cost represents a very large portion of the total operating expense, as in... certain kinds of public utilities and the renting of owned buildings, differences in interest rates ... play a larger part in the cost saving or profit calculation.... Moreover, insofar as uncertainty implicit in the estimate of the volume factor diminishes, the

decision becomes more sensitive to comparatively small cost differentials" (pages 266-267).

The 1952 McGraw-Hill survey found 80 per cent of companies planning to finance all capital expenditures from profits and reserve, 17 per cent indicating that they would borrow part of the funds they required, and 3 per cent specifying that they would sell stock to raise part of the funds. Two related points argued in earlier McGraw-Hill reports are that management reviews plans frequently and that capital expenditures are particularly sensitive to fluctuations in profits because they constitute a major source of funds for capital expenditures. Fifty-six per cent of all manufacturing firms answered that they would cut their 1950 capital budget if general activity declined 20 per cent during the year; 30 per cent of the manufacturers said (1948) they would increase their 1949-1953 investment program if they could issue stock at a price equal to ten times earnings per share (historically considered a fair price); most companies reported that they could not do this.

Meade and Andrews report "divergence of practice" concerning the influence of availability of liquid resources and report one response that suggests that this influence is more significant for smaller firms (pages 30-31). McGraw-Hill offered some corroboration with a report that "small companies...are holding down their spending, either for lack of cash or lack of opportunities for expansion."[40] Friend and Bronfenbrenner found "that in 1949 changes in the plant and equipment supply situation and in competitive conditions were relatively much more important in raising expenditures of the smallest firms than for the largest firms. Only the smallest firms mentioned changes in the earnings outlook.... The few firms ...which gave changes in the availability and cost of debt and equity financing as the primary factor...were all relatively small; each had assets less than one million dollars in amount" (page 20).

Friend and Bronfenbrenner agree that the cost of money is an unimportant factor in capital expenditures: "... changes in the availability of debt and equity financing were quite unimportant in altering planned outlays on plant and equipment. In a year when debt financing apparently became somewhat more difficult to obtain, only a few firms substantially decreased their capital expenditures as a result of this development. Similarly though stock prices rose considerably during 1949 and equity financing was more attractive

[40]Report on June 1952 checkup on business plans for new plant and equipment.

to business concerns, very few firms were thereby induced to step up their expenditure programs" (page 19).

These same authors tested several "variables relating to liquidity," with generally insignificant results. However, on one test, relating the 1949 ratios of liquid assets to sales to corresponding ratios for 1948 and 1941, it was found that: "The correlation between this measure of surplus liquidity and the discrepancy of actual from anticipated investment was small for the reporting sample as a whole, but larger for those firms which experienced sizeable increases in sales as compared with anticipations. Such firms presumably had a strong motive for exceeding their projected investment and the existence of excess liquidity apparently had an appreciable effect in encouraging investment under these circumstances" (page 22).

McGraw-Hill reports, however: "Some machinery makers have really slashed their earlier plans for new plants and equipment. The reasons given were lower demand for specific types of machines, *lack of cash for capital expenditures,* and concern about the general business outlook."[41]

Finally, although Katona and Morgan eschew discussion of "the role of financial considerations in making investments," they declare "that the desire to finance expansion out of available liquid funds was expressed frequently" (page 85, footnote). They allude to the subject again in suggesting that some of the firms with favorable views and expectations did not indicate current or planned expansion because of insufficient funds or because such expansion had been recently completed (page 89).

In commenting on the dual effect of taxes and depreciation regulations, de Chazeau declares: "...business judgment may be warped by tax considerations, especially in times like the present when income is high and corporations are boxed between high income taxes and excess profits taxes. Even at normal rates of depreciation, government may seem to be sharing in the cost of capital; the share is greater with accelerated depreciation, and a larger volume of interest-free depreciation funds adds to the inducement to invest. The risk that corporation taxes may rise even higher in the future seems remote in contrast" (page 99).

The 1953 McGraw-Hill report stated: "About 85 per cent of manufacturing firms have a policy of spending all their depreciation allowances for plant and equipment, and they expect to continue

[41] *Ibid.* (italics added).

that policy" (page 3). However, we may presumably reserve some doubt as to the relevance of any such expectations to the maintenance of economic stability.

In earlier McGraw-Hill surveys almost two-thirds of respondent companies reported (1948) that they would increase capital expenditures if corporate income taxes were cut 20 per cent or if five-year (accelerated) depreciation were permitted, with the latter somewhat more popular. And perhaps highlighting the relative importance of tax considerations, "only about one-third of the manufacturing companies report that they would invest more in the next five years if profits increased 10 per cent."

Flexibility, Adjustment, Time Lags, and Accuracy of Estimates

The interests of forecasters and of analysts of cyclical problems come into a common area in considering the flexibility of capital expenditure plans. This involves issues of the ability to adjust to changes (both anticipated and unanticipated) in the economic climate, the time lags from stimulus to plan, from plan to expenditure, and from stimulus directly to expenditure, and the accuracy of businessmen's estimates of their future capital expenditures.

Gort finds: "Actual contracts with equipment manufacturers, and other contractors, are not consummated until a point is reached when the number of months that remain before the time when the additional capacity is to be available is roughly equal to the expected delivery interval for equipment orders. Thus, in a three-year program contracts may not extend over more than two years. A curtailment of plans may entail a loss amounting to only the cost of the engineering work done....

"A contract provides for a period during which it can be altered without penalty, and an order can usually be rescinded without a prohibitive penalty unless actual fabrication has somewhat advanced. As a matter of practical experience, however, retrenchment affecting orders already placed has been infrequent, and a general disinclination toward such a practice was expressed by most officials with whom this question was raised" (page 90).

In regard to capital expenditures made with the companies' own construction forces, Gort observes: "Changes in work plans... can be readily made on short notice, but retrenchment is made somewhat more difficult by the desirability of maintaining a stable working force" (page 90).

He indicates several potentially asymetrical qualities in discrepancies between planned or budgeted capital expenditures and

those actually incurred within a given year (pages 91–95). First, since top management frequently regards requests for additional funds during the year as evidence of poor planning by staff members, lower officials tend to get all contingent expenditures listed in the plan or budget. This is confirmed in at least some statistical data indicating a general excess of cancellations over additions to annual construction budgets. Second, unanticipated changes may occur in costs of plant and equipment. Third, timing of expenditures may be altered because of both unexpected delays in construction and easing of supply problems which by speeding construction periods has permitted delay in initiation of projects. Fourth, sales may differ from expectations either because of errors in forecasting or changes in business conditions from the time forecasts were made. He suggests that once construction programs have begun, increases in expenditures may be more easily realized than decreases. Finally, in his analysis of flexibility and timing of expenditures, he explains that there is frequently an interval varying from ten to twenty months between dates of authorization on certain large items of expenditure and the period in which the bulk of the expenditures are actually made.

Firestone reports that it takes a substantial amount of time for expenditures to react to a change in plans. Even under the impetus of the Korean hostilities, such delays were confirmed: "It takes time to reach agreement on the extent and type of military expansion most urgently required, to draw up plans and specifications, to place orders for equipment, to convert existing capacity and to build new plants where existing facilities are either not available or not fitted for the purpose required. Therefore months may pass before ideas are translated into brick and mortar or complicated machinery and equipment. In the interim, capital expenditures are rising gradually and not abruptly" (page 176).

McGraw-Hill reports: "Business plans for capital investment are flexible as business conditions change, but there is more leeway for them to go up than down.... The small companies, of course, can adjust programs more quickly. Some big firms said they'd consider cutbacks. But these would apply in 1953 rather than in 1952 .... A good many companies spent less than planned in the first six months of 1952 because they couldn't get materials as fast as they hoped for."[42]

[42] *Ibid.* Lawrence Bridge, writing on the basis of Commerce–SEC data, finds "that in 1946 and 1947 when supply was the major limiting factor, the larger firms were in a better position to obtain delivery of capital goods

Gort finds, as we have seen, a budgetary tendency (noted particularly in *annual* budgets) to overstate capital expenditure items because of the greater ease of dropping items once included than in adding expenditures not previously envisaged. The failure of this overstatement to be noticed in recent years is traced to compensating errors occasioned by price rises and to sales which exceeded expectations. Both brought on capital additions which made up for items deleted from the originally inflated budgets (pages 88–89).

Another reason for a tendency for capital expenditure estimates to be overestimated is implicit in Mack's discussion of the attitudes of those who probably furnish most of the estimates. For she explains that the treasurer, interested in being sure that funds will be easily forthcoming for all present and future emergencies, overestimates costs. "Accordingly, we find the growing art-science of accountancy adding elegance to account books but not changing too much the fundamentally conservative nature of the statement of costs in those businesses in which conservatism could be afforded" (pages 215–216).

Firestone also states: "The largest number of companies reporting upward revisions of their investment intentions at mid-1950 were firms that decided to embark on new projects" (page 220), but these new projects were generally small and firms involved tended to show less than average capital expenditure anticipations. Further additions of projects were frequently balanced by cancellations of projects; since the survey was on an establishment basis, in some cases additions simply reflected transfers of projects from one establishment to another of the same company with no net change for the company as a whole. However, Firestone adds: "On the other end of the scale were companies, few in number but making the largest capital expenditures, which gave competitive conditions as the main reason for upward adjustment of their plans. Although these reasons were given in only six instances, or 4 per cent of the total, the average capital outlay per establishment involved about $2.5 million in 1950" (page 221). The group ranking

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than were the smaller companies. As capital goods output increased and demand pressures by large manufacturers eased, the smaller corporations were better able to satisfy their deferred demands." However, "capital outlays by the smaller firms declined proportionately more in 1949 and increased relatively more in 1950 than did those of the larger companies. These trends are probably due to the differential cyclical impact on various size groups of firms. It has generally been found that operations of the larger firms are less sensitive to changes in activity than are the smaller firms" ("Capital Expenditures by Manufacturing Industries in the Postwar Period," p. 19).

next in terms of capital outlay was that ascribing increases to changes in the production pattern and new products.

Turning to the analysis of reasons expressed for downward revisions of anticipations, we learn from Firestone: "Of the 69 replies received [218 firms in all gave 236 replies; hence certain minor discrepancies between numbers of firms and numbers of replies], 35 per cent mentioned projects cancelled or deferred. These cases cover, in the main, two types: plans by small or medium-sized firms with limited financial backing in industries with uncertain market prospects; and those by large firms which in their continuing review of capital expenditure programs attached greater priorities to certain projects and regions, thus canceling some undertakings and substituting others. Other significant reasons for downward adjustments of investment plans were the sales outlook, 17 per cent; miscellaneous, 16 per cent; plant and equipment costs, 9 per cent; and plant and equipment supply situation, 7 per cent" (pages 222–223).

On the adequacy, if not accuracy, of investment plans for aggregative forecasting, he reports: "In the case of Canada's most important industry [manufacturing] business firms have been able to indicate a turning point in the trend of investment at a time when the economic outlook was in considerable doubt, and when conflicting trends were becoming apparent both at home and abroad" (pages 192–193).

In comparing actual and anticipated capital expenditures, Friend and Bronfenbrenner found a certain tendency to underestimation by respondents, but there was sufficient accuracy to permit advance information on turning points in capital expenditures in most industries. Size of firm and average age of equipment (as measured by the ratio of recent previous investment to the value of gross fixed assets) appeared to relate positively to the accuracy of these projections. Moreover there is greater accuracy in anticipating expenditures for equipment than for plant, probably due to the discrete nature of plant expenditures.

While Friend and Bronfenbrenner reported that "a change in sales outlook was by far the most commonly mentioned as the reason for a decrease in expenditures below the level anticipated at the beginning of the year," earnings outlook change was also found significant in causing reduction of expenditures below the planned level but was closely correlated with change in sales outlook. "Working capital requirements, timing, and availability of labor and materials were [also] clearly more important on the down than on the up side." Sales and earnings, apparently most important factors in reducing

expenditures, were mentioned "in a much smaller proportion of the cases" as factors making expenditures exceed plans. Rather, as Friend and Bronfenbrenner report: "The most significant factors tending to increase planned outlays were changes in the plant and equipment supply situation, in plant and equipment costs, competitive conditions, new products, routine underestimates, and miscellaneous influences resulting in the initiation of substantial new projects. These factors were mentioned as the principal motivating forces by 73 per cent of the firms with expenditures higher than planned but only by 28 per cent of the firms with lower expenditures" (page 19).[43]

Summary and Synthesis

The works discussed above evidence a considerable variety of purpose, method, and coverage. Several are designed to facilitate forecasting the level of aggregate investment and changes in that level. The majority, however, are aimed directly at economic analysis of the determinants and process of capital expenditures by the firm. Several utilize questionnaires to be filled in by the respondents. Others rely upon personal interviews of management's personnel, and a few attempt to supplement interviews with examination of firm documents. There is some evidence of integration of subjective information from respondents and objective statistical data of the firm (sales, profits, liquid assets, etc.). Coverage varies from that of a single firm (United Steel Company Ltd., by Andrews and Brunner) to virtually the entire economy (government surveys, particularly the Canadian, reported by Firestone). Most reports involve a cross section of industries; one is confined to

[43]The questionnaire used as a basis for these findings involved a check list "to designate the principal factor and other major factors responsible for the discrepancy in expenditures. The list included changes in the sales outlook, current expenses, net earnings, working capital requirements, plant and equipment supply situation, plant and equipment costs (viz., prices paid), availability and cost of debt financing, availability and cost of equity capital, and other (technology, competitive conditions, unfilled orders, etc.).... In addition, the respondents were requested to indicate the reason for the difference between actual and anticipated outlays if this was not due to the divergence between actual conditions and expectations with respect to the factors enumerated in the check list. They were also asked to submit any other remarks which might help to explain the discrepancy in expenditures."

Seven additional explanatory factors classified as a result of the responses included: "change in competitive conditions, new product or change in product mix, change in technology, timing problems, routine under- or over-estimates, and miscellaneous," all referring to changes from expectations (cf. Canadian surveys, footnote 22).

electric utilities. Except for the forecasting surveys (and the Katona-Morgan work), sampling techniques seem generally "rough and ready," although there is no evidence that they are inadequate for their purpose.

The substantive findings present many common threads and some divergences. While there are occasional hints that differences may arise from heterogeneity in the data, particularly as to the time dimension, an uncomfortable number of differences stem from variety of theoretical suppositions and tools.

Several writers are struck by the apparent complexity of management orientation and evidence of irrationality in decisions. One may wonder, however, whether emphasis on complexity and irrationality is entirely compatible with the analyst's efforts to furnish simplifying explanations of economic behavior. Many problems of irrationality may be resolved by modifying our assumptions appropriately about the entrepreneur's reaction to risks and uncertainties and his lack of knowledge of the future.[44]

Information is furnished that investment plans are most firm with regard to the near future and more tentative and incomplete as they approach the planning horizon. Some evidence is offered on the frequency of formal review of investment plans, but this would seem less important than an understanding of the conditions and probabilities relating to change or realization of plans, to which several of the forecasters give particular attention.

The formal procedures concerned with approval of capital expenditures seem characterized by a caution and restraint which suggest that management is more concerned about preventing excessive expenditures than increasing potential receipts. One may conjecture, however, that this finding reflects a tendency on the part of top management to screen and prune expenditure requests from below. It might not characterize fairly the resultant activities of the firm as a whole, which would depend upon a balance of the exuberance of lower echelons and the prudence of high executives.

Through almost all of the reports runs an emphasis on the significance of level of sales or demand. Associated with this is generally the level of profits. In some cases emphasis is placed on current profits and current sales, but several writers suggest the significance of expected future sales and profits. In several in-

[44]Cf. Franco Modigliani, "Some Considerations on the Relevance of Entrepreneurial Anticipation to Current and Future Activity of the Firm," Cowles Commission Discussion Paper: Economics 2038, April 11, 1952, unpublished.

stances even explicit attention to future conditions involves generally implicit emphasis on the present because little variation from the present is usually assumed for the future. But on the other hand in some cases attention given to "current" variables involves the future. Thus current orders refer to future shipments.

Some investigators give or report attention to distinctions between capital expenditures for "replacement" and for expansion, and some find increasing severity of competition for sales a factor stimulating investment. However, others see little positive effect in such competitive influences. A more widespread tendency is to stress the relevance of expectations about future demand to most "replacement" decisions and the relative rarity of "replacement" expenditures which do not involve expansion. It is also reported that earnings ratios and "payoff" estimates are used fairly widely, but frequently only to set screening limits to expenditure proposals rather than to determine just which of those not rejected should be undertaken or which should get priority. On many essential expenditures no such estimates or ratios are calculated, and on large expenditures top management generally chooses to weigh various "intangibles" which are not introduced into earnings calculations. What calculations are undertaken do not always seem to make obvious economic sense.

There is little evidence that changes in the cost of plant and equipment influence the physical volume of capital expenditures. There is one report of considering trends in prices and supply conditions in decisions relating to inventory holdings, but another report indicates that businessmen consider profit on their productive operations rather than on inventory speculations as the only sound way in which to operate; inventories should be kept as low as possible.

There are numerous reports that current interest rates have no direct connection with investment decisions. These are documented by various statements by businessmen indicating that they never consider interest rate charges at all, or simply that such considerations never influence investment decisions. There is some reference as well to the lack of influence of cost of capital in general although there are indications that selling prices of stocks (hence the cost of equity financing) is of some consequence. We may point out, nevertheless, that costs must enter into estimates of profits and earnings except insofar as cost variations are relatively small compared to anticipations of income variations (which, however, may quite frequently be the case). While generally discounting

factors relating to the cost of capital, several writers allude to the importance of availability of capital or cash, particularly for smaller firms. In this connection there is some reference to the undesirable conditions and terms (as distinguished from rates) which banks sometimes impose.

One report suggests that capital expenditures would be increased upward if various restraining influences were removed or inducements added, and several indications are given that firms are prepared to reduce expenditures rapidly where conditions warrant. In this latter connection, it is suggested that capital expenditure plans are not made firm, and commitments are not undertaken any longer in advance of actual expenditures than necessary. However, there are other reports of inability to expand expenditures rapidly and some indications of substantial lags from the time expenditures are actually begun until the period at which they reach their maximum rate.

Correspondence between actual and planned or anticipated capital expenditures has been sufficiently close to permit extensive use of such forward estimates for forecasting purposes. Lack of correspondence has been attributed in large part to a variety of economic changes which were not evisaged by firms at the time of their estimates. Prominent among these are changes in product sales, cost of capital goods, and in the length of time necessary for completion of construction or delivery of equipment. Perhaps balancing a tendency for expenditure plans to be incomplete, noted above, was the exaggeration of prospective expenditures by lower officials in order to reduce the probability of having to suffer the onus of failure to live within their budgets.

Many of the points indicated above, and some others, will come into evidence again in the analysis of the present writer's interviews of large manufacturing firms. It is to be hoped that the resultant bifocal view will help our understanding of both the investment area explored and the survey tools applied.

4. *Interviews of the Merrill Foundation Research Project in Expectations and Business Fluctuations*

General Scope and Method

In the spring of 1950 a series of interviews of a pilot nature were conducted by Franco Modigliani and members of the staff of the Merrill Foundation project in Expectations and Business Fluctuations. These involved almost exclusively firms in the agricultural

equipment industry and emphasized problems of capital expenditures and forward planning. This work was carried forward by the present writer with interviews of fifteen manufacturing corporations in the Middle West and East[45] in the winter and spring of 1951–1952.

The firms included were generally extremely large, with annual sales exceeding $1 billion in several cases, and were typically the largest or among the largest in their industry. Industries included were agricultural equipment, shoe manufacturing, beer, container (paper and cardboard), steel, and rubber. Interviewees ranged from presidents, board chairmen, and executive vice-presidents to controllers, treasurers, production schedulers, and firm economists. Most firms were visited several times, with interviews generally commencing with a top executive and then continuing with various subordinate officers. In the course of the interviews, firm documents and statistics were solicited and, where obtained, were studied and analyzed. In 1953 drafts of the analysis of the interviews with each firm were sent to that firm along with other excerpts from this manuscript for comment, correction of errors in the reporting of fact or interpretation, and the answering of various specific questions that seemed to require further consideration. In several cases this correspondence was followed by reinterviews with the firm in 1954.

The firms selected can in no sense be considered either random or representative samples of American industry as a whole. Indeed the entire work may be considered largely in the nature of a pilot study with findings and conclusions put forward explicitly for purposes of independent verification. However, the firms covered represent such substantial proportions of important industries that results may be of more than passing interest.

Interviews were relatively unstructured, with no formal written schedule of questions, but the interviewer was generally able to take copious notes which made possible fairly accurate direct quotations of interviewees. To make available exact written remarks reflecting in some cases more careful thought on the matters raised, terminal letters were addressed to top officials interviewed, in both the fifteen firms interviewed by the present writer and those included in the earlier pilot study, asking rather summary questions relating to the issues under consideration.

[45]Initial contact was made by a letter sent out over the signature of the Dean of the College of Commerce of the University of Illinois explaining briefly the nature of the project and introducing the interviewer. The latter then took over the correspondence and received generally very substantial cooperation from the firms concerned.

It should be understood that a substantial portion of the interviewing effort was directed to acquisition of information bearing on the formation and influence of entrepreneurial expectations. The interviews herein described were but one phase of the larger research task and were directed explicitly toward complementing various associated theoretical and empirical investigations. Specifically, for example, attention was given to the nature of estimates of capital expenditures furnished to surveyors in connection with Jean Bronfenbrenner Crockett's work on Commerce-SEC anticipations-realization data. The formation of sales expectations and their reflection in both capital expenditure plans and production scheduling were examined carefully in the light of developing hypotheses by Modigliani and Owen H. Sauerlender[46] and by Robert Ferber[47] bearing on the regressive, "conservative" character of expectations. Information on capital expenditure plans was solicited in order to contribute to the hypotheses set forth by Modigliani in relation to the planning horizon.[48] While leading to some attention to matters which are peripheral to this paper, this role in the "expectations" project did involve a major focus on capital expenditures and on production planning and inventory control, all of which are of course integrally related to anticipations of future conditions affecting the firm.

The interviewer was hunting broadly for determinants of the level of capital expenditures. This involved consideration of the effective lines of authority for proposing, accepting, and rejecting various types of expenditures; examination of the extent to which well-defined criteria exist for accepting or rejecting specific expenditures; the nature of these criteria; and the degree to which they vary in accordance with the type of capital expenditure (as replacement, expansion, or new products, or small versus large outlays); the influence of cost of capital and availability of internal funds, of long-run extrapolations of current trend versus assumptions that current rates will be maintained, of explicit or implicit allowances for uncertainty, the time dimension of capital expenditure plans, changes, and execution; the extent to which factors other than profitability play a role in investment decisions; and some indications of the nature of data on capital expenditures and capital expenditure plans which are obtainable from questionnaire surveys.

[46] *Op. cit.*

[47] *The Railroad Shippers' Forecasts*, University of Illinois, Bureau of Economic and Business Research, 1953.

[48] Abstract in *Econometrica*, July 1952, pp. 481–482.

Space limitations of this paper have led to a rather particular kind of selectivity in the findings herein reported. For one thing, those findings which seemed most unique or particular and not given readily to summarization have tended to be ignored. Material included in this report relates in larger than proportionate measure to points on which there seemed enough consensus or enough tie-in to the conclusions of other researchers summarized above to warrant generalization. There has been also some tendency to report findings which seem to contradict or suggest caution with regard to the conclusions of other writers.

The conclusions offered in the following pages should ideally be checked against the interview data from which they have been derived. For the interview technique is by its nature a very personal method of research, and one's fellow economists in instances like this have every right to wonder whether they have anything more in a reporter of interviews than, at best, a good storyteller. Unfortunately there may be as many only vaguely related "stories" as there are raconteurs. "Morals" of the stories are likely to be at least as numerous. The interested reader is urged, therefore, to consult a much more complete report of these interviews[49] which, by means of fairly extensive quotations and presentation of material on a firm-by-firm basis in the context in which it was gathered, is intended to bring the reader as close to the original data of this study as appears reasonable. By the nature of an interview study, this degree of closeness to the data cannot be very great. The reader is encouraged nevertheless to utilize the more detailed firm-by-firm presentations in the larger study to go as far beyond—and back over—these conclusions as he will.[50] Further, these, like all other interview findings, should be subjected to rigorous criticism and an attempt at verification by other techniques of analysis.

Investment in Inventories

Much time was spent in almost all of the interviews in noting the effect on current production of expectations about the future. This involved, generally, relatively detailed study of the procedures and principles of production scheduling as well as of the kinds of reactions one might expect, in activities related to current production, from changes in the economic conditions facing the firm.

The amount of inventories which any firm will hold is the resultant of several pressures which reflect the different economic

[49] *Determinants of Capital Expenditures: An Interview Study.*

[50] The material on inventories, however, is *not* reported upon in *Determinants of Capital Expenditures.*

functions of various departments in a firm. The head of production planning in one of the rubber firms put this as follows:

1. "Sales" wants enough of everything so that no sales are ever lost
2. "Production planning" wants to avoid extra costs occasioned by uneven production
3. "Financial" wants to keep down investment (the amount of money tied up)

The nature of the sales pressure is fairly clear. It is greatest in products of a style and/or perishable nature such as shoes and beer, or where demand cannot be put off. In the case of one large shoe manufacturer, production was controlled by those directly responsible for sales. In both shoe and beer firms, there is fairly marked evidence of friction caused by the tendency of sales personnel to make it difficult for other company officials to operate within what seem like generally reasonable constraints for their work. As the result of the pressure from "sales," production people have to maintain large stocks of raw materials and goods in process as well as finished products adequate to meet demand. Thus they are kept in a position to adjust production quickly to meet both expected and actual changes in demand. But the result may well be the tendency for shipments of finished products to lead production at the business cycle turning points, noted by Abramovitz in his monumental work on inventories.[51] For when times are good, sales personnel are loath to admit that a drop is more than temporary. If they allow production to be cut and the drop does prove temporary, they may not be able to meet demand promptly and may lose sales to competitors. Hence if the drop in sales does continue, there will be investment in inventories of finished products until sales departments finally acknowledge the need for a curtailment of production. On the other hand, toward the end of a recession, sales departments, which have been accused of both exaggerated optimism and overpessimism, may be slow to come out of their mood of depression and may fail to order increased production at the first increase in shipments. Indeed examination of at least one shoe firm's monthly data on shipments would indicate that a refusal to see in every increase a continuing upturn is quite warranted. For on several lines of shoes for several postwar years, statistics showed a negative correlation, if any, between orders received early in the season and what was finally sold.

[51]Moses Abramovitz, *Inventories and Business Cycles*, National Bureau of Economic Research, 1950, pp. 254 ff.

Placing this situation in a context of seasonal demand accentuates the lag of production over shipments. Production must be high enough during months prior to those of high demand to build up inventories which must be drained during the peak months of shipments. Heavy shipments of beer in the summer months, for example, cannot be accomplished by increasing brewing in the summer months. They must rather be carried out on the basis of beginning brewing at capacity rates earlier in the off-season.

However, there is a growing weight of evidence that businessmen are generally conservative (if not "reactionary"—that is, believing all changes are transitory and that business will revert to what it was before the change). Thus they are reluctant to anticipate changes and prefer to adjust cautiously to changes which have occurred. This expresses itself in a tendency to let the shock of variations in sales be absorbed by inventory fluctuations rather than met by prompt changes in production.[52]

An extreme seasonal manifestation of this tendency affecting raw materials was indicated in one of the steel firms interviewed. Iron ore can be brought in over the Great Lakes only during the shipping season. In at least recent years, it has been standard procedure to bring in enough ore so that inventories at the end of the shipping season will be sufficient to sustain capacity operations until the opening of the following year's shipping season. Then if sales actually slump below capacity, since the firm is not equipped to store finished products, there will be an increase in inventories of raw materials beyond the corresponding figures of the year before—an investment in inventory going along with the drop in shipments and production.

[52]We may quote the comments on some of these issues in a letter to the present writer by the assistant treasurer of a rubber firm: "You state 'Financial wants to keep down investment.' Personally I would prefer 'to maintain balanced inventories' in lieu of 'to keep down.' I do not attribute 'the financial viewpoint' to conservatism, but rather to the detached view that can be taken if one is removed from the enthusiasm and blue sky that should be a part of the sales group; better yet, I'd prefer to quote the 'financial desire' in the words you use later on in the paragraph for the production people 'adequate to meet demand.' Along the same line... you state that businessmen are generally conservative and reluctant to anticipate changes. In lieu of 'anticipate' I would prefer the word 'speculate on.' Generally, I feel businessmen are quite ready to anticipate changes; their hesitancy is on the indefiniteness of changes, which, of necessity, backs them in to being cautious. Generally, our experience has been that this is the attitude of the businessman whether his background has been sales, production, or financial."

Further evidence to support the lags noted by Abramovitz between shipments and production and/or an inverse relationship between finished product inventories and sales may be found in terms of the major constraints of production-planning departments suggested above. This interviewer heard over and over in virtually every industry the guiding principles of production scheduling: avoid sudden jumps in production as much as possible; do not lay off men this week that you may have to hire back next week. This labor problem is undoubtedly an important one (and has little to do basically with union relations). Irregular employment is a heavy cost which can be shunted by management to labor only in the very short run. In the long run, management cannot avoid the cost either in higher wage rates to retain first-quality workers or in being forced to be content with marginal workers and high labor turnover. But prompt adjustment of the rate of production to every change in sales expectations, or even to every (possibly temporary) change in the rate of sales, might involve frequent fluctuations in employment of labor. Thus if shipments are expected to arise and decline over a period of time, or if sales actually fluctuate, production schedulers attempt to keep production as stable as possible, building inventory in periods when shipments are low and disinvesting in inventory when shipments are high.[53]

Another factor influencing investment in inventories which emerges sharply from the interviews is the tendency to invest in inventories as capacity operations are reached in order to be able to meet supply shortages which tend to become more numerous and more serious at high levels of operation. This is possibly related not merely to high levels of operation but also to increasing levels of operation near the peak of general activity as manufacturers become aware of the difficulty suppliers have in meeting their generally increasing demand for raw materials.

We should also report a widely repeated belief that it is not the business of a manufacturing firm to speculate on prices of inventories. "We are processors not speculators" has the appearance almost of a moral precept. But there are certainly exceptions, one of the foremost of which is the purchase of leather by shoe manufacturers, where the amount of leather held is influenced by price expectations.

[53]Various of the inventory considerations discussed above fit well propositions presented by Modigliani and Sauerlender, *op. cit.* See also Modigliani and F. Holm, "On Production Planning Over Time With Some Conclusions About the Nature of the Expectation and Planning Horizon," *Econometrica*, January 1955.

A pressure for not only stocks of goods in process but all inventories (some perhaps after a lag) to vary more or less directly with the level of production may be induced from the fairly widespread practice of measuring inventories in terms of days' (or weeks') supply. To the extent that rules of thumb with regard to desired inventories are expressed in these terms, larger physical volumes of inventories would appear acceptable with larger output. It would be interesting to explore further whether "days' inventory" tends to relate to expected or current level of output. This interviewer found one or two bits of evidence that expected level of output was the relevant consideration (as would appear to be rational) but such evidence must be offered even more tentatively than most of our generally tentative findings.

Finally we should note the influence of those whose responsibilities are financial. Here from the standpoint of both cash availability and profit rate there is constant demand that inventories be kept as low as possible. Officials of at least two firms indicated standards or rules which made the cost of carrying inventory equal in effect to the profit rate of the firm. A pressure of this magnitude tends to prevent inventories from staying for very long outside of acceptable inventory-output ratios. However, firms are subject to numerous other pressures, some of which have been mentioned above, so that one should not be surprised by Abramovits's suggestion that it may not be valid to assume "that stocks are kept at a constant ratio to output and sales."[54] (One may indeed be a bit surprised by Abramovitz's statement that such a constant ex post ratio is a "common assumption.")

And in the way of a random note, we may suggest that Abramovitz's lack of information on "perishable goods made to stock whose production cycles are governed by demand"[55] may be met at least in part by interview material obtained from breweries. We have here an interesting, but not uncommon, complication in the highly seasonal nature of the demand. Thus it is necessary for brewers to begin to build up "cellar inventories" long before the summer peak and then reduce them in the period of high summer sales. Since there is little stocking of packaged beer and since sales fluctuate much more than brewing (which is at capacity) during the summer, stocks of raw materials and goods in process will vary inversely with sales. Thus one would expect (at least

[54]Abramovitz, *op. cit.*, p. 460.
[55]*Ibid.*, p. 241.

relative to the previous year) inventory investment when sales decline and disinvestment when sales rise.[56]

Nature and Extent of Forward Estimates and Capital Expenditure Plans

An essential notion about the place of capital expenditures in the firm that this interviewer—undoubtedly like many before him—must carry away is that they are treated as something very important. They do not represent undertakings lightly initiated. Rather they tend to be tied to basic long-run evaluations of the economic situation in which the firm believes itself.

In deciding the major components of their expenditures, most of the large firms interviewed made some effort to ascertain long-term trends in demand for their products. They were interested, they emphasized, not in temporary spurts of demand but in the long-term growth pattern. Since they had few illusions about their ability to predict the details of future developments—or even predict accurately their broad outlines—they attempted to set up strategies for future action, committing themselves only as far ahead as was necessary. For example land might be purchased in various localities to permit building new plants where, when, and if appropriate, or new processes might be tried first in one plant, with their introduction in other plants contingent upon later developments.

This interest in the long-term trend, coupled with the desire to avoid premature commitments, would appear to explain well the correlation between the length of capital expenditure plans and the volume of capital expenditures noted below. It would also explain our evidence of greater importance attached to long-run sales forecasts in periods of near-capacity output. For expected future sales would become relevant to current capital expenditure decisions in some proportion to the probability that future demand would exceed capacity. And large capital expenditure programs with correlated shortages and backlogs would increase the relevance of expected or planned elements in the future program to the steps to be taken now.

The desire to be conservative, to avoid getting out on a limb, is reflected in the tendency of capital expenditure plans to extend no further in the future than seems necessary in terms of advance com-

[56] This would not be true if sales fluctuations could be anticipated correctly long enough in advance. But such anticipations are most difficult since many raw materials are purchased in the fall for the ensuing year, and capacity brewing for a summer with high sales might have to begin in February.

mitments or orderly activities in capital markets.[57] Generally they extend less far into the future than the long-range demand forecasts on which they are frequently based because of the general notion that today's capital expenditures must be justified by tomorrow's sales. However, there is a frequent insistence that there are no capital expenditure plans beyond the approved budget. This insistence may, of course, reflect a sort of intrafirm discipline designed to prevent subordinate officials from acting as if they have a claim on the future funds of the firm. Hence it may not rule out the existence of at least implicit or informal longer-range plans guiding top management's actions.

The length of forward capital expenditure plans tends to vary with the amount of the capital expenditure program. Many firms planned five years ahead in their major postwar expansion but revealed briefer planning periods when major expenditures were completed. This last phenomenon may reflect an awareness of the effects of U-shaped supply curves of materials and/or capital, which would necessitate a judicious spreading of expenditures over time. There were also several indications that the supply of entrepreneurial services themselves was such as to inhibit rapid growth. There was a limit to just how fast top management could act in evaluating proposed expenditures. There might be a shortage in adequate executive personnel both to make a wise decision on the construction of a new plant and to fit the new plant into the organization if such a decision were made. In either case an expansion might be slowed until top management were confident they could handle it.

The firms interviewed appear to have a relatively high discount for risk and uncertainty when they make capital expenditures commitments which can be justified by developments only in the as yet unknown future. Since the more distant future is even more uncertain than the near future, profits apparent in the relatively near

[57]Note the correspondence of these findings with the formulation by Modigliani (*Econometrica*, July 1952, p. 482): "When we recognize the cost of forming expectations and of planning, and take into account the fact that information on events expected for a given point of time is likely to increase at no cost as that point approaches, we may expect to find that the relevant expectation and planning horizon involves a subset, possibly a small subset of all future parameters and moves.

"Since only the first move can be implemented, no other future move need be planned explicitly even if it is 'relevant.' However, as relevant moves appear in the system that has to be solved in order to decide the first move, they may be explicitly planned as a by-product of the solution for the first move. But these plans are not final decisions about later moves; such decisions will be reached at the proper time on the basis of information that will be available at that time...."

future may be much more relevant to capital expenditure decisions than profits very uncertainly anticipated in the distant future.[58] This approach may, of course, help explain the tendency for capital expenditures to be made in periods of prosperity even on projects which must pay off over a period considerably longer than that of the business cycle. Proper attention to the implicit value of the businessman's high rate of discount for risk and uncertainty may, by the way, enable other investigators to confirm the present writer's conviction that firms' actions are essentially rational. Admittedly, though, the rationality may not always be obvious to one unfamiliar with the preference functions of the management of the firm—and the personnel of that management may be incapable of articulating the essential implicit rationality of its actions.

However, although this risk factor shortens the horizon, long-lived assets must be paying propositions over a long period, and this tends to make firms relatively resistant to short-term fluctuations. To the extent that they are, they may offer an interesting confirmation of the instability hypothesis offered by the French economist Aftalion, many years ago, which likens the economy to a cold room with a fireplace which is slow to heat up. The reluctance of management to react capriciously to momentary changes may make them ignore developing signs of disaster during a prosperous period. Thus they invest too long during the heated boom and later through a refusal to believe the first indications of upswing, delay investment too long after the chilling crisis-depression catharsis.

Formal Aspects of Approval

There is little to offer in the way of generalizations on the details of procedures by which the various firms formulate and decide upon capital expenditures.[59] Projects appear to emanate both from

[58]It may be well to distinguish between internal plans of the firm and commitments to outsiders. One would expect the firm to be more cautious with regard to the latter. However, it should be realized that commitments to outsiders may be canceled or altered, while the formulation of internal plans may in themselves represent a substantial irrevocable expenditure of the time of company personnel and in some cases the hiring of outside consultants as well. Thus it may pay neither to make outside commitments nor to plan for expenditures whose prospective profitability would be so far in the future that a high discount must be applied to arrive at the present value of their expected contribution to company profits. For in that case the gain from planning now rather than doing nothing (with the possibility of planning later) must be of the second order of smallness.

[59]The reader interested in more detailed information on this score, however, may be referred to the recent National Industrial Conference Board report, *Controlling Capital Expenditures*, Studies in Business Policy 62, 1953.

top management and from operating and engineering departments. While major expenditures generally require approval by the board of directors, they are usually thrashed out informally before they reach the board so that formal rejections are relatively rare. Individual smaller expenditures are frequently approved merely by operating people or single officials out of blanket authorizations which are agreed upon by the board of directors (or some such top group). There is apparent also a certain tendency for top management to screen and reduce the amount of requests which have come up from below or to set up criteria which will reduce the number of expenditure requests coming up. In the words of the president of a large container firm: "We constantly have much more submitted from our people down the line than either the management committee or the board of directors approves." Finally one must observe differences of opinion or at least differences of emphasis within the firm. Different departments tend to operate as a rough system of checks and balances, reflecting the different functions and immediate goals of various specific elements in the organization.

Classifications, Criteria, and Calculations

Consideration of the costs and earnings criteria allegedly used by business firms in deciding upon capital expenditures leads into something of a wilderness where method is difficult but not impossible to find. Many firms set up classifications of capital expenditures with conceptually overlapping categories (and respondents to surveys frequently balk vigorously at questions utilizing just such classifications). However, these classifications may offer ready operating rules for those whose duties involve initiating, evaluating, or passing upon requests for capital expenditures. The classifications indicate (in some cases by their nature and in some cases with accompanying instructions) the scope and substance of calculations required. Some of the sets of categories are as follows:

1. Maintenance, repair, expansion, and savings
2. Diversification of product, improvement of quality, obsolescence, and increase of capacity
3. Replacement and expansion
4. Replacement, economies, expansion, and new products

Maintenance, repair, and replacement categories generally require no profitability calculations. Gains accounted for under "savings" or "obsolescence" must usually be calculated under the assumption of current volume of operations. Expansion projects somewhere

along the line run into the question: "For how long?" If the need for expansion appears temporary or uncertain, it is likely that favorable consideration will be given to one or several alternatives to the purchase or construction of new capital assets. Such alternatives might involve increased employment of labor, utilization of outside suppliers, revamping old plants or reactivating idle ones, and simply sacrificing sales (possibly with favorable price results).

However, the overlapping of categories is notorious. While this overlapping is frequently cited by business respondents, it probably occurs in numerous and important instances (important from the standpoint of economic analysts, not necessarily the standpoint of the businessman) in which business respondents do not call attention to it. Thus the interviewer-analyst may note that businessmen see an increase in demand as forcing the working of high-cost extra shifts and the development of costly bottlenecks. Yet certain labor-saving devices or expenditures designed to ease bottlenecks would be classified as cost reducing, or expenditures justifiable in terms of savings. Should they be considered so by the analyst or should they be considered as devices for movement to a lower short-run cost curve appropriate to the increased rate of output, thus lowering costs per unit expanded of current output, and permitting cheaper further expansion of output?

There is a general vagueness by top management about the specific variables which enter into the results of calculations of earnings ratios, payoff periods, and other measures on which they supposedly base their decisions. Actually the vagueness may reflect a utilization of these measures in ordinal rather than cardinal fashion, with an implicit confidence that "errors" would be of the same direction and magnitude in the various cases in which these measures are used.

The prevalence of formulas which involve annual operating profits and ignore prospective life of assets is frequently perplexing if not exasperating to the interviewer. Similarly the handling of depreciation charges in these formulas is downright offensive to one nurtured in the neat definitions of a Keynesian concept of marginal efficiency of capital. In some cases the crudities of calculations and criteria for capital expenditures appear to lend a distinct bias in favor of short-lived assets. But then we may observe differential standards that appear likely to compensate for the "errors" we see in the businessman's measures. Furthermore much of the "bias" in favor of short-lived assets may involve merely a greater rate of dis-

count for risk and uncertainty, as suggested earlier, and a sharper time preference than the outside investigator may reckon with.

The Role of Expansion

The estimate of future demand is certainly the most often cited determinant of the volume of capital expenditures. But it is important to note, in addition, a number of responses by businessmen which are not couched explicitly in terms of the role of demand and expansion, let alone in the sophisticated phrases of the economist's acceleration principle. For among such responses are many which may be interpreted reasonably as confirming the importance of these factors. Thus the statement by the president of one large shoe manufacturing firm that "we won't put in a new plant unless demand warrants it" was certainly not atypical.

Apparently on a different note, the executive vice-president of a steel company said: "Much expenditure is not for expansion, but rather for cost reduction and quality improvement. We expect a competitive market in regard to cost and quality of product." However, when the interviewer at this point suggested that these matters constituted the major factor in capital expenditures, the response was, "also changes in industry demand."

Similarly, the unavailability of scrap may manifest itself in such high prices for scrap as to necessitate construction of additional iron facilities. This point is implicit in the executive vice-president's remark, pursuant to the quotation above: "We might also come to the belief [that iron facilities would have to be constructed] in terms of cost reduction. I don't believe it will happen. In competitive times scrap is cheaper." It might be quite likely that an analyst of questionnaire replies would tabulate this as pointing to cost reduction *rather than* pressure of demand as the factor bringing about capital expenditures. Yet careful examination indicates that it is an increase in industry demand which might raise costs (of scrap) to a point that would force construction of facilities for an alternative source of pig iron.

Further indirect confirmation of the role of demand and factors of expansion may be noted in the following portion of the analysis by this writer of his interview with officials of a large farm equipment company.

The relation of the share-of-the-market factor to such an apparently unconnected economic theory as the acceleration principle may be found in the controller's statement that: "If our share of the market were falling in a capacity market we would expand. If our share

were falling in a falling or stationary market we might cut prices." The former situation is one in which production is proceeding at capacity and the fall in market share is due to the firm's inability to meet demand, when other firms in the industry are able to meet this demand (or at least their own traditional share of the demand, while some of the demand for the industry's products is being lost to the entire industry). The share-of-the-market factor can thus be interpreted to mean that a firm will expand to meet an increase in demand if the alternative is a permanent sacrifice in sales rather than a mere deferral to a future slack period. The rule-of-thumb for determining a permanent sacrifice in sales in a "capacity market" is a falling share of that market.

Investment for purposes of expansion, as suggested above, is apparently based on compelling major movements in demand rather than the relatively small, even if sharp, changes which occur in short periods. A vice-president of the agricultural equipment firm cited above explained: "We don't want over-full capacity for a short-term peak and a lot of idle capacity for the rest of the time.... Capacity is provided in terms of that amount which would permit us to satisfy a high level of demand without forcing us to develop too much backlog, or lose too much to competitors."

Likewise, the executive vice president of the steel company declared: "You'd have to have a belief that demand was keeping up to undertake a major expansion. Our present program was approved in the summer of 1950 and if business had gone to pot, we would have gone ahead. We would have thought the recession temporary.... We came to realize about 1949 that we were on a new plateau and that we had to expand steel capacity. It took four years to accept this expectation."

The general conservatism in regard to capital expenditures thus reflects itself in a slowness to arrive at decisions to expand accompanied by a reluctance to abandon, without apparently good reason, a course of action one commenced. The conservatism is reflected as well, in at least one or two instances, in a preference for expansion of capacity in tried-and-true old products rather than for incurring major costs for the production of untried new products.

In terms of current economic theory, there is much in the interview material which may be used to confirm the acceleration principle. However, such confirmation would not be on the crude level that would have current investment a unique function of changes in demand in a specific (generally immediately) past period. Instead, a suggestion about the difficulties of statistical confirmation of the

acceleration principle, particularly at the level of aggregates, may be found in evidences of entrepreneurial caution, lengthy lags in response, and peculiarities in supply functions. The generalized Hicksian *Trade Cycle* model with a variety of lags may hence prove more useful than the simple second-order difference equation presented by Samuelson in his well-known multiplier-accelerator article.[60] And, of course, our indications of lagged but pervasive influence of expansion upon investment fit easily into growth models such as those of Harrod,[61] Domar,[62] and others.

The tie-in between cost-reducing and capacity-expanding factors in investment discussed earlier can be variously illustrated. For one thing numerous executives state directly that modernizing improvements and replacements increase capacity. Beer companies explained that they reduced shipping costs by setting up additional plants in new areas in which sales had developed. In steel (as just noted) when demand is high, increased costs of scrap may induce construction of basic steel facilities which reduce the cost of iron to the company and increase its availability in the industry. Improvements in equipment can, as suggested by one rubber firm, tend to reduce expenditures necessary for expanded plant facilities by permitting more economical plant layouts in new plants.

The Role of Nonexpansionary Expenditures and of Replacement

At least one notion from which conclusions with serious policy implications have been drawn may be questioned by our findings. This relates to the assumption that a high volume of capital expenditures may be sustained by expenditures for "replacement" and "modernization" or other purposes separate from expansion. It would appear rather that "replacement" and "modernization" expenditures are actually subject to many if not most of the pressures of the economic vicissitudes which have caused major fluctuations in capital expenditures explicitly for expansion purposes. Similarly in spite of evidence of rules of thumb which tend to allow expenditure of depreciation allowances for "replacement," it is not clear that high depreciation charges can be relied upon to maintain a high level of replacement expenditures. In the last analysis most ex-

[60]Paul A. Samuelson, "Interactions between the Multiplier Analysis and the Principle of Acceleration," *Review of Economic Statistics*, May 1939, pp. 75–78, reprinted in *Readings in Business Cycle Theory*, Blakiston for American Economic Association, 1944, pp. 261–269.

[61]See above, note 32.

[62]See, for example, Evsey D. Domar, "Expansion and Employment," *American Economic Review*, March 1947.

penditures seem subject to tests of profitability which offer no ground for expecting stability in the firm's expenditures in a world of fluctuation. The rules and formulas are changed where appropriate.

In an interview occuring early in 1952, the controller of an agricultural equipment firm declared: "We replace when things fall apart. If replacement is planned, when the replacement comes along... the 'replaced' asset and its replacement are both used." Commenting over two years later, a high executive of this firm explained that this statement had reflected a particular circumstance at the time of the interview and not a general policy: "In 1952, we were in the midst of a combination of circumstances entailing (1) pent-up demand in excess of productive capacity, and (2) long delays in procurement of new capital tools and equipment. At the time, government preference for our products was forcing good commercial customers into our competitors. More output was, accordingly, most essential—and for the time being was more important than the lower unit costs which could be obtained if obsolescent equipment could be replaced by modern machinery. It was not that we did not wish to make replacements. We couldn't. Whatever new capital equipment we could get was applied to *more* output on top of what we could get from continued use of old equipment."

This would indicate that the designation of capital expenditures for expansion or replacement would depend upon the level of demand or output. For at high levels of output, retirements would be postponed and expenditures which might otherwise be justified as replacements would merely be added to existing equipment. On the other hand at lower levels of output the same expenditures might be justified as replacing high cost equipment which, in view of the level of activity, it seemed appropriate to retire.

From a slightly different analytical viewpoint, this may mean that there is a tendency for the firm to move to the right and up on its short-run cost curve in a period of high output. Thus the firm does not buy as much new plant and equipment as it would if it were sure that the new level of output were to be maintained. Operation of the acceleration principle in the short run would be inhibited. Nevertheless expenditures designated for "expansion" might appear large in periods of high and expanding output because the upward slope of the short-run cost curve is so great as to appear prohibitive. Thus expenditure proposals which have the effect of permitting movement to a cost curve permitting more economical operation at increased outputs are now viewed primarily as expanding capacity rather than reducing costs.

Changing labor costs seem relevant to at least certain types of expenditures. They may induce expansion of facilities in new locations if such changes reveal locational or geographical differences. This was suggested by a shoe manufacturer and seemed to receive corroboration in the interviews with one agricultural equipment firm.

Prices of Capital Goods

It is indicated that construction costs are not significant in determining the physical volume of investments. Higher costs thus must mean greater expenditures. A major explanation of the apparently inelastic demand for capital goods is a widespread conviction among business executives that increased costs will be accompanied by increased product selling prices and increased earnings. One would therefore not be warranted in concluding that an increase in the *relative* prices of capital goods and other commodities would have little or no effect upon real investment.

One should note as well that the significance of capital goods prices is implicitly a problem in marginalism and not one to be answered, as we warned early in this paper, by majority vote. Major capital expenditures are frequently in the form of large integrated projects. If 90 per cent of all firms interviewed had said that a 5 per cent increase in construction costs had not led to any project cancelations—but 10 per cent had canceled their projects—the demand for investment goods as a whole might well be price elastic.

Supply of Money Capital

On the whole, remarks by business executives suggest that questions relating to the supply of money capital do not appear to them to be crucial in capital expenditure decisions. "We'll get the money if we need it," is a common refrain. As the financial vice president of one rubber company put it: "We're not restrained by money considerations. If we decide to go ahead on something we'll get money somewhere, from profits or elsewhere." Yet there is repeated evidence that the problem of obtaining funds is an important one, in at least the financial departments of the firm. Conclusions drawn from the remarks of various of the controllers interviewed might indicate that availability of funds must be a decisive factor in investment decisions.

While not allowing ourselves to be influenced unduly by the remarks of those who emphasize financial considerations because of their own preoccupations, we must likewise be careful not to be misled by those who ignore financial considerations for the reason that

it is *not* their particular concern. Thus a production man who must justify proposed capital expenditures in terms of whether they promise increased profits or cost savings sufficient to meet some specified earnings criteria may easily respond that it is not the cost or availability of capital that concerns him but only the expected profitability (or cost saving). Yet the parameters of the earnings criteria which the production man accepts as given may themselves be determined by the availability and/or cost of capital.

Questions directed at the interest rate receive almost uniformly negative response, as they have received when asked by other interviewers. However, by the interest rate the business respondent hardly conceives of the symbol of a whole structure of capital costs to which the theoretical economist has given so much attention. Our interviews suggest the need for fewer stereotyped questions in this area and more careful probing along lines of concepts of capital cost which seem relevant to the firm. This might lead to problems such as discovering constraints about debt-equity ratios and analyzing the effects of interest rates and floating of new stock on existing corporate securities.

The need for care in investigating is shown too by considering the problem of availability of funds. One brewery reported that elaborate earnings calculations had been undertaken to convince the bankers of the desirability of a loan. In at least this interview, then, it became quite clear that availability of funds was hardly a variable exogenous to the economic prospects of the firm.

Taxes

Interviews suggest the merit of further attention to the operation of the various phenomena of capital formation under the substantial influence of current tax and tax-related regulations. Thus the effect of the excess profits tax, if testimony from several firms is to be given credence, is not merely to reduce the net cost of interest but to make it negative. Also the effect of taxes themselves is not simply, as some investigators have been inclined to report, to reduce capital expenditures by reducing the amount of funds available. For high taxes on profits would appear also to induce certain expenditures which can be added to current costs and thus reduce current tax liabilities. Such expenditures might be desirable if they were expected to yield increased profits in the future, when tax rates may be lower, or merely to yield utility of some other nontaxable kind, such as greater security for the firm. In the context of high corporate profits and excess profit tax rates, the accelerated

amortization rights granted under government certificates of necessity were reported by some firms to have had a substantial effect in the direction of encouraging capital expenditures.[63]

Flexibility, Adjustment, and Time Lags

Our interviews enabled us to observe a variety of lags from stimulus to expenditure which are of considerable relevance in economic analysis, particularly that part relating to cyclical fluctuations. Knowledge of these lags may aid as well in determining the extent to which expenditures may differ from plans as economic conditions change. However, it would be particularly presumptuous to attempt to summarize and generalize the scattered bits of data collected on this subject. We might suggest one lag to which the interviews called our attention: that from the borrowing of money to its utilization in capital expenditures. This lag apparently may be considerable. To the extent that it is, efforts to control the rate of investment by manipulating the money market and/or the rate of interest run into serious complications in addition to other difficulties suggested by economists in recent decades.

Accuracy of Estimates and Reaction to Surveys

Our interview findings offer some insight into factors involved in changes in investment plans and reasons for discrepancies between anticipated capital expenditures reported to surveying organizations and the expenditures actually incurred. Survey respondents tended to list only those expenditures definitely planned. This occasions a serious underestimate when the period under consideration is near the planning horizon. The underestimate is probably accentuated by the sharp distinction made by many firms between "planned" and "approved" expenditures; the horizon of the latter is of course very near and many firms insist that no formal plans (such as might be utilized by reporting controllers) contain other than approved expenditures. However, our interviews indicate as well certain tendencies to overestimate expenditures. They may stem from the in-

[63]See our discussion, section 1, above, of the fallacy of composition which may be involved in interpreting interview comments on accelerated depreciation. It might also be pointed out that accelerated depreciation privileges are likely to bulk much larger in business minds in periods of high profits and high taxes than during the depths of a depression, when profits and profits taxes tend to be nil. Cf. Robert Eisner, "Accelerated Depreciation: Some Further Thoughts," *Quarterly Journal of Economics*, May 1955, pp. 285–296, the various works cited therein, and Evsey D. Domar, "A Rejoinder," *ibid.*, pp. 299–304.

centive of operating people to make high cost estimates in order to avoid having to justify requests for supplementary appropriations because original grants prove inadequate. Tendencies to overestimate expenditures may result also from the peculiar personal position of the respondent. For the person furnishing "the firm's" anticipations is frequently the controller, for whom capital expenditure estimates are merely part of cash forecasts or cash budgets in which he is under some pressure to be "conservative." To be conservative in this context means to underestimate receipts and to overestimate expenditures.

Conclusion

Finally, we must caution again that the positive ideas suggested in this paper are tentative. They are offered for scrutiny, pondering, and possible verification, not merely by others employing interview techniques but also by the body of economists studying capital formation with whatever tools may be at their command. The one definite conclusion that this writer can make is the essentially negative one that the interview technique cannot by its nature be definitive in an area of this kind. It can suggest ideas and theories and offer new insights into relationships uncertainly grasped. But explanation and prediction of economic variables must finally receive confirmation in the operation of those variables themselves and not in the subjective explanations of those who presume to control them.

COMMENT

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Robert Eisner has performed a service in bringing together some of the scattered material which has been accumulating on investment decisions in addition to his own findings. Further, he has helped us by pointing out some of the problems in this area of investigation:

1. Actions important to individuals may cancel out in the aggregate, and things reported by only a few may be the major factors either because they do not cancel out or because they affect large decisions.

2. One cannot accept at face value respondents' descriptions or explanations of what they do without further examination.

3. The nature of responses may well depend on just who in the firm fills out the questionnaire and whether he knows what the questions mean.

4. Rules of thumb may be varied as circumstances demand. This would mean that they are not rigid responses to situations but sensible methods of simplifying decision-making and deciding when it is necessary to make new decisions. It would also mean that the rules are less important than the deviations from them.

All these points are true and important. There are, however, certain inconsistencies between the factual data Eisner reports and some of his conclusions:

1. He concludes that accelerated amortization has a substantial effect on investment decisions, presumably because one person he interviewed so reported, because others listed it among "factors considered," and because the McGraw-Hill survey results gave this impression. As a general matter most people will say that in making their decisions they considered almost any factor you mention. If the factor is something pleasant, such as tax reduction most of them will say they'll work harder, or invest more, or not move South.

2. He seems to conclude that the interest rate may still be important in the face of a substantial number of specific statements to the contrary. For example one individual in discussing 2¾ per cent versus 4 per cent says he would have borrowed and invested anyway. As a general matter, it's always easier to say you take account of something than that you do not. This should not be taken to mean that I don't believe that financing is important. I don't know. It's quite possible that capital rationing is important and that it depends on the attitudes of bankers who refuse or accept applications for loans. Here again the problem is basically attitudinal, except that in this case it is the attitudes of the bankers which are significant. It is probable that in some situations even capital rationing will not deter the investor. Two manufacturers were interviewed in our Michigan study who had actually borrowed from personal loan companies to finance inventories!

3. He concludes that businessmen are "essentially rational," while feeling "perplexed and exasperated" at their "offensive" formulas; yet rationality is nowhere defined, and there is even a hint that conclusions about rationality may depend on our "assumptions." If this means that it depends on our definition of rationality, I should agree; but what we need is not a definition of rationality, or a determination of whether people are rational or not. We

need an analysis of the motivational processes of executives and of the decision-making process in the firm. Eisner also makes a distinction between attitudinal and factual variables, without noting that insofar as we are interested in people's decisions, it is not facts but their knowledge and interpretation of the facts and the way they organize them to make decisions that count.

4. Most striking of all is the complete omission from the author's conclusions of the possibility that an actual or expected *decline* in sales and profits can be the force which induces decisions to invest.

I should like to add some general comments. I am forced to conclude that as economists we are finding it quite difficult to approach investment decisions without a considerable handicap arising from our previous theorizing with its simplified concepts and crude ideas about motivation. A more general and systematic search for what motivates businessmen and how decisions are made would seem to be far more rewarding than attempts to check hypotheses which are too specific and at the same time too vague. As I shall explain below, this does not mean that we should operate without theory. It means that our theories should be more complex. The process of research consists in developing and testing the specific operational hypotheses derived from these theories. It is important to realize that failure to prove a specific hypothesis may mean that the methods were inadequate (questions not understood, etc.) or that the specific hypothesis was too simple or wrong, or that the basic theory was wrong or too simple. Many investigators feel that the theory of profit maximization is too simple and needs to be replaced by a more general theory of motivation. We also need to be able to explain *changes* in motives and how different motives lead to different actions.

If we are going to take a broader appraoch, I submit that we must choose one of two methods. Either we must do case studies so intensively as to allow us to develop new and better specific hypotheses or we must interview a representative sample of businessmen and use methods that allow quantification and intercorrelations. Of course the second method is essential if the hypotheses developed in the first are to be tested.

In case study investigations, we must concentrate on specific recent decisions or specific decisions in the process of being made rather than ask people what they "generally do," or whether they take account of each of a suggested list of items. What a man says he generally does is very seldom what he reports doing in specific

situations. Since a man cannot be motivated by facts he does not have, a study of all the memos and documents that he reads would be useful. Even more useful would be actual observation of basic policy meetings, particularly if it was not clear who in the firm was making the decisions. Also, as we pointed out in our monograph *Industrial Mobility in Michigan*,[1] it is dangerous to ask whether each of a series of factors is important in making a decision. Almost everything is checked as important. There are several different ways in which this may be true for each factor: some are a minimum requirement generally present (availability, etc.), some are precipitating factors which really determine only the exact timing, others are basic variables which are crucially important.

Furthermore the interviewing itself is extremely important. It is my conviction that interviewers who have too many specific hypotheses in mind cannot do an unbiased job and that what is needed is that economists design the study and people trained in nondirective interviewing obtain the answers. It is all too easy, as I know from personal experience, to ask additional questions which suggest the "right" answer to the respondent while seeming merely to clear up what he meant.

All these things are also important in an interview study with a representative sample of firms. In addition the sampling and the content analysis (quantification) need to be carefully done. There is a difference in the kinds of conclusions which can be drawn from sample surveys based on probability samples, as our Michigan study was, and those based on a small fractional response to a mail questionnaire or on case studies of a particular type of business or in a particular locality. Since there are so many small firms which are not important in the aggregate, it is not sensible to take a representative sample of firms, but it is easy to take a sample where the probability of selection is proportional to the employment of the plant, as in the Michigan study. This includes the giant firms but is also representative of the small ones, and the results are stated in the form: "Manufacturers representing x per cent of the employment report.... "

The quantification possible in a sample survey allows us to avoid emphasizing fascinating but isolated revelations of particular moti-

[1] *Industrial Mobility in Michigan: A Sample Survey of Michigan Manufacturers*, Survey Research Center, University of Michigan, 1950 (see also George Katona, *Psychological Analysis of Economic Behavior*, McGraw-Hill, 1951, pp. 318–319 and George Katona and James Morgan, "The Quantitative Study of Factors Affecting Business Decisions," *Quarterly Journal of Economics*, February 1952, pp. 67–90).

vations or attitudes. More important it allows us to get at decision-making and motivation not only by what people say but by complex interrelationships between expressed opinions, recalled facts, accounting data, actual decisions, and satisfaction with decisions. Correlations between reported conditions, expectations, attitudes, and available information on the one hand, and subsequent or planned investment decisions on the other, can show what factors are related to actual decisions. Most of the investigations that have been made of investment decisions seem to me to fall between the two chairs since they are neither intensive detailed case studies of specific investment decisions nor properly quantified and analyzed studies of representative samples.

I should like to register my dissent also against the search for answers to questions like: "Which concept of capital cost is relevant to the businessman?" The proper question is what motivates the businessman and how his motives change, not how he defines his terms. To take an example from another area, the fact that most consumers when talking about "saving" mean putting money in the bank tells us almost nothing about how they would regard the purchase of a house, or even whether it is saving thus defined which they are trying to increase, maximize, or hold steady. To return to the businessman, how do we know he wants to minimize capital cost or to maximize net return over cost?

Allied to this are the misleading results that can follow from paying attention to formal aspects of capital budgeting, administrative approval, etc. This may help us to locate the decision-makers in large firms but it tells us very little about the factors which affect their decisions. It is not the rules that are important but the frequency with which, and the conditions under which, they are broken.

Finally I should say that Eisner's conclusion that "the interview technique cannot by its nature be definitive in an area of this kind" is far too negative.[2] Properly used, interviews can explore hypotheses which are capable of testing. Interviews with representative samples of firms can test these hypotheses and arrive at conclusions about factors affecting investment decisions. It is true, of course, that some theories are so stated as to be untestable. Other theories however can be translated into hypotheses which can be tested.

[2]Milton Friedman has likewise scorned what he terms "the belief that a theory can be tested by asking questions of consumers, producers, and the like." *Survey of Contemporary Economics*, B. F. Haley, editor, Irwin, 1952, p. 457.

These hypotheses must then be built into the design of a study and into the framing of meaningful questions. The replies to these questions and their intercorrelations with one another and with accounting and economic facts can lead to conclusions about the theory. As in any research, although the conclusions are capable of only limited generalization and are subject to further testing under different conditions, e. g. depression, they are nonetheless definitive in the sense that any social science research can be so labeled.

Carefully done, such research is more efficient, and its statistical inferences are far more direct, than they are with other research methods. Studies of aggregate investment must rely on cruder sorts of inference than those which study investment by individual firms or plants, and the latter must rely on less direct inferences than interview studies which have not only the statistical and accounting facts for individual firms but also reports of the extent to which they were known and used, the expressed motives and perceptions of those who made the decisions, etc. Whether cruder inferences depending on time series but extending over several years are more capable of generalization than studies more narrowly constricted in time but based on close examination of individuals' knowledge, perceptions, motivations, etc. is a matter for debate. The fact is, however, that in both cases we are inferring something about why people make decisions the way they do.

What is needed in such an investigation is not only a good method, but a broad-gauged approach that starts out with an operational research theory, not just with narrow and specific hypotheses. Such a general theory might state only that the businessman has certain goals (needs) and that he will see certain paths to achieving them. The needs may be oriented to the company, the person, some group in society, etc. The possible paths to achieving these goals are not relevant to decisions unless the businessman knows of their existence and feels they are acceptable (legally, socially, emotionally) and effective. He will be influenced by his own and his friends' past experiences. Subsidiary hypotheses, also of a general nature, might state that since one goal is sure to be freedom from constant strain and thinking, decisions involving genuine rethinking and effort will be limited to situations where following routine rules threatens to lead to intolerable results. Finally we might add that institutional and other constraints, e. g. availability of necessary capital equipment, may also play a part in the final outcome. Even

if we cannot test these theories in their full complexity, we may be able to find generalizations about behavior—functional relations—that work most of the time. There will always be problems in specifying the particular variables that fit into this theoretical scheme and are relevant in actual circumstances, and there will always be problems in measuring them. But there is no reason to believe that a research program in this area cannot ultimately tell us a great deal about what determines investment decisions under different conditions.

CHARLES B. REEDER AND WALTER E. HOADLEY, JR.,
Armstrong Cork Company

Robert Eisner's detailed analysis of investment decisions in fifteen manufacturing corporations succeeds in capturing much of the flavor of the capital formation process—perhaps as much as can be expected by use of the survey technique. His work, furthermore, represents real progress in bringing closer together the theory of capital formation and actual business practice, which will be hailed particularly by business economists who almost daily are in a position to observe discrepancies between the two.

There are two points in Eisner's paper, however, which warrant further analysis. The first has to do with the inherent limitations of the questionnaire or interview approach as a means of studying this particular problem. Eisner is aware of these limitations as he points out that "it is quite possible that the individual businessman does not really know, in any sense satisfactory to the economist, what determines his investment decisions. We may add that if he did know he might not tell." In addition to these qualifications by the author, it should be noted that assuming the businessman *does* know what determines his investment decisions and that he *would* speak frankly, what he might report as being of paramount significance *today* very likely would be entirely different from what he might report at some later date. In other words it is doubtful whether the investment *process* can be fully understood or properly analyzed solely in terms of some specific point in time.

As one observes the investment process over an extended period of time, the dynamic "process" aspect becomes more and more important. The many diverse influences which underlie any given decision to spend capital are constantly shifting in relative importance with the passage of time and rarely found to be precisely the same at any two periods.

A reversal in general business, technological developments within the industry, or even a change in management personnel, each could bring about a marked shift in the nature of the fundamental determinants of specific investment decisions and almost certainly would invalidate generalizations based on other conditions. Profit maximization is, of course, the primary motivation of any investment decision, but over time there commonly will be differing emphasis upon short-term versus long-term considerations and even in the measure of profit employed (e.g. return on sales versus return on capital; pretax versus aftertax). In time of boom, capacity considerations typically are uppermost in the minds of most business executives and expansion to keep up with demand would undoubtedly predominate as the reason for capital outlays. In periods of slack demand and intense competition for sales, however, capital expenditures are more likely to be dictated by the need for lower costs and for new or improved products than for added capacity. Thus, generalizations about the importance of specific determinants of investment expenditures within a firm *must be* related to a given economic, psychological, and political environment. Therefore, no analysis of the determinants of investment can be complete unless it is a continuing one, extending at least over the course of a "business cycle," and probably through the various growth phases of an individual firm as well.

A second comment on Eisner's paper involves the misdirected emphasis given by him to "the competitive situation" as a determinant of investment.[1] Much of the seeming general confusion surrounding the capital expenditure process as observed by persons outside of industry can be resolved by fuller knowledge and appreciation of the extent to which competitive pressures actually dominate executive action within individual companies. "Competitive pressures," as used here, mean chiefly the ever-present intense desire to maintain or increase "industry position," i.e. the sales and profits of a given firm relative to those of all other firms in the industry, but this concept also includes the strong motivation to take action to meet new developments of almost any sort of competition.

[1]In subsequent correspondence, Eisner states that he regards the competitive situation as "the framework in which economic factors such as changes in demand and opportunities for cost saving operate." This concept, it appears to us, is so broad as to obscure and oversimplify the importance of the multitude of competitive forces in *individual markets* which influences significantly the investment decisions of individual firms.

The importance of competitive pressures can be clearly seen in the many instances where executive requests of boards of directors for capital investment are justified *solely* in terms of meeting urgent competitive conditions. For example when approval is sought for capital primarily to expand capacity, the supporting reasoning typically will be that the expenditure (1) will permit the company to capture an increasing share of a profitable market, (2) is necessary to maintain the company's percentage position in the industry, or (3) will enable the company to offset expected competitive inroads or to regain a loss of market position. These are all essentially the same reason, differing only in the company's position in relation to competitors. If the requested capital is principally for cost-reducing equipment, the argument may be that (1) improved operating margins are necessary to protect profits against possible competitive price-cutting, or (2) the anticipated improvement in return on capital employed is needed to strengthen the company's general financial position and dividend policy and hence to insure a good competitive position in the capital markets.

Thus in one sense the common focus for almost all capital decisions which Eisner seeks is to be found in competitive pressures in one form or another. Some assumption as to the expected share of the market, i.e. the root of competitive pressure, must accompany an estimate of *future demand*, which Eisner says is "certainly the most often cited determinant of the volume of capital expenditures." And improved profitability, with all of its competitive implications, is never far from the center of the stage when capital outlays are being considered.

Analysis oriented largely toward competitive influences obviously poses some difficult problems in estimating or appraising the aggregate volume of investment; nevertheless competition in many forms is of such outstanding importance in day-to-day business investment decisions that it would appear to warrant fuller treatment than it is accorded in Eisner's paper.

These two general comments should not be allowed to obscure Eisner's contribution to the field of "applied economic analysis." To those of us whose function it is to interpret to business managements the "applied" or "practical" meaning of economic theory, efforts such as his are of benefit.

MICHAEL GORT, National Bureau of Economic Research

Robert Eisner, in his interesting and useful study, has succeeded admirably in isolating a number of conclusions that appear with

some consistency in the several studies of investment decisions he discusses. Of course it cannot be said that we now have a firm foundation for the study of this class of business decisions. As was to be expected, a number of divergent findings were uncovered in the various reports. Yet it is probably true that future research can at least now progress beyond the initial exploratory stage. Eisner's report on his own interviews is also interesting. I should like, however, to comment first on one or two methodological issues raised by the study.

The sample of companies which Eisner used for his study, fifteen in number, was relatively small especially because the companies were drawn from six diverse industries. The degree to which reliable conclusions can be drawn from this sample depends in inverse proportion on the extent of differences in investment behavior patterns to be found among the various companies. A few comments from the author on this question and, particularly, on the extent to which any differences can be attributed to the structures of the industries from which the companies were selected, would be welcome.

Eisner chose the relatively "unstructured" interview as his investigation procedure. While I feel that this choice of method was correct, some discussion on this point is probably pertinent. In addition to the relatively "unstructured" interview, two other methods have been used in previous surveys on subjects related to business decisions. First, and most extensively, there has been the use of the mailed questionnaire. The most important advantage of this technique is that it offers an inexpensive way of encompassing a large number of respondents. It is more suitable, however, when the questions asked are few in number and relate to readily determinable issues of fact. Its most serious limitation is that it offers no means whereby carefully considered replies can be distinguished from casual speculations or mere guesses. Moreover, replies to questions concerning complex problems of business policy are frequently highly misleading in the absence of detailed information. The reliability of questionnaire results is reduced further by the very limited control that can be exercised over securing answers from those actually responsible for particular decisions.

As distinct from the mailed questionnaire, some investigators have employed a highly "structured" interview procedure in which an attempt is made to secure from every respondent answers to each one of a uniform list of questions. Like the mailed questionnaire

this approach has the advantage that results can readily be quantified and that questions of a "suggestive" nature are more easily avoided. But like the questionnaire, also, it suffers from serious infirmities. These arise from the fact that answers based on reliable information are given equal weight with mere guesses and that the requirement to secure a reply to each question drastically limits the amount of time available for more detailed exploration of individual questions.

Interviews were, of course, used in psychology long before they were used in economics for the study of business decisions. It is understandable, therefore, that the methods appropriate for the former might tend to be duplicated for the latter. Some reflection, however, will reveal fundamental differences between the scientific problems of attitude testing and those of ascertaining the determinants of businees behavior. The most important is that decisions in corporate enterprise are not frequently made through sudden flashes of inspiration or through merely general attitudes which offer answers to specific business problems. An investment decision, for example, may entail negotiations, discussion, and exchange of technical memoranda, extending over many months, with some sixty or seventy officials involved in the process. It is unreasonable, therefore, to suppose that any one official will have answers to all of the questions an economist may wish to ask. It is equally unreasonable to conclude that the initial response of the businessman to a complex question will adequately represent what he would do when faced with a problem he has had time to consider. I feel sure that for the study of business decisions through surveys, the dangers associated with "suggestive" questions have been considerably exaggerated when compared with the risks of misleading results that stem from inadequate detail. It is also true that, to an important degree, rigid adherence to a particular schedule of questions introduces the interviewer's bias in that it restricts the exploration of factors which may be of far greater relevance than those incorporated in the questions that are asked.

In commenting on Eisner's findings, I should like to raise a semantic issue. At several points in his discussion, Eisner develops an interesting account of the flexibility which businessmen attempt to introduce into investment decisions by abstaining from making firm commitments until such time as final decisions become necessary. Yet, at another point in the discussion, the following sentence appears. "The firms interviewed appear to have a relatively high discount for risk and uncertainty when they make

capital expenditures commitments which can be justified by developments in the as yet unknown future." Postponement of decisions in an uncertain world reflects, it would seem, a desire for flexibility rather than the process of risk discounting. An ability to discount for risk and uncertainty implies that business decisions are based on certainty equivalents and that, therefore, there exists, no need for flexibility. It seems doubtful, in the light of the evidence presented, that the author wished to convey this meaning.

One interesting finding of Eisner's is that "...investment for purposes of expansion... is apparently based on compelling major movements in demand rather than the relatively small, even if sharp, changes which occur in short periods." This suggests, on the surface, a conclusion that is at variance with the findings of earlier studies reported by the author in which substantial changes in investment plans in response to temporary downturns in demand were observed. Most of the difficulty lies, however, in the ambiguity of the term "short period." Some distinction might nonetheless be made between two aspects of expansion decisions. The first is concerned with the interval of time over which the new capacity will be used—in this connection it would doubtless be true, as the author suggests, that an expansion of capacity would not likely be contemplated unless a major long-term movement in demand were expected. On the other hand another question is concerned with the time of installation of the added capacity. Here a considerable degree of flexibility probably exists with respect to delaying or accelerating the construction of new capacity.

In the initial section of his study, Eisner makes an important substantive comment in conjunction with a methodological issue. He draws attention to the hazards of inferences about aggregative behavior from the experiences of individual firms. Thus he cites the example of positive and negative changes in sales being offset in the aggregate, while interest rates remain the sole source of aggregative change. Eisner concludes that the "debunkers" of the rate of interest as a factor explaining fluctuations in investment have not proved their conclusions on the basis of their evidence. Without disagreeing with the author, the hazard of drawing inferences from aggregative phenomena, notwithstanding conflicting evidence suggested by the experience of individual firms, is at least as great as the opposite danger. Positive changes in sales may be offset by negative ones but a shift in sales may also occur from firms with high to those with low capital-to-output ratios. Thus the conclusion that interest rates are more important than

changes in sales, in the hypothetical case, might well be unwarranted. Moreover the evidence which the "debunkers" of the rate of interest offer, to the extent that it is correct, shows that interest rates, alone, cannot explain a *major* fluctuation in the rate of investment except as they affect other factors relevant to investment decisions such as expenditures on consumers' durable goods, residential construction, etc.

Reply by Mr. Eisner

I have already taken the liberty of incorporating in the body of my paper various ideas suggested in the comments, particularly these expressed by Charles B. Reeder and Walter E. Hoadley and by Morgan, when an earlier draft of this paper was presented to the Conference. Our points of difference should certainly not be construed as implying my failure to appreciate the constructive value of the discussion.

More or less close to the surface in both the Reeder and Hoadley comment and that of Morgan, I suspect, is an appeal for greater descriptive realism in our theory of the determinants of capital expenditures. Reeder and Hoadley point to the relevance of different factors at different dates and to the "multitude of competitive forces in *individual markets*...." One gathers that for the business firm—and probably for the business economist—decisions are couched over and over in terms of responses to the competitive situation. An economic analysis, Reeder and Hoadley seem to imply, should be presented in similar terms. Morgan, while disclaiming any desire to reject "theory," asks for "a more general and systematic search for what motivates businessmen," objects to "hypotheses which are too specific," and argues that "our theories should be more complex."

It is with some hesitation that I would do battle with the views thus suggested, for they contain at least half-truths of painful relevance in this troublesome area of research. But "more complex theories," if on occasion inevitable, are hardly a *desideratum*. Our quest in the theory of capital expenditures, in business behavior generally, and indeed in economics and all science, must be for simple, clearly defined axioms, and theorems from which one can hope to deduce "predictions" of specified phenomena. It would be foolhardy to insist that current economic theory always "works," that it is in a form where data can readily be acquired enabling us to predict with a high degree of confidence the timing of the next phase of the business cycle, or to be sure of the kinds of public policy which would raise the level of capital expenditures. But

would our problem be nearer of solution if we played down assumptions of profit maximization and a whole host of associated variables and relationships such as the acceleration principle, the cost and availability of capital, and the discounted present value of new plant and equipment?

Faced with an apparently infinite variety and complexity of human behavior, is the economic analyst to be content with noting that people behave differently on different dates, that each decision requires for its explanation a description of "the multitude of competitive forces in *individual markets* which influence significantly the investment decisions of *individual firms*" (Reeder and Hoadley)? Is he at the outset to abandon various simplifying assumptions of economics (among which the most basic is that economics per se offers a fruitful abstraction for social scientists) and substitute "a broad-gauged approach" which sees the businessmen constrained "legally, socially, and emotionally" in the pursuit of "certain goals (needs)" which the analyst dare not define a priori (Morgan)?

My differences with Morgan, I may perhaps conjecture, stem from his emphasis on "what motivates businessmen" per se and my primary concern with the economic consequences of their actions. The assumption of certain axioms about motivation may prove useful in the development of theorems or propositions which, given adequate data, make satisfactory economic predictions, particularly at an aggregative level. But I would grant quickly that such axioms may prove quite inadequate to a psychologist trying to explain or predict the class of phenomenon with which he is concerned. For him the businessman must remain a complex individual possessed of a great variety of goals, drives, compulsions, and fears. For the psychologist's purpose, understanding might be substantially hindered by assumptions which at the outset rule out most of the behavior he is interested in explaining. The economist's persistence in working with narrow "specific hypotheses" of an exclusively economic nature should imply no judgement that the subjects of his study are in fact motivated along the narrow lines which he assumes. He persists in his specific hypotheses and assumptions not until a "broad-gauged" investigation shows them to abstract from a major part of reality but until he loses confidence in his ability to use them in making economic predictions.[1]

[1]One may recall profitably Milton Friedman's discussion of the roles of the axioms and theorems and "assumptions" and "implications" (*Essays in Positive Economics*, Chicago University Press, 1953, especially pp.

In view of the above I would be particularly unenthusiastic about the "nondirective interviewing" for which Morgan calls. I am *not* concerned that the economist-interviewer will blind himself to many of the psychologically interesting complexities of business behavior. I *am* concerned that the noneconomist (noneconomic-theorist) would fail to probe for the kind of information which could appropriately be used in testing, enriching, guiding, and reformulating economic theory. The economist may, of course, inadvertently suggest the "right" answer to his respondent. But the noneconomist trained in nondirective interviewing may never secure the answers which enable us to translate the language of the businessman into the relations of economics.[2]

It would seem to me that economists who ask businessmen questions promise to be most useful if they are prepared to translate the responses, concepts, and very thought processes of businessmen into the relations and systems found fruitful in *economic* analysis. Of course the businessman thinks frequently in terms of meeting competition and has various rules of behavior for the multitude of individual competitive situations in which he may find himself. But

23–30). We may say that theorems offer predictions about reality and may be rejected on the basis of criteria related to the accuracy of their predictions. Axioms would be rejected not because they, themselves, may be palpably inaccurate but because the theorems derived from them prove unsatisfactory. But the axioms of economic theory (assumptions of profit maximization, for example) appear as theorems to the psychologist. Satisfactory to the economist (who might predict that employers will offer trade unions no *more* and very probably less than they demand), they may prove absurd to the psychologist (who might argue that the *theorem* that employers maximize profit is quite inadequate in predicting how any particular employer will treat the old employee who has been with the firm for fifty years).

[2] I am sure that Morgan would go to no such extreme as the German historical school. Morgan does not reject theory and he would have "economists design the study." But his appeal for nondirective interviewing brings to mind the indictment by Eli Heckscher of "the school headed by Gustav Schmoller [which]... wanted to throw overboard the theoretical study of economics which had dominated the field for at least a century before, wanting to substitute for it a collection of facts from different ages, studied without any preconceived ideas as to what was to be learnt from them." Heckscher declares further: "It is necessary not to stop at a so-called fact which is meaningless in itself; what explanation it really points to must be investigated, and often it will be found out that the sources will yield all the knowledge wanted, if only properly questioned. It is the lack of that questioning which is most usually at the bottom of the difficulty. Without the aid of economic theory, economic historians usually lack what is called the heuristic principle, *das heuristische Prinzip.*" "A Plea for Theory in Economic History," *Economic Journal*, Economic History Supplement 4, January 1929, pp. 525–534, as reprinted in *Enterprise and Secular Change*, Irwin, 1953, pp. 421 and 429.

is it not the function of the economist to cut through the apparent variety and find the central principles, which, whether or not evident to the businessman, guide, explain, or enable us to predict his conduct? If each businessman tells us that he is interested only in keeping up with his competitor and maintaining his own "share of the market" (*and* expanding his share where possible!), may we read into this an implication that in periods of near capacity output an increase in demand is likely to call forth capital expenditures? Should we then not look for ways of testing our *economically* relevant hypothesis, which is not merely that businessmen respond to "competition" but that their attitudes and rules are such that the acceleration principle may be expected to manifest itself in a high-output, increasing demand situation?[3] And should the various business situations not be subdivided in accordance with the different sets of economic implications which flow from them rather than in accordance with the differences in their appearance to businessmen?

The economist, I should insist, must approach businessmen with certain clear economic hypotheses to which he would like to relate business behavior. Our purpose was not to secure a motion picture (undirected and uncut, at that) of the details of business operation. Nor was it to get a set of frequency distributions of unweighted responses to questions which are irrelevant to economic analysis or, if relevant, unlikely to be understood. Intending no slight to those who use public opinion polls for appropriate purposes, I must (with Friedman, I admit) reiterate my distrust of those who would resolve questions of economic theory by ballots. Would a study really be better off if we could say that 61 per cent of a probability sample of firms in the rubber industry (expressed as a percentage of industry sales) said they would not cut investment in the event of a decline in sales (or would invest more, as Morgan implies is likely)? Such a report would seem to go with, and indeed might well require, identical questions to all respondents—sterotyped formal questions of the sort which at least some of the comments indicate are undesirable.[4] I might add that many of my respondents expressed

[3]The function of interviewing should of course not be directed merely to efforts to support or reject unalterable hypotheses. As indicated above, the interviewing may well suggest modifications and reformulations of hypotheses. Thus for example interview data may suggest that one may expect substantial and variable lags from changes in sales to capital expenditures in seeking statistical confirmation of the acceleration principle. They might even indicate the specific lags for which to look in various industries in various situations.

[4]I find myself in quite general sympathy with the methodological comments on various of these matters offered by Gort.

considerable disdain for questions of this sort, which are posed to them by various of the surveys in the field of capital expenditures.

In regard to some of the more detailed specific comments:

1. The Reeder and Hoadley argument that different variables prove relevant at different periods of time (or that parameters change) is, of course, important. Some cognizance of it is taken in various parts of my paper. But again, even here we must bear in mind the methodological imperative to strive for simple hypotheses. The complexity of a relation which is unstable or variable over time is analytically costly and not to be lightly or unnecessarily introduced.

2. I would continue to defend the substantive point that accelerated amortization has encouraged capital expenditures in certain *individual firms*. Balancing Morgan's well-taken observations on the trap of being fooled by the readiness of businessmen to respond in a fashion which seems favorable to questions about "good" things, such as tax reductions, is a widespread tendency for businessmen to proclaim loudly that business behavior should not be biased by tax considerations. The evidence in support of the importance of accelerated amortization was probably given more credence because it makes sense in terms of an analytical model. It should be clear that this does not imply that accelerated amortization or accelerated depreciation necessarily raises the level of investment for the economy as a whole (on which I have written elsewhere).[5]

3. Both the issue of depreciation mentioned above and the interest rate problem, to which Morgan and Gort devote some attention, may be used to demonstrate what I mean by my insistence that the interview technique cannot be "definitive." For here I would certainly stand clearly with Friedman in arguing that the test of our hypotheses must be correspondence between reality, as indicated for example by the accounting data for which Morgan wisely calls (and which I have also collected but have not as yet utilized at all adequately), and the predictions of our hypotheses.

4. I certainly have not found impressive evidence that a decline in sales would bring forth investment as Morgan suggests. I should

[5]Robert Eisner, "Depreciation under the New Tax Law," *Harvard Business Review*, January-February 1955, and "Accelerated Depreciation: Some Further Thoughts," *Quarterly Journal of Economics*, May 1955; also "Changes in Methods of Depreciation and Their Effects," in *Federal Tax Policy for Economic Growth and Stability*, submitted to the Subcommittee on Tax Policy, Joint Committee on the Economic Report, 1955, pp. 515–527.

rather wonder whether some of the supporting data he discovered on this point did not reflect in part a rather false front of "patriotic" optimism of respondents who would not admit that our "great economy" could have a "depression" that would get them down. I wonder too whether it might not reflect a tendency to postpone less urgent capital expenditures not immediately necessary to meet demand to periods when pressure for output was less severe. If this were so, it might mean that certain types of capital expenditures would increase as sales declined for the very reason that other types of expenditures which had been exhausting the economy's capacity for investment had declined. This should not be expected to lead to an increase in the total expenditure of many individual firms in the face of declining sales.[6] It should certainly not be expected to lead to an increase in the aggregate of the economy's capital expenditures. Here again, however, I believe the issue should be resolved by neither Morgan's nor my interview findings, but by appropriate economic data.

5. I should admit, on reflection of Gort's point in regard to uncertainty, that the "relatively high discount" is likely to be a minor factor in inhibiting commitments for capital expenditures. The high rate of discount would serve to lower the present value of expected returns from a commitment (or more relevantly, the excess of the present value of a commitment now over its discounted expected value later), which would have to exceed its cost, including the planning necessary to decide which commitment to make. But I believe Gort is wise in focusing on the desire for flexibility as the effect of uncertainty most pertinent to the inhibition of capital expenditure commitments. To this one might relate the cost (including managerial effort) of maintaining *flexible* plans, which may be such that the flexibility required by uncertainty may inhibit not only "commitments" but the formulation of plans.

[6] There is certain evidence in the findings of Jean Bronfenbrenner Crockett, working with Department of Commerce–Securities Exchange Commission capital expenditures data, of investment in excess of plans by firms whose sales declined when those of the rest of the industry increased. This may be interpreted as confirming Morgan's argument. It may, however, mean rather that industry sales trends are taken as a better indicator of the company's future demand than the current fluctuation in its own sales.