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AUTHOR Hotchkiss, Lawrence; And Others
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ABSTRACT

Five theoretical perspectives related to occupational choice were assessed. These were (1) Super's career development perspective, (2) Holland's typology of occupational choice, (3) status-attainment research in the field of sociology, (4) economic theory of individual willingness to work in different occupations, and (5) a model of decision making drawn from psychology. Although Super's work is highly eclectic, some of his key hypotheses lack strong empirical support. While national samples suggest that Holland's basic hypothesis regarding matches between personality and job type have merit, many of his secondary hypotheses remain weak. Status-attainment research is largely supported by data. However, its theoretical and conceptual bases are too simplified to render a realistic picture of the process of occupational choice. Economic theory contributed important hypotheses neglected in other writings done to test these theories. Application of decision theory to occupational choice is the least thoroughly studied perspective on career choice. Because key concepts relating to the process of occupational choice are not clearly defined and because statistical procedures have not been used in research on career choice, a comprehensive theory resulting from the integration of these five perspectives is not close at hand. (MN)

THEORIES OF OCCUPATIONAL CHOICE: A CRITICAL ASSESSMENT OF SELECTED VIEWPOINTS

Lawrence Hotchkiss
Michael S. Black
Robert E. Campbell
Gonzalo Garcia Jr.

The National Center for Research
in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio 43210

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FOREWORD

This volume reports an intensive review of alternative theories of occupational and career choice. The work summarizes and presents critical assessments of selected theories. The primary audience for this work is composed of scholars specializing in study of occupational and career choice, reflecting the National Center's continuing commitment to advancing basic knowledge of topics related to vocational education. The results of the study also offer general implications for counseling practice. These are summarized briefly in the "Nontechnical Summary."

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Robert E. Taylor
Executive Director
The National Center for Research
in Vocational Education

NONTECHNICAL SUMMARY

This volume begins with a broad overview of several theoretical perspectives related to occupational choices. From this overview, five perspectives are selected for thorough analysis in the remainder of the volume. The five selected perspectives are: (a) Super's career-development perspective, (b) Holland's typology of occupational choice, (c) status-attainment research in the field of sociology, (d) economic theory of individuals' willingness to work in different occupations, and (e) a model of decision making drawn from psychology. Consideration of these five viewpoints juxtaposes a wider variety of orientations to career choice than previously has been assembled into a single volume.

Three important ideas stand out in Super's writings. Most important, perhaps, is the notion that occupational and related choices occur gradually in a complicated process that occurs over an extended time. This idea contrasts markedly with earlier static ideas of matching men and jobs and, in some measure, varies from other contemporary theories. The second important idea in Super's writings is the hypothesis that self concept plays an important role in occupational choice. According to the theory, occupational choice is the process of "implementing" one's self concept. That is, people tend to choose jobs that are consistent with their self images. Finally, Super emphasizes the concept of vocational maturity. In broad terms, vocational maturity includes vocational satisfaction and success.

Super's work is highly eclectic and, as such, provides a valuable perspective from which to view occupational choice. Empirical support of key hypotheses is not strong however. In part, the reason for lack of strong empirical support is the absence of precisely defined concepts. Key ideas such as vocational maturity and self concept remain ambiguous despite recent efforts to develop measuring devices.

Holland's theory centers around a six-category typology. The distinctive feature of the typology is that the same categories are used to classify personality and occupations, thus generating a natural hypothesis that people match their personality type to the occupational type. Numerous variations on this theme are proposed. The most imaginative elaborations stem from a hexagonal arrangement of the six types in a manner that describes degree of similarity among the types. A secondary hypothesis is thereby generated stating that people whose jobs and personality types do not match are likely to be in occupations whose type is most similar to their personality type. Numerous other hypotheses derive from the hexagonal pattern.

A large quantity of empirical work is associated with Holland's theory. The bulk of this work does not show very

convincing support of the theory beacause it is based on specialized samples and relies on awkward analysis methods. Further, multivariate methods are seldom, if ever, applied in order to study cause-and-effect relations in complex natural systems. On the other hand, in recent years some results based on national samples have been reported that suggest Holland's basic hypothesis regarding matches between personality type and job type may have some merit. Empirical support of many of the secondary hypotheses derived from the hexagonal arrangement remains weak, however.

In order to classify individuals or occupations into one of Holland's six types, profiles along six dimensions corresponding to the six types are generated. The value of using the categorical variable defined by the typology rather than the six profile scores is not clear; much information is discarded when the profiles are converted to Holland types. Many of Holland's theoretical hypotheses could easily be translated to apply to profiles.

Status-attainment research originated with the study of social mobility in sociology. Typical mobility research depended on broad classification of occupations into status levels. Cross classifications of father's and son's occupation using the broad status categories shows moderate degree of correspondence between father's and son's occupational status. Status-attainment research depends on two innovations. First, detailed procedures were developed to assign a number measuring occupational status to each occupation. Occupational status scales facilitated the second important innovation--use of path analysis. Path analysis is a statistical methodology (based on regression analysis) designed to study cause-and-effect relations in the absence of experiments.

Current status-attainment research applies path analysis to uncover the reasons why the statuses of father's and son's occupation are related. Findings suggest that parental attitudes and perceptions of peers comprise an important part of the explanation. Parents at different occupational levels hold different expectations for their children. Parental expectations tend to be adopted by children, and children's expectations affect the occupation they eventually choose. Educational achievement is a critical step in this process; much of the relationship between parental occupational status and the occupational status of their children is due to the educational level achieved by the children. A large quantity of research tends to support these conclusions. Much of the research is based on national samples or comparatively good quality state and local samples; none of the data is flawless, however. Analysis generally does incorporate relatively sophisticated multivariate methods.

On the other hand, the theoretical and conceptual aspects of status-attainment work are too simplified to render a realistic picture of the process of selecting an occupation. First, non-prestige aspects of occupations are ignored. Thus, for example, the six Holland types are not considered, and the obvious importance of sex stereotyping of occupations also is not considered. Secondly, the gradual process of narrowing down one's occupational options described by Super and other vocational psychologists is not accommodated by status-attainment work. Thirdly, most of the mathematical statements of status-attainment theory do not accommodate the probable reality that several of the variables exercise two-directional effects (e.g., parents affect children and, in turn, children affect parents). Finally, the mathematical statements of status attainment theory are static -- they do not account for change over time.

Theory of occupational choices made by individuals has not been the focus of a large volume of work in economics. The economic literature focuses on determining the total volume of labor in any labor market as a function of aggregate supply and demand. Thus, the emphasis in this volume on individual occupational choices does not draw on the full range of economic theory related to allocation of people into jobs.

Two theoretical orientations shape most economic theories of individual occupational choices, human-capital theory and utility theory. In human-capital theory, it is hypothesized that people tend to choose occupations in order to maximize net income, properly discounted to a "present value." Net income excludes money spent on education, training and other forms of personal improvement that tend to increase one's income. Such forms of personal improvement that increase income are termed human capital, in analogy with physical capital. Income is linked to human capital through jobs. Certain human-capital accumulation is, according to the theory, necessary to perform certain jobs. One gets paid for performance on the job.

Utility theory includes both income and nonpecuniary factors as bases for job selections. According to the theory, people balance all features of jobs, including income, against constraints that prevent one from achieving all that is desired. The final choice is a compromise that maximizes overall satisfaction or "utility" subject to the constraints. These ideas are expressed in mathematical terms. The mathematical theory was first applied to consumer choices of quantities of goods and services and was then adapted for application to occupational choice. The adaptation is awkward, however, because occupation generally is viewed as a discrete category rather than a quantity.

Little empirical work has been carried out in direct efforts to test economic theory of individuals' occupational choices. One of the reasons is that the key concepts are difficult to operationalize. Economists generally do not consider utility to be measurable. Determining net lifetime discounted earnings is subject to many decisions that must be based on inadequate information. The theories of individual occupational choices are more often used to justify empirical procedures linking income to education than they are to be tested directly.

Economic theory contributes two important hypotheses that are neglected in other writings about occupational choices. First, the importance of income as a motivating factor is emphasized; however, influence of nonpecuniary motives is also recognized explicitly. Secondly, the hypothesis that people tend to maximize satisfaction subject to constraints is developed nowhere else to the extent it is in economics. In addition, economics contributes important concepts such as "present value" that are not well understood by noneconomists.

Application of decision theory to occupational choice is probably the least thoroughly studied perspective of occupational choice among those reviewed in this volume. The key concept in the application is termed "valence." Valence of an object such as an occupation is defined as the satisfaction it will yield. Thus, the terms valence and utility are nearly synonomous. Valence of a given choice is hypothesized to be a mathematical function of the valences of outcomes which the given choice is likely to help achieve. Valences of different choices, such as different occupations, are compared, again according to hypothesis, by a mathematical function. The method of comparison includes not only the valence of each occupation, but also the individual's judgment about the chance of getting into each occupation. The final selection of the occupation depends both on valence and on perceived chance of gaining entry.

Clearly, this model provides only a skeleton. It could apply to all sorts of choices besides occupation. It says nothing about factors that generate valences or people's judgments regarding chances of entering different occupations.

Little direct evidence supporting the theory for occupational choices is available. Indirect evidence regarding other types of choices is mixed. Laboratory experiments tend to refute the basic ideas, but nonexperimental work lends more support. At the present time, decision theory supplies a source of potentially useful, technical tools and ideas about processes of choice. These ideas have not been verified. Further, environmental variables affecting occupational choices are seldom considered in decision theory.

This brief summary suggests that achievement of a detailed theory describing the process of occupational choice is not close at hand. Available writings, nevertheless, offer useful sources of insight. The concluding chapter of this volume adopts the viewpoint that a detailed, comprehensive integration of existing theory of occupational choice is premature. Fundamental concepts are not defined adequately and hypotheses are not explicit enough for such an effort to be useful. For the immediate future, it appears that conceptual clarification is of paramount importance. For this task, the present authors argue that mathematical expression of concepts, as well as hypotheses, can play an important role. In particular, the central concept in occupational choice theory, viz, the concept occupation, is not clearly defined. It is suggested that the meaning of occupation derives from general usage and that more precision in defining the term is essential to improving understanding of occupational choice. It is recommended that defining occupations by a numerical profile may be a useful attack on the problem. The profile for each occupation could include numbers to represent prestige, as in status attainment research, income, as in economics, six scores representing the six Holland types, and several other variables. This strategy provides the conceptual foundation for integrating several different theoretical points of view and also permits comparison of factors that motivate occupational choice.

The concept of choice is also ambiguous. It may include, depending on the context, attainment, expectation, preference, aspiration, and valence. These terms have meanings that are similar, but not identical, to each other. Clear conceptual distinctions among these terms and hypotheses linking them are needed.

At present, failure to utilize statistical procedures and mathematicasl language to express verbal hypotheses of continuous change over time is a real barrier to progress in occupational theory and research. It is noted that the mathematical technique termed differential equations may be useful in expressing continuous change, but other possibilities must be examined, especially for describing abrupt changes such as those associated with change of job or residence.

We believe that there are two important features of this volume that are not characteristic of current reviews of occupational choice theories. First, the five theoretical viewpoints selected for careful study come from a spectrum of scholarly opinion that has often been neglected in previous reviews. Secondly, confining attention to a limited number of theories permits more critical assessments than are currently available. The chapters discussing each theory are replete with detailed summaries, criticisms and suggestions regarding conceptualization, recommendations regarding research strategies, and assessment of strengths and weaknesses of empirical evidence.

The most obvious implication of the conclusions of this volume for vocational guidance is that basic theory does not supply the necessary rationale for a "technical" solution to problems encountered in vocational guidance. Basic issues such as the importance of interests, values, personality, income, prestige, and personal autonomy on the job have not received clear resolution. While technical apparatus such as computerized career information systems, interest inventories, and career maturity indexes may be useful, much is left to informal judgments of individuals. Extensive empirical work in the status-attainment literature, for example, suggests the importance of informal, personal associations with parents and peers.

One of the important goals of career guidance is to help people find satisfaction in their jobs. At present, however, we do not understand what generates job satisfaction. Further, the concept of satisfaction is not adequately defined for scientific research, and hypotheses related to satisfaction do not account for elementary problems in the logic of hypotheses involving discrepancies between two or more variables, as the concept of satisfaction implies.

CHAPTER 1

INTRODUCTION TO THE STUDY

This study is about theories of occupational choice. There appear to be at least two important, practical reasons for interest in occupational choice. First, occupation is the means of livelihood for the vast majority of our population. Secondly, many people's sense of self-respect depends in large measure on the type of work they do. The scientific literature about occupational choice is, indeed, massive, but to date it has not produced a theory that can be used without considerable ambivalence to direct individuals into productive, rewarding jobs. Neither can extant work be used unambitiously to justify restructuring jobs. Existing literature is spread across a variety of academic disciplines and theoretical perpsectives, thus tending to retard development of a comprehensive, vigorous theory of occupational choice.

The purpose of this volume is to compare and evaluate selected theories of individual occupational choice. The theories are drawn from a broad spectrum of viewpoints, and the treatment is highly analytical. The aim is to provide research scientists a source which will help them integrate and extend existing work. Occupational choice is treated as the dependent variable, and different theoretical approaches are examined to assess their ability to predict occupational choice. Studying individual occupational choice provides or allows for a necessary focus to the work; however, it is useful to point out what is excluded by this focus and how the work on individual occupational choice relates to broader aspects of careers and employment.

To those familiar with vocational psychology, the concept occupational choice connotes a static orientation associated with trait-factor theory. Beginning with Ginzberg (1951) and Super (1953, 1957), the concept of career development was introduced into vocational psychology, and the emphasis in this literature shifted from a static conception of matching people with jobs (Bell 1940) to the study of an ongoing process; hence, the focus of the present volume may appear somewhat archaic. The authors have tried, however, to avoid undue concentration on a static conception of occupational choice. In fact, the final chapter suggests a mathematical treatment of occupational choice that explicitly incorporates change over time. Still, there is much more to the concept of career development than a dynamic view of occupational choice. Some of these additional elements are addressed in a chapter reviewing Super's work, but one must, nevertheless, retain a perspective on the place of this volume in the larger context of career development theory; the present study

addresses only a part of career development. Still, a dynamic view of occupational choice is a central idea in career development theory. Super, for example, defines a career as a sequence of occupations (Super 1972).

Focus on individual occupational choice also omits a major portion of economic work about allocation of persons into economic roles. The economic literature emphasizes the distribution of persons across occupations. Theory stipulates that the distribution is determined by the intersection of supply and demand curves. The present work addressed individual supply decisions, thus omitting consideration of demand altogether and deferring study of aggregation of individual labor supply decisions into a supply curve. Nevertheless, the work reported here represents an important aspect of the more comprehensive economic work on the distribution of labor across occupations and jobs.

The task at hand demands as much conceptual clarity as can be mustered. In attempting to achieve clarity, the authors frequently resort to mathematical language. This practice comprises part of our general strategy for doing social research, and the reader ought to be informed of our position before launching into the remainder of the volume. The research, community is far from unanimous regarding the appropriate role of formal reasoning in the study of human beings. If unanimity existed, there would be no need to explicate the strategy to be used in the present volume.

There appear to be at least five advantages to be gained from application of mathematics to the study of occupational choice. First, both concepts and hypotheses are more likely to be stated precisely enough to avoid ambiguity. Secondly, the inherent unity among diverse outlooks is more likely to emerge. Thirdly, one may draw on a vast reservoir of mathematical theories and techniques to derive testable hypotheses from theory even though the theory may not be testable directly. Fourthly, one frequently is led to examine all logical possibilities of, say, a typology; whereas some possibilities may otherwise be overlooked. Finally, the well-developed concept of continuity in mathematics often counters the natural human tendency to view the world in dichotomous or categorical terms. The present authors do not hold this view rigidly. None of the purported advantages of mathematics in social research have been demonstrated beyond reasonable doubt, although we believe that each of them is illustrated in this volume. On the other hand, the exclusive value of alternative approaches has not been demonstrated unambigously either. In broad outline, the major strength of mathematically treatment of occupational choice is precision and rigor; whereas, the major strength of nonmathematical theory is comprehensiveness

and immediate practical application--though the advisability of implementing any application is generally ambiguous.

It is very difficult to develop a mathematical model that accounts for all aspects of a comprehensive theory of occupational choice, and the effort suffers from a lack of persons trained both in the substance of the problem and in mathematics. Thus, development of a rigorous, formal theory of occupational choice probably must be viewed as a long-term undertaking. In the meantime, nonmathematical approaches supply inspiration for the main substance of the problem and for application to counseling. A reciprocal feedback should be maintained, however; a study of mathematical treatments of occupational choice can surely inform nonmathematical discourse and lend perspective and limited techniques for applications.

A large number of theoretical orientations to occupational choice have emerged in the past few decades. Rather than examine all of these orientations, a subset is selected for relatively intense scrutiny. This approach permits a thorough review of the selected theories that would not be possible in a more comprehensive coverage. The remainder of this chapter presents a broad overview of several theoretical positions from which a few are selected for detailed review in later chapters. The selections are made to assure coverage of major approaches as well as to maintain balance among diverse viewpoints.

In later chapters, each of the selected theoretical perspectives is summarized and evaluated regarding conceptual clarity, adequacy of operational definitions, and the status of empirical evidence. Also, the different viewpoints are compared and an effort to synthesize contrasting ideas is presented. Following Chapter 1, each of several chapters focuses on one of the earlier selected theoretical viewpoints. The last chapter summarizes the writing, compares the different perspectives, and offers suggestions for synthesis.

Super's Developmental Self-Concept Theory of Vocational Behavior

Theoretical Framework

Super's theory has a long history. The initial theoretical formulations were outlined in the American Psychologist in 1953 (Super 1953),[1] and the theory has been subject to testing and

[1]Although the 1953 paper is the first effort to formulate an explicit theory, some of the ideas can be traced to earlier papers (e.g., Super 1951).

revision ever since (Super 1957, 1960, 1963a, 1963b, 1963c, 1972, 1973, 1974; and Super and Overstreet 1960). Super has focused consistently on two broad themes: (1) the importance of self-concept in vocational development, and (2) the view that vocational development is a process that occurs continuously throughout the life span. The following paragraphs present brief descriptions of these two themes.

According to Super the self-concept is the collection of one's beliefs about one's personal characteristics--e.g., "I am smart." These beliefs range from fairly simple "percepts" such as "I am strong" to more complex abstractions such as "I am a good athlete" (see Super 1963b). The theory indicates that a person progressively views himself/herself as a distinct person, based on observed differences between one's own characteristics and observed characteristics of others. The person's view of himself/herself embraces a full range of role behaviors, e.g., as a sibling, parent, athlete, worker, and student. The self-concept is a continually developing entity shifting somewhat through life as experiences indicate that changes are necessary to reflect reality. The importance of the concept for vocational behavior is that during occupational exploration and other developmental stages the person gradually eliminates occupations that are inconsistent with his/her self-concept. For example, if he/she does not see himself/herself as having the math skills required for engineering, he/she will disregard this occupation. This is a simple example. The role of the self-concept in vocational behavior is complex, according to Super. It encompasses many subtle behaviors such as role modeling, role playing, stereotyping, and fine behavioral discriminations (e.g., like me, not like me) and subsumes much of vocational behavior.

As Super became active in the scholarly study of occupational and career choices, the field was dominated by trait-factor theory arising out of differential psychology (see, e.g., Super 1953, 1957). Trait-factor theory is an essentially static conception of occupational choices; in Super's view the theory characterizes occupational choices as occuring at a single point in time--based on perceived correspondences between personal traits such as personality, aptitude, and interest and the requirements and features of the job. Super proposes (as had Ginzberg 1951 and others previously) that career choices and occupational choices in particular, develop gradually over time and that it is important to incorporate developmental psychology into the study of career choices.

The developmental theme in Super's work is manifest in his division of careers into stages closely reflecting the life stages as described in the developmental psychological literature especially as described by Buehler in 1933 (Super 1957: 71).

Buehler identified five life stages: (1) the growth stage, beginning at birth and lasting to about age fourteen, (2) the exploratory stage, encompassing the approximate period from age fifteen to age twenty-one, (3) the establishment stage, lasting from age twenty-two to about forty-five, (4) the maintenance stage, extending from about age forty-six to retirement, and (5) the decline stage, lasting from about age sixty-five on. The exploratory stage and establishment stage comprise the most important periods of career development and have been described by Super in terms of five sequential, developmental tasks (Super 1963c). Vocational development tasks are attitudes and behaviors a person exhibits as he/she progresses through a stage. For example, during exploration, there is the task of "crystallization" which includes a number of behaviors such as formulation of ideas about appropriate work, efficient use of resources, and awareness of present-future relationships. Super proposes five major vocational development tasks: (1) crystallization (ages fourteen to eighteen, (2) specification (eighteen to twenty-one), (3) implementation (twenty-one to twenty-four), (4) stabilization (twenty-three to thirty-five), and (5) consolidation (thirty-five plus). The associated ages are approximate.

Although the developmental theme is important in Super's writings, he also emphasizes the importance of matching individual characteristics to job requirements (Super 1951, 1957). In this sense, Super is an eclectic, selecting important features from both developmental psychology and differential psychology. The point he emphasizes is that matching of persons to jobs does not occur suddenly at a particular point in time. Rather the match may be viewed as the culmination of a long series of decisions and gradually developed view of the poignant features of different jobs and of oneself. One might view the gradual development of a (vocational) self-concept as the mechanism by which an individual learns about himself/herself so that a match with an appropriate job can be made. Interestingly, the complement to learning about oneself, learning about characteristics of occupations is not emphasized in Super's theoretical writings to nearly the same degree as is the self-concept.

As Super has progressed with his longitudinal research, the Career Pattern Study (Super et al. 1957; Super and Overstreet 1960; and Super et al. 1967), he has supplemented the theory with additional concepts such as vocational maturity and work values. The concept of vocational maturity is defined normatively as the congruence between an individual's vocational behavior and the expected vocational behavior at that age. The closer the congruence between the two, the greater the person's vocational maturity. By assessing vocational maturity, one can gauge the rate and level of one's vocational behavior. To measure vocational maturity, Super has been developing an instrument

entitled "The Career Development Inventory" (Super and Forrest 1972). Additionally, Super and his colleagues have constructed the "Work Values Inventory" published by Houghton-Mifflin (1970). The "Work Values Inventory" is designed to measure fifteen common work preferences for features of work such as achievement, independence, surroundings, security, variety, and prestige.

Commentary

Super's developmental self-concept theory has wide appeal to both practitioners and researchers. Super views theory development as an ongoing enterprise that continually needs to be reformulated as new data are generated. He has been hesitant to call his formulations a theory since he recognizes that his work needs more expansion through empirical investigation, but he has doggedly pursued empirical study and has refined the theory as new knowledge is acquired.

Review of the significant studies testing Super's hypotheses, generates a certain ambivalence. Many of the studies are insightful, but suggest the need for tighter methodology, e.g., more specification of independent variables, refinement of dependent variables, identification of moderator variables, and above all, more refined instrumentation for the construct of self-concept. Although this sounds simple enough, it is hard to implement because of the difficulty of operationalizing self-concept.

Super (1969) emphsizes the need for better instrumentation and for further explication of the metadimensions of self-concepts. He suggests consideration of such aspects of self-concept as self-esteem, realism, cognitive complexity, clarity, abstraction, refinement, certainty, and structure.

Additionally, Super recognizes the freedom of the individual as key to the predictive capacity of self-concept. He states, "I suspect that its (self-concept theory) ability to do this (predict occupational choice) will be partly a function of how free a society we develop. Surely the importance of the individual as a decision-maker depends on his freedom to make decisions" (Super 1969 p. 13). This is especially applicable to disadvantaged youngsters whose life circumstances tend to inhibit expression of the self-concept. Consider the ghetto youth who does well in academic work, but discounts college because he/she knows the probability of going to college is slim. Omitting occupational choices that require college education is, in his/her view, realistic. His/her freedom of choice is restricted.

Although most researchers and practitioners would accept

Super's ideas about the existence of vocational life stages, they also would suggest, as would Super, that: (1) the stages should be refined, and (2) that there is a need for more explication within each stage especially beyond adolescence. There have been several recent attempts to do this, most notably Crites (1976), Heddesheimer (1976), and Westbrook and Mastie (1974). Additionally, the theory could profit from increased study of adult development; Brim (1976), Levinson (1978), Sheehey (1976), and Schlossberg, Troll, and Leibowitz (1978) have conducted exemplary studies.

Holland's Typology
Theory of Vocational Behavior

Theoretical Framework

Holland first proposed his typology theory of vocational choice in 1959. The theory has subsequently undergone several revisions (Holland 1966, 1973). Holland's basic premise is that career orientations or preferences can be described in terms of personality types. Consequently he has empirically identified six major career orientations as follows (Holland 1973). (The original names and current letter codes are in parentheses.)

The Realistic (R) (Motoric) orientation is characterized by agressive behavior, interest in activities requiring motor coordination, skill and physical strength, and masculinity. People oriented toward this role prefer "acting out" problems; they avoid tasks involving interpersonal and verbal skills and seek concrete rather than abstract problem situations. They score high on traits such as concreteness, physical strength, and masculinity, and low on social skill and sensitivity.

The Investigative (I) (Intellectual) persons' main characteristics are thinking rather than acting, organizing and understanding rather than dominating or persuading, and asociability rather than sociability. These people prefer to avoid close interpersonal contact, though the quality of their avoidance seems different from their Realistic colleagues.

The Social (S) (Supportive) people seem to satisfy their needs for attention in a teaching or therapeutic situation. In sharp contrast to the Investigative and Realistic people, Social people seek close interpersonal situations and are skilled in their interpersonal relations, while they avoid situations where they might be required to engage in

intellectual problem solving or use extensive physical skills.

The Conventional (C) (Conforming) style is typified by a great concern for rules and regulations, great self-control, subordination of personal needs, and a strong identification with power and status. This kind of person prefers structure and order and thus seeks interpersonal and work situations where structure is readily available.

The Enterprising (E) (Persuasive) people are verbally skilled, but rather than use their verbal skills to support others as the Social types do, they use them for manipulating and dominating people. They are concerned about power and status, as are the Conventional people, but differ in that they aspire to the power and status while the Conventionals honor others for it.

The Artistic (A) (Esthetic) orientation manifests strong self-expression and relations with other people indirectly through artistic expression. Such people dislike structure, rather prefer tasks emphasizing physical skills or interpersonal interactions. They are introspective and asocial much like the Investigatives, but differ in that they are more feminine than masculine, show relatively little self-control, and express emotion more readily than most people (Osipow 1973: 42-43).

The six types represent major life-styles and patterns of personal relationships between the person and work environments. Typological approaches for describing personal orientations are not new. In fact, construction of typologies is one of the oldest methods in psychology. As early as 1892, William James, one of the founding fathers of psychology, outlined the personal characteristics of five decision-making types (James 1892, pp. 429-434). It is of historical interest to note that some of James' typological descriptions may still have relevance today for vocational behavior. (See for example, the similarity of the decision-making types of Tiedeman and Miller [1975]).

A more modern comparative example of a typology is the popular Allport-Vernon-Lindzey Study of Values (1951). Their six value scales (theoretical, economic, aesthetic, social, political, and religious) have been used frequently by vocational counselors and other practitioners to assist people in contemplating life-styles. In some ways, Holland's typological approach is similar to the Allport-Vernon-Lindzey typology, in that both approaches pervasively extended the basic typology to many aspects of behavior. Holland sees his theory as encompassing many facets of life with major implications for development over the life

span, vocational maturity and vocational coping styles (Holland and Gottfredson 1976).

Holland and his associates have developed several techniques for measuring a person's resemblance to each of the six theoretical personality types. These include the Vocational Preference Inventory (VPI) Holland (1965), The Self-Directed Search (SDS) Holland (1971a, 1971b), The Strong Vocational Interest Blank (SVIB) Campbell and Holland (1972), Matteson et al. (1973), The Kuder Preference Record, which examines major fields of academic study and expressed vocational preferences, Holland (1973) and the Environmental Assessment Techniques (EAT), Astin and Holland (1961). The VPI and SDS are the most commonly used techniques. Both of these techniques provide a profile of scores describing personality types. The profile is then converted into one of Holland's six personality types or into one of a larger number of subtypes. The subtypes are created by combining pairs or triplets of the six main types.

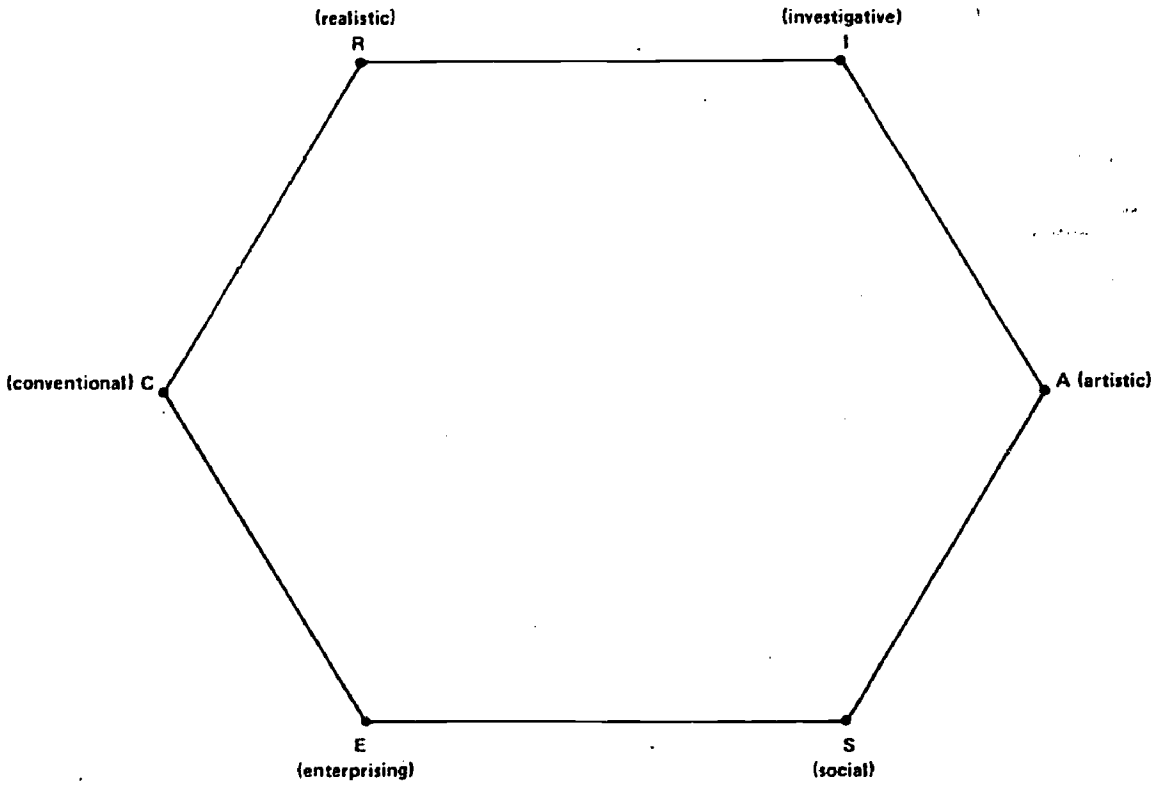

FIGURE 1. Schematic of Holland's hexagonal model.

Dependence on occupational stereotypes is built into the theory. Holland feels that individuals develop occupational stereotypes that have psychological meaning and that these can be used constructively to help plan the individual's career. This idea depends in part on the assumption that the stereotypes often are fairly accurate.

Holland further expands the basic typology by use of the hexagonal model of the six types (see Figure 1). The hexagonal model decribes the correlations among the six types. Types occurring adjacent to one another are the most similar (Investigative and Artistic, for example) while types located opposite one another are the least similar (Realistic and Social, for example). An acronym-memory device to recall the model is RIASEC. The types appear on the hexagon in the order given by the spelling of the acronym.

Holland (1973) has introduced three key concepts based on the hexagon: congruence, consistency, and differentiation. Congruence is defined as the compatibility of the personality type with the environmental type. Consistency describes the degree of similarity (using the hexagonal relationships) between the two highest personality codes. A person whose two highest codes are adjacent on the hexagon is called consistent (E-S, for example). If the two letters are opposite on the hexagon, the person is inconsistent (R-S, for example). Differentiation is defined as the numerical score representing the difference between a person's highest and lowest personality type scores. If the differentiation value is low, there is relatively equal presence of six types and the person is described as undifferentiated, i.e., having a flat profile and no clear-cut direction. If the score is high, the person is differentiated suggesting that the person has definite preferences.

According to Holland, one can make a number of psychological inferences about a subject's typological data using the above constructs. These could include, for example, inferences concerning a person's vocational maturity, the quality of decision-making behavior, and the soundness of career management.

Commentary

Holland's theory has recently been generating a great deal of attention from practitioners and researchers. In a recent review of vocational behavior and career development for the Journal of Vocational Behavior, Osipow reports that Holland's theory has produced an extremely large volume of empirical research and "in sum, the newer results based on the general theory in the past year continue to provide generalized support for the overall validity of the theory's constructs" (Osipow, 1976, pp. 136-137).

There is substantial evidence suggesting some validity in the theory. However, the theory has limitations and has been criticized appropriately. The limitations pertain to the following:

1. The relative absence of empirical data to account for the developmental antecedents for Holland's types, e.g., "How does one become an artistic type?" (Osipow 1973, p. 78).

2. Minimal information for the differentiation of the sexes. Are females' occupational choices adequately described by the theory? (Holland 1976a and Prediger and Hanson 1976).

3. The use of raw scores instead of normed-standard scores to define the theoretical constructs and provide interpretative information to clients (Prediger and Hanson 1976).

4. The formulation and operational use of level hierarchy to predict aspiration levels. At present an adequate formula does not exist (Osipow 1973: 77). It should be noted, however, that predicting occupational level using sociological status attainment procedures has achieved some success and may have relevance for Holland's theory (Curry et al., 1976).

5. The limited data to support the use of the VPI and SDS for adults facing midcareer or reentry to work problems. Thorensen and Ewart (1976: 32) point out that "more than two-thirds of the studies supporting Holland's theory have been done with college or high school students."

Holland and his associates as well as others have been trying to correct these deficiencies. For example, in the past several years a number of studies testing the application of the theory for women and midcareer adults have been published (e.g., Lacey 1971; Mathews 1977; and Osipow 1976). Several studies on women using Holland's theory suggest that the theory does not predict well for women and that modification of the typology might be in order. A beginning was initiated along these lines by Matthews (1977) and by Holland (1976a).

Holland has exerted a great deal of effort to demonstrate how his theory can be used to help people with vocational planning. His most recent suggestions appeared in the Counseling Psychologist, 1976, in which he extends the typology over the entire life span, e.g., coping styles, midcareer change, and for special groups (Holland and Gottfredson 1976).

Roe's Theory of Occupational Choice

Theoretical Framework

Anne Roe's theory of occupational choice has evolved from the following bases: (1) investigations focusing on classification of occupations, (2) investigations into the backgrounds and personality differences of research scientists, and (3) investigations of the psychological differences among workers in different occupational groups and levels within the classification system. The major findings of these studies are summarized in the following paragraphs.

Roe's studies of established scientists in different academic disciplines reveal that differentiation of interests develops from the degree to which attention is focused on persons or nonpersons. Roe hypothesizes that this difference in focus develops early in life, primarily as a result of early childhood experiences. The theory specifies that parent-child relationships characterized by rejection, neglect, and the casual treatment of children result in nonperson orientations. Roe also believes that children from either extremely protected or overdemanding environments become nonperson oriented.

Roe's development of an occupational classification system is based on the two dimensions of group and level. Group is a classification based on interest in interpersonal relations or manipulation of objects. Roe postulates that these groups are ordered in terms of degrees of interpersonal interaction. Level refers to the degree of responsibility, ability, and education required.

Roe and Siegelman (1964) later issued a revised statement of the original theory suggesting that economic and chance factors are important and play a greater role in career choice than the earlier theoretical statements suggest.

Roe's theory has not been widely supported by observations. Studies by Grigg (1959), Hagen (1960), Utton (1962), and Switzer and associates (1962), fail to support the hypothesis regarding the relationship between early parent-child interactions and specific vocational choice. Modifications of the theory have failed to show significant results.

Commentary

The following represent the major difficulties and limitations which have arisen from studies of Roe's theory:

1. The theory requires specificity in describing formative experiences.

2. The theory is not easily tested because the propositions are stated in such general terms that they are ambiguous (Osipow 1973).

3. Roe's classification of occupations and people into the dichotomous categories of person-oriented and nonperson oriented is restrictive for the purpose of testing the hypothesis (Green 1964).

4. Numerous methodological problems relating to the assessment of parent-child interaction and the use of the retrospective technique for collecting information exist.

Roe's theory is built on a few major concepts including genetic factors, need structures, and family experiences. Hence, it is reasonably parsimonious. However, the theory has been difficult to test, primarily because of vague concepts, terminology, and the lack of adequate instruments for measuring parent-child relationships and interactions. Additional restrictions of the theory include--parallel complements

1. failure to deal with the effects of changing family environments on personality development, especially the effects of changing parental attitudes;

2. failure to account for differences between the mother's and father's child-rearing practices.

Roe's classification system has been used in career counseling. This two-dimensional classification of occupations has been adopted into computer-based approaches for use in the vocational decision-making process.

Ginzberg's Theory

Theoretical Framework

The theory of occupational development proposed by Ginzberg and his associates represents the combined efforts of an economist, a psychiatrist, a sociologist, and a psychologist (Ginzberg et al. 1951). The theory is a direct response to the lack of a theoretical framework in vocational psychology, although Super (1953) later criticized Ginzberg for ignoring available theory. The theory is based on cross-sectional studies

of selected groups of individuals and on research into human resources. The background data for the theory were collected through interviews with male students at Horace Mann University School and Columbia University.

These empirical investigations into the character of events influencing the process of occupational choice led Ginzberg and associates to postulate the following broad categories of variables as being significant in the determination of vocational choice: (1) emotional factors (e.g., stress), (2) individual values, (3) reality factors (e.g., job requirements, educational opportunities), and (4) educational influences. The major elements of Ginzberg's theory include: process, compromise, irreversibility, and stages in the choice process. More specifically, the theory states that--

1. occupational choice is a developmental process taking place over a span of about ten years;

2. the process of occupational choice is largely irreversible;

3. the process of occupational choice ends in a compromise between interests, capacities, values, and realistic opportunities;

4. occupational choice can be best characterized by three periods: (1) the fantasy period, (2) the tentative period, and (3) the realistic period.

The process of occupational choice is central to Ginzberg's theory. The theory is based on the principles of developmental psychology and focuses on developmental stages as aspects of a lifelong process.

Recently, Ginzberg (1972) has made some modifications in the theory. Some of the major revisions include the following:

1. The process of vocational choice is more aptly described by optimization than by compromise

2. The process of vocational choice is lifelong and open-ended

3. Irreversibility is no longer valid.

This revised theory of occupational choice postulates a lifelong process of decision-making in which the individual attempts to find the optimal fit between career goals and the realities of the work world.

Empirical support of Ginzberg's theory is mixed. The research of Tiedeman and O'Hara (1963) focusing on the consequences and sequence of Ginzberg's predicted periods support the stages of development stipulated by Ginzberg and associates. Hollender's (1967) study provides support for the idea that realism increases with age. Small (1953) failed to support the hypothesized relationship between age and realism. Hollender (1967) provides inferential support for Ginzber's hypothesis that vocational choices change from a fantasy base to a realistic base. Studies by Davis, Hagan, and Strouf (1962) conclude that the level of the tentative choice exceeds that of the fantasy choice.

Commentary

The theory of Ginzberg and associates is an early attempt to present a developmental theory of occupational choice. The theory describes career behavior in terms of the general concepts of human development. Ginzberg and associates propose that career development is a series of predictable, sequential events. The theory is based on the evolution of increasing self-determination concomitant with individual realistic attunement to the environment.

Empirical studies have tended to support the Ginzberg hypotheses regarding vocational development as a process: increased realism with age, the presence of compromise in occupational choices, and work role. However, much of the empirical work suffers from methodological problems related to: small and unrepresentative samples; the use of selected groups; the lack of valid and reliable measurements and criteria; the lack of longitudinal evidence; and failure to control for important variables such as socioeconomic status, ability, and education. The theory has been difficult to test, and it has had little development since its original formulation. Its greatest contribution may lie in its emphasis on the developmental nature of career choices at a time when trait-factor theory dominated career-choice theory and counseling practices.

Sociological Perspective

Theoretical Framework

Background. Sociological interest in occupational choice grew out of a long tradition of study in social stratification and in particular, social mobility. Consequently, sociological work with occupational choice has depended heavily on status

dimensions of occupations (e.g., prestige, power, wealth, Weber (1964)). Early theoretical work emphasized broad questions of structure and function in societal systems and examined the role of occupational status in society (see, e.g., Sorokin 1927; Barber 1957; Dahrendorf 1959; Davis and Moore 1945; Lipset and Bendix 1964; Inkles and Rossi 1956; and Hodge, Treiman, and Rossi 1966). Early empirical work focused on analysis of father-to-son occupational mobility tables (see, e.g., Kahl 1967; Rogoff 1953; Jackson and Crockett 1964; Centers 1948; and Blau and Duncan 1967). The early theory and research did not emphasize study of individual occupational choices, but it does provide a perspective that emphasizes the importance of structural factors such as parental status and the distribution of occupational opportunities in restricting individuals' occupational choices.

Two developments led sociologists to embark on an intensive study of individual occupational choices. First, a large number of measurement studies were carried out to determine relatively easy and reliable methods for assigning status scores to occupational categories (Reiss 1961; Duncan 1961; Hodge, Siegel, and Rossi 1966; Klatsky and Hodge 1971; Grasmick 1976; Siegel 1971; Treiman 1977; and Featherman and Hauser 1976). Secondly, the method of path analysis was introduced into stratification research (Blau and Duncan 1967; and Duncan, Featherman, and Duncan 1968). Assigning status scores to occupations permits useful reduction of a bewildering array of data and fostered use of multivariate statistical analyses. Path analysis stimulated introduction of additional variables to help uncover the reasons behind the ubiquitous observation that parents' status affects the status achieved by their children.

The status attainment process. An intergenerational occupational mobility table generally consists of a cross-tabluation between the occupational status achieved by males and the occupational status of their fathers. Although the variety of analyses and insights that can be derived from such tables probably far exceeds what a novitiate might expect (see, e.g., Spilerman 1972; Blumen, Kogan, and McCarthy 1955; Goodman 1965; and Bishop, Fienberg, and Holland 1975), analysis of multivariate systems is severely restricted by reliance on Tables.[2]

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[2]The author's believe that this comment holds even in light of the new log-linear models for analyzing tables (see Bishop, Fienberg, and Holland 1975, for an exposition of these models).

The introduction of path analysis by Blau and Duncan (1967) substantially improved the prospects for studying variables that intervene between father's occupational status and son's occupational status, and also made it possible to study more than one variable in the complex of variables defining the status of one's parents. The basic Blau-Duncan path model is shown in Figure 2.[3] It has been extensively elaborated in the past several years. One of the first major additions to the model was offered by Sewell, Haller, and Portes (1969) and by Sewell, Haller, and Ohlendorf (1970). (See also, Duncan, Featherman, and Duncan 1968.) Sewell and his associates added social psychological variables to the model in an effort to further interpret the relationships between parental status and socioeconomic achievement; they also included a standardized ability measure as an "exogenous" variable paralleling parental status. The intervening variables included by Sewell and associates are occupational status expectation in high school, educational expectation in high school, a composite significant-other variable, and school grade-point average.

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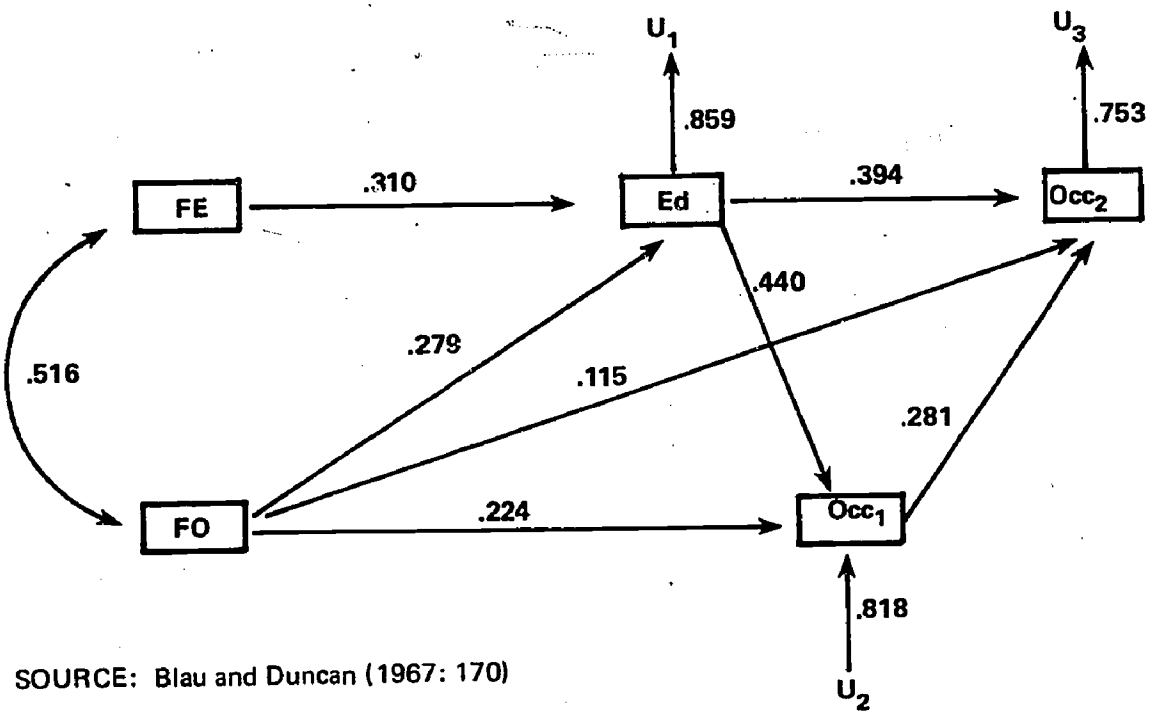
[3]Since this volume is directed to researchers from many disciplines who are interested in occupational choice and the method of path analysis has not been disseminated evenly across disciplines, a brief summary of the meaning of Figure 1 is presented in this footnote. The straight arrows in the path diagram indicate hypothesized (linear) effects of the variable at the base of the arrow on the variable at the pointed end of the arrow; curved double-headed arrows indicate correlations between variables whose causal relationship is left unanalyzed. The variables labeled U_i are unmeasured residuals indicating that no dependent variable in the model is completely determined by the measured variables that are hypothesized to affect it. The numbers associated with each arrow are the calculated path coefficients as reported by Blau and Duncan; these coefficients indicate the magnitude of the linear effect running in the direction of the arrow. Each path coefficient is calculated under simultaneous statistical controls for all variables hypothesized to affect the dependent variable (except, of course, the independent variable whose effect the path coefficient indexes. Numerous expositions of path analysis are available. Among the more elementary introductions are Heise (1975), Duncan (1975), Land (1969), and Duncan (1966).

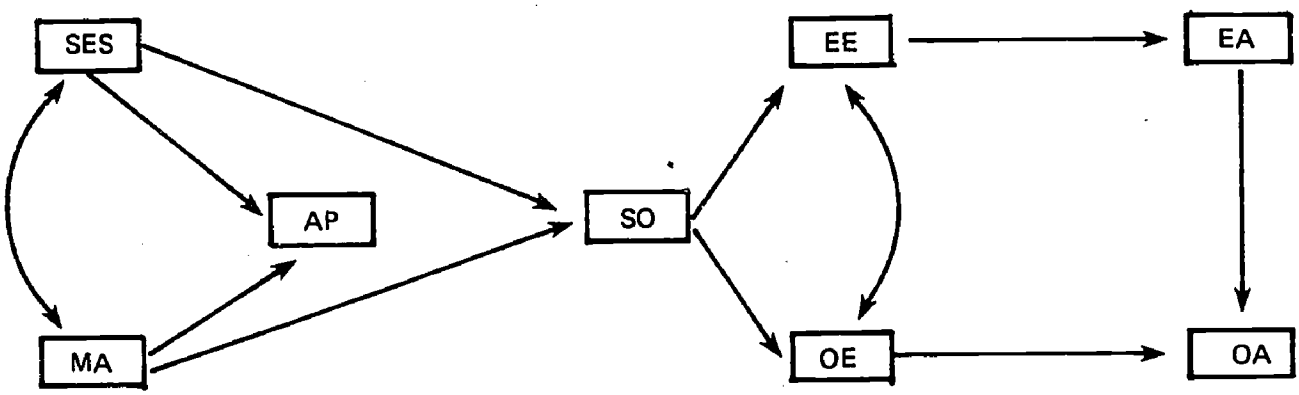


SOURCE: Blau and Duncan (1967: 170)

NOTE: The symbols are defined as follows:
FE = father's education
FO = father's occupational status
Ed = respondent's education
Occ_1 = status of respondent's first job
Occ_2 = status of respondent's 1962 job

FIGURE 2. Blau-Duncan path model of occupational status attainment.

The essential theoretical features of the "Wisconsin Model," as the model proposed by Sewell and associates is often called, can be summarized succintly: Social psychological processes intervene between parental status and status achievements of their offspring, providing an interpretation of the relationships between parental status and achievement. More specifically, by hypothesis, parental status influences the significant others with whom youth associate, significant others influence youth's educational and occupational expectations, and the career expectations affect achievements. Figure 3 shows a highly simplified path diagram drawn to reflect the major hypotheses rather than empirical results. The path diagram supplies some details of the theoretical expectations that are difficult to summarize verbally.



NOTE: The symbols are defined as follows:

SES = parental socioeconomic status
MA = measured mental ability
AP = academic performance (school GPA)
SO = significant other variable
EE = student educational expectation in high school
OE = student occupational expectation in high school
EA = educational attainment
OA = occupational attainment

FIGURE 3. Simplified path diagram of the major hypotheses in the "Wisconsin model."

The Wisconsin model has been tested and elaborated repeatedly with data collected from Wisconsin youth while they were high school seniors and from the same respondents as adults. The data generally support the theory, but the theory is not supported in every detail. For example, a small direct effect of academic performance on educational expectation persisted in spite of the hypothesis that it is zero. On the other hand, the major hypotheses concerning significant other influence and the effects of career expectations on career attainments are supported strongly.

Since the appearance of the Wisconsin Model, an extensive empirical literature has developed. This literature contains numerous variations of the basic model but generally lends support to the view that significant others and career expectations of youth play an important role in transmitting parental status to their children. (See for example, Alexander and Eckland 1975; 1974; Alexander, Eckland, and Griffin 1975; Curry et al. 1976; 1977; Gasson, Haller and Sewell 1972; Hauser 1972; Hout and Morgan 1975; Kerckhoff 1971; Kerckhoff and Huff 1974; Otto 1976; Picou and Carter 1976; Porter 1974; Sewell and Hauser, 1975;

Williams 1975; 1972; Woelfel and Haller 1971. See, however, Wilson and Portes 1975.)

In recent years the status attainment viewpoint has been subject to challenge and reinterpretation. For example, Patrick Horan (1978) challenges earlier claims that status attainment work is devoid of a theoretical perspective (see Coser (1975), for example). Horan links the status-attainment work to a "functionalist" view of social systems in which allocation of people into occupational roles is carried out in a manner insuring that the most capable people fill the most important roles (see Davis and Moore 1945). This is a conservative view of American social structure. Bowles and Gintis challenge the role of education implied by the status attainment model (Bowles and Gintis 1975; 1973; Bowles 1971). In the status attainment model, it is implied, but not explicit as in human capital theory, that education generates competence and thereby allocates capable individuals into important occupational roles. Bowles and Gintis, on the other hand, argue that the educational structure certifies rather than trains, and that much of the training that does occur is training to obey authoritarian figures in an autocratic bureaucracy. Such "training" stands in sharp contrast to the traditional view of training for technical competence.

Commentary

While the Wisconsin model and associated empirical research have contributed toward understanding occupational mobility processes, much work remains. First, the causal ordering among the major variables in the Wisconsin Model is open to debate (see Nolle 1973; Curry et al. 1976; Hout and Morgan 1975; and Williams 1975). For example, although the model postulates that significant others affect young people's career expectations, it is at least possible that significant others' educational and occupational expectations of students may be affected by the educational and occupational expectations communicated to them by the students. Appropriate longitudinal data and simultaneous equation methods need to be used to test such possibilities. Secondly, the models should be submitted to dynamic tests in which the accuracy of predictions are tested with observations on the dependent variables that have not been used to estimate the prediction equations. Thirdly, the detailed theory rationalizing the impact of significant others on educational and occupational expectations of youth has not been adequately tested (see, Woelfel and Haller 1971; Haller and Woelfel with Fink 1968). Finally, the model does not adequately account for uncertainty of career expectations that is hypothesized in the psychological literature (e.g., Super 1957; 1963) and in some sociological writing (e.g., Miller and Form 1951; Slocum, 1966).

Theory underlying the sociological perspective is not as extensively developed as psychologically oriented theories such as Super (1957), Holland (1959), Roe (1956), or Ginzberg and associates (1951). The concepts are not as fully developed as economic concepts such as present value, internal rate of return, and indifference curves. On the other hand, the Wisconsin model contains important substantive ideas that have generated extensive empirical analysis. Further, the general form of the path model is such that it can be readily expanded to include psychological and economic perspectives.

Economic Prespective

Theoretical Framework

Occupational choice has not been the subject of intensive study by economists. Available work is based on economic theory of nonoccupational choices, modified for application to occupational choices. Economic theory of individual occupational choices falls in two classes: theories drawn from the concept of human capital and theories based on utility maximization.[4] The following review briefly summarizes these two approaches.

Human Capital Theory. According to Lester Thurow,

> Human capital is defined as an individual's productive skills, talents, and knowledge. It is measured in terms of the value (price multiplied by quantity) of goods and services produced (Thurow 1970: 1).

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[4]These two approaches to economic theory of occupational choice derive from the mainstream of contemporary labor market research. Cain (1976) has recently reviewed challenges to the mainstream approach, labeling the challenge segmented labor-market theory and the mainstream approach neoclassical theory. The segmented labor-market theorists are a highly diverse group, but they do share some important claims. The most visible feature of the segmented labor-market theories is the assertion that the U.S. economy is divided into at least two labor markets that are isolated from each other. According to the claim, there is very little labor mobility between the isolated segments of the labor market. The view that the labor market is segmented is accompanied by some fundmental challenges to neoclassical theory of labor supply and demand. First,

Thinking about individual's productive skills, talents, and knowledge as a form of capital has led economists to modify theory designed for physical capital for application to human capital. The basic orientation is to treat expenditures and foregone earnings associated with education, on-the-job training, health, migration, and labor-market information as investments--investments in human capital. This orientation has stimulated a massive outpouring of theory and research designed to assess the social and individual returns to investments in training and education (see e.g., Hansen 1970; 1963; Griliches and Mason 1972; Bowlby and Schriver 1973; McMahon 1974; Freeman 1971; Becker 1964; Mincer 1974; Taubman and Wales 1974; Taubman 1976; and Ribich and Murphy 1975). Other types of human capital have been studied to a lesser extent, e.g., returns to labor market information (Parnes and Cohen 1975; and Stigler 1962), migration (Yezer and Thurston 1976), and occupation (Carol and Parry 1968; and Wilkenson 1966).

One's occupation is an important link between training and earnings. One trains for an occupation and receives earnings for services performed in an occupational role. Thus, selection of an occupation implies varying degrees of investment in human capital and affects the returns that one receives on the investment. The returns to investment in human capital are conceptualized as the lifetime discounted earnings. This term refers to the earnings stream over one's working life adjusted to account for the fact that money received in the future is not as desirable as the same amount received immediately.

Utility Maximization. The economic concept of utility is defined as the degree of satisfaction derived from products, services, or activities. Utility is viewed as a function of the

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the challenge asserts that wages do not act as the market clearing mechanism, because of limited mobility between market segments and institutional arrangements preventing downward adjustment of wages. Secondly, the segmentalist claim that profit/utility maximization is not the main mechanism determining demand/supply of labor. While the dissenting voices of the segmented labormarket theorists comprise an important challenge to conventional theory, the evidence supporting the challenge is uneven, and no comprehensive alternative to neoclassical theory has been proposed. (See, however, Thurow [1975] for a sober beginning to such an alternative.) No clear statement of a theory of individual occupational decisions has been derived from the challengers' position, however. Consequently, the discussion in the text does not address the segmented labor-market viewpoint.

quantity of factors such as goods, services, income, or activities. The important aspect of a utility function is that it accurately orders an individual's preferences between different combinations of goods, services, and/or activities (Ferguson and Gould 1975; Henderson and Quandt 1958).[5]

In most applications of utility theory, it is assumed (a) that individuals can select between alternative bundles of goods and services, and that (b) the selections are transitive (e.g., if A is preferred to B, and B is preferred to C, then A is preferred to C).

The typical application of utility theory proceeds by use of a utility function and a constraint function. The degree of utility for each individual is written as an algebraic (often unspecified in theoretical discourse) of two or more activities. It is assumed that individuals select the combination of activities that maximizes their utility, subject to specified resource limits.

A highly simplified example from consumer-choice theory will serve to illustrate the main principle. Suppose that a consumer is faced with the choice between purchase of two goods and all income is to be spent on the two goods. Utility can be viewed as dependent on the amount of income and the allocation of spending between the two goods. If x represents the quantity of the first good and y symbolizes the quantity of the second, then the utility function can be written: $u = f(x,y)$, where u denotes utility and f is an unspecified function. A fundamental assumption of the theory is that the utility function gives nonnegative changes in u for positive increments in either x or y, ceteris paribus.

Almost by definition of the term utility, consumers desire to achieve the highest possible utility within their income limits. The income constraint can be written into the following equation: $I = p_x x + p_y y$, where I = income, p_x and p_y = the price of good 1 and 2, respectively, and , as before, x,y = the quantity of goods 1 and 2, respectively. Collecting the utility function and the income constraint one has the following nonlinear programming problem

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[5]Frequently the term activity will be used to refer to goods, services, and/or activities. This usage avoids awkward syntax and reflects a common practice in the technical literature about function extrema subject to constraints, viz, the literature on linear and nonlinear programming.

maximize	$u = f(x,y)$	(utility function)
subject to	$I = p_x x + p_y y$	(income constraint)
	$x,y \geq 0$	(nonnegative quantity of goods)

Generally, mathematical analysis of this problem shows that maximum utility is achieved when the consumer purchases quantities of the two goods such that his/her willingness to exchange x for y (i.e., the marginal rate of substitution) equals the ratio of the price of x to the price of y. It is mathematically straightforward to extend this type of analysis to cover all feasible sources of income allocation, including any number of goods or services and savings; the same results can be obtained (see Ferguson and Gould [1975] for an introduction to this theory, Henderson and Quandt [1958] for an intermediate-level treatment, and Lancaster [1968] for an advanced presentation).

Once the mathematical structure of the problem is understood, it is fairly simple to apply the main ideas to other types of choices. For example, the classical application in labor market theory is to workers' choices between leisure time and work time (Ferguson and Gould 1975; Becker 1971). Utility is viewed as dependent on money income and nonpecuniary factors. Each worker's problem is to select quantities of leisure time and work time to maximize utility, subject to the constraint that leisure and work time must add to the total time available in each period. As will be seen in a later chapter, the idea of utility maximization can be applied to theory of occupational choices in several ways in addition to the choice between labor and leisure.

Commentary

Compared to broad schema such as that proposed by Super, economic theory of occupational choice is highly focused. The high degree of focus is responsible for both shortcomings and advantages of the economic approach. The shortcomings stem from the grouping of nonmonetary variables into an amorphous set, "nonpecuniary income." While this strategy does explicitly account for the influence of nonmonetary factors, it gives little insight into the manner in which divergent, nonmonetary variables operate (see Lucas [1977] for an exception, however). On the other hand, the narrow focus promotes formalized theory construction, and, in principal, should foster careful empirical work. In practice, however, direct empirical tests are difficult to execute, because of the impossibility of deriving measures of utility that can be compared between individuals and the practical obstacles to collecting lifetime discounted earnings of individuals, as required by human capital theory.

In spite of limitations of economic theories of occupational choice, the economic approach presents an articulate viewpoint that scholars of career decisions can ill afford to ignore. First, utility theory proposes a structure on the psychological processes of individual decision making. The claim is that individuals are able to act in a rational way to achieve desired ends--few economists would claim that individuals always act rationally, but the presumption is that people are able to approximate rational behavior closely enough to make the theory viable. Secondly, human capital theory emphasizes the connection between occupational choices and investments in factors such as schooling, training, medical care, and migration.

The main variable influencing individuals' decisions to invest in their own human capital is lifetime discounted income. This latter variable is unique to economists; sociologists interested in income attainments would do well to learn and apply the logic of discounted earnings streams to their analyses. Mincer (1974), for example, develops an economic model of the distribution of cross-sectional earnings; the concept of lifetime discounted earnings plays a pivotol role in the theoretical analysis. Regression analysis testing several variations of the model reveal over fifty percent of the variance in the log of income can be "explained" by simple functional combinations of age and schooling. In contrast, Sewell and Hauser (1975) explain about eight percent of the variance in income (not the log of income) using a sociological model with several independent variables. Thirdly, economic work presents rich examples of ingenious application of a set of technical tools to the substance of occupational choice.

In addition, economists have used human capital theory to derive a number of general implications of interest, (see especially Becker 1964; and Mincer 1974). For example, human capital theory can be used to derive the expectation that income distributions are skewed; that age-income distributions are flat for low-trained people and concave downward for highly trained people; that young people are more likely to invest in education and training and more likely to migrate than older people; and that people with more talent invest more in education and training. As Becker notes, this is a wide variety of expectations to derive from a single theory, and all of the implications hold roughly in observations.

The basis for the expectation that younger persons invest more in education and training than do older people may be of interest to those who use occupational-choice theory in vocational counseling. The reasoning is that for a given rate of return, the present value of an investment for young people is higher than for older people because youth have a longer working

life remaining to collect the returns on their investment. This reasoning may lead vocational counselors to reconsider the implications of recommending that people psychologically prepare themselves for several occupational shifts and associated retraining throughout their lives. By the time one is forty or fifty years old, the time and money spent on retraining may not be a good investment in the economic sense, because too few working years remain in which to collect the returns on the investment. This does not mean, of course, that midcareer job shifts are always unwise, only that economic considerations are less likely to favor job shifts as one grows older and as training level increases. This comment is particularly pertinent for developing much needed vocational counseling services for adults.

Information Processing Theories

Theorectical Framework

Background. There is a class of theories of occupational choice that are a specific application of general behavior theory. The model of human behavior postulated by general behavior theory, grossly oversimplified, can be depicted as shown in Figure 4.

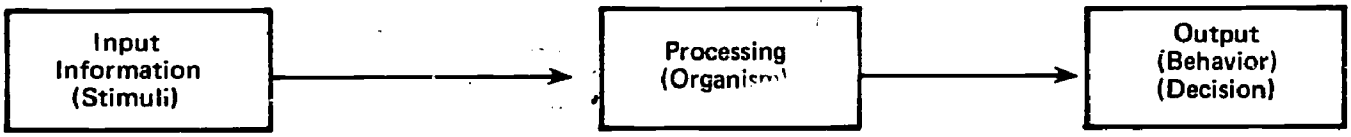

FIGURE 4. General behavior model.

Information, or stimuli, are inputs to the organism. The information is processed in some way, resulting in behavior that may be overt or cognitive, and that can function as new information (feedback).

One type of theory, generally called learning theory, is primarily concerned with the input and its relationship to the output. Traditional learning theory, both classical and operant conditioning, are exclusively concerned with stimulus-response (input-output) relationships. Cognitive learning theories give some role to the processing component, though the emphasis is still on the stimuli and responses.

A second type of theory, called information processing theory, is primarily concerned with the mechanisms by which the organism processes the input to yield the behavior. It denies a simple connection between stimuli and responses.

Each of these two types of theories has its counterparts in the area of occupational choice. In this section, the information processing theories will be summarized, and the learning theories will be summarized in the next section. The two types of theories are complementary, each focusing on a different aspect of the problem.

The information processing theories applied to occupational choice are themselves of two types. Decision theories are concerned with the global process of decision making based on the expected consequences of alternative decisions. Logic-flow theories are concerned with the sequence of steps that individuals go through in arriving at a decision.

Vroom's expectancy theory. The most highly developed of the decision theories is Vroom's (1964) Expectancy Theory. Vroom postulates that for every decision that an individual might make, she/he expects certain consequences, or outcomes, to result. These outcomes may be desirable or undesirable to some degree. The extent to which an expected outcome is considered desirable or undesirable is said to be its valence. The outcome may be desirable or undesirable for its own sake, or because it is viewed as instrumental in obtaining some other outcome. The valence of any given outcome is seen by Vroom to be a monotonically increasing function f_j of the algebraic sum of the products of the valences of all related outcomes multiplied by the perceived instrumentally of the given outcome for obtaining the related outcomes. Vroom expresses this in mathematical notation as

$$V_j = f_j\left[\sum_{k=1}^{n} V_k I_{jk}\right] \quad (j = 1, \ldots, n)$$

$$I_{jj} = 0$$

where

V_j = the valence of outcome j

I_{jk} = the cognized instrumentality of outcome k for attaining outcome j

$(-1 \leq I_{jk} \leq 1)$

In addition to a valence, every outcome has a subjective probability of occurence, or expectancy, associated with it.

The force on a person to commit a particular act, or make a particular decision, is said to be a joint function of the valences of the outcomes associated with that act or decision and

their expectancies. Specifically, the force of a particular act is a monotonically increasing function g_i of the algebraic sum of the products of all associated outcomes multiplied by their expectancies. This is expressed mathematically as

$$F_i = g_i \left[\sum_{j=1}^{n} (E_{ij}V_j)\right] \quad i = n+1, \ldots, m)$$

where

F_i = the force to perform act i

E_{ij} = the strength of the expectancy that act i will be followed by outcome j ($0 \leq E_{ij} \leq 1$)

V_j = the valence of outcome j

$i \cap j$ = the null set

The decision rule that Vroom postulates is that individuals will choose that alternative with the largest positive, or smallest negative, force. In terms of occupational choice, this means that the individual will choose, from among those occupations which are available to him/her, that occupation with the largest positive, or smallest negative force.

Although it is not part of the formal model, Vroom implies that the expectancy of attainment of an occupation includes a cost factor. For example, presumably, between two occupations with equal probability of attainment, the more costly to enter will have the lower expectancy. He does not elaborate, however. Neither is there any concern for how the valences and expectancies came to be. They are taken as givens which determine the individual's decision. (Determination of their origin is a job of learning theories.)

The major criticisms of Vroom's theory are that (a) it is too simplistic, and (b) it seems doubtful that people make the kind of conscious mathematical calculations that the theory implies. However, the theory's utility need not stand on its completeness. The notions of valence, expectancy, and force may be useful as part of a more comprehensive thoery of choice. It also is not necessary to assume that individuals make conscious mathematical calculations in arriving at decisions; if Vroom's mathematical functions are an accurate account of decision-making behavior, then they are useful for descriptive purposes whether or not they are consciously employed by the deciding individual.

While there may be no direct test of Vroom's theory in the

literature, Vroom cites a large number of studies that he claims are supportive (Vroom 1964). Mitchell and Beach (1974) have reviewed the evidence bearing on Vroom's and other expectancy theories.

Kaldor and Zytowski's maximizing model. The Kaldor-Zytowski Maximizing Model is similar to Vroom's theory in that it assumes that an individual will choose the occupation with the highest valence given that the expectancies (subjective probability of attainment) are equal (Kaldor and Zytowski 1969). They use the occupational utility function instead of valence, and express these functions, not as equations, but as curves plotted in n space, where n is equal to the number of variables considered in determining the utility of an occupation. Each curve represents various combinations of the several variables having the same level of total utility. Points on the curve represent specific occupations. All occupations located on the same curve have the same occupational utility, but not the same combination of values on each variable. Consider a person trying to decide among several occupations. For the sake of simplicity, assume that only two variables are involved: average pay and social status. Figure 5 represents some possible occupational utility functions.

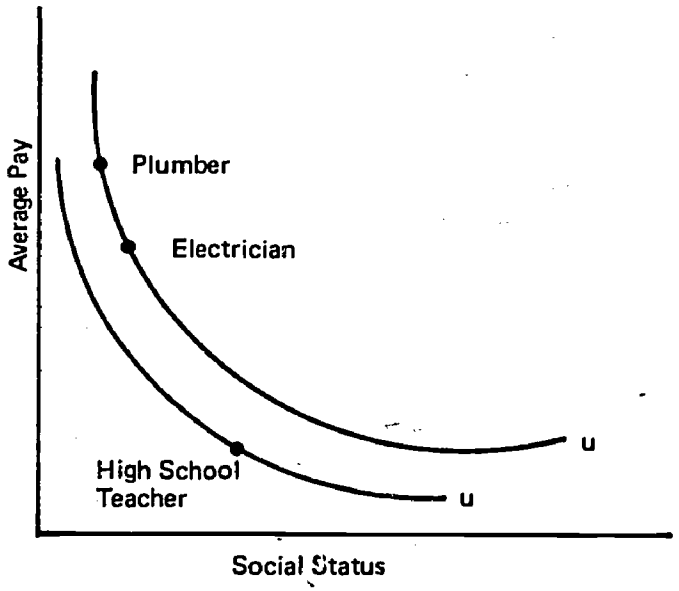

FIGURE 5. Indifference curves for an occupational utility function.

Both plumber and electrician fall on the same curve; thus, both have equal occupational utility, even though plumber pays more, but has less social status, than electrician. High school teacher, on the other hand, has less occupational utility than

either plumber or electrician. It has more social status than either, but the low pay is not sufficient to compensate.

It is assumed that, other things being equal, a person will choose the occupations with the highest utility. How a person decides between two occupations with equal utility is not mentioned. Kaldor and Zytowski also introduce the notion of resources, which includes both money and psychological characteristics that the individual can invest in an occupation. The resources, available to a person act as a limiting factor on his choice of occupations; e.g., he couldn't be a physician if he didn't have the money or ability to get into medical school.

The only evidence known to the authors that bears specifically on the Kaldor-Zytowski model, is a study by Kaldor and others which is generally supportive (Kaldor, Eldridge, Bardinal, and Arthur 1962).

Other decision models. A variant of the expentancy models are the policy capturing models (Mitchell and Beach 1975). These models do not try to predit what choices a person will make, but to determine what information he/she uses to make a choice. The regression model uses linear regression or analysis of variance to make this determination (Mitchell and Beach 1975; Hoffman 1960; Cohn 1968; Hays 1963).

Anderson's Information Integration Theory (Anderson 1971; Anderson and Alexander 1971) is similar, except that it allows for both weighted average and multiplicative combinations of information, as well as the additive combinations allowed by multiple linear regression. Generalized decision theory has also been utilized in studying occupational choice (Edwards 1954; 1961; Mitchell and Beach 1975). None of these models have, however, been very extensively applied to occupational choice.

Hilton's career decision-making model. Hilton's Career Decision-Making Model is the prototype of logic-flow models applied to occupational choice. It is basically an adaptation of Miller, Galanter, and Pibram's (1960) TOTE model of human behavior (although Hilton does not cite these authors). TOTE is an acronym for test-operate-test-exit, and was first proposed by Miller and associates as the unit of behavior to replace the stimulus-response (S-R) unit advocated by traditional learning theory.

Behavior, according to the TOTE model, involves a continuous comparison (test) of perceived reality against the individual's environmental beliefs, expectations, and desires, which Miller and associates call the image. Perceived reality is represented by the current input from past experience. When new input causes

an excessively large discrepancy between reality and the image, cognitive disonnance results (Festinger 1957), which the individual feels as discomfort, thus motivating him/her to take action (operate) to reduce the disonnance. Moderate degrees of discrepancy create interest and are felt as pleasurable; too little discrepancy creates boredom, and the individual is motivated to increase the discrepancy. The action taken may operate on reality, ("Harvard rejected me; I'll appeal to the The Board of Trustees"), or it may operate on the image, ("I haven't been rejected irrevocably; I'll be reconsidered next year"), or directly on the negative affect ("I think I'll get drunk"). The individual continues to iterate through successive test-operate sequences until a test indicates that the dissonnance is reduced, at which point the sequence of behavior stops (exits). The successful behavior, and knowledge of its success, is stored in the image; thus, new behavior may have been learned and/or the efficacy of old behavior confirmed or disconfirmed. In either event, learning has taken place. The process is diagrammed in Figure 6.

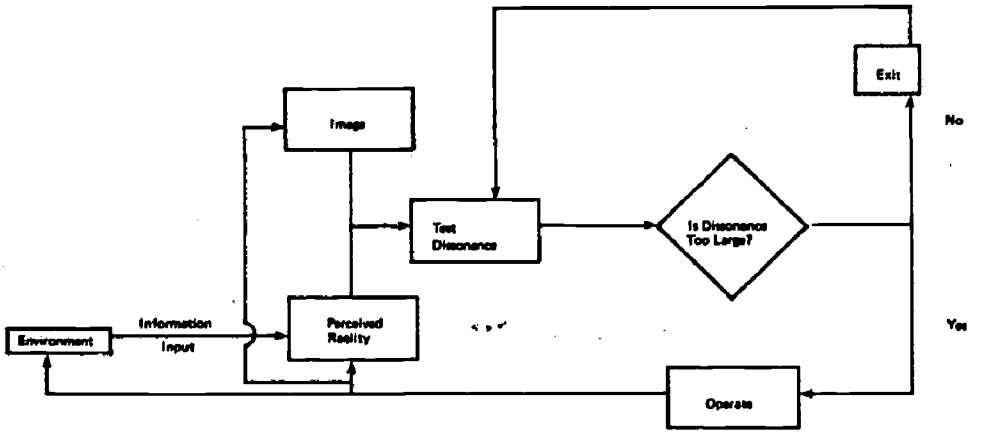

FIGURE 6. The TOTE model of behavior.

The initial choice of action is based upon past successes and failures; that is, upon past reinforcement of behavior under similar circumstances. Although Miller and associates do not make the connection, expectancy theory could be integrated into the model at this point. Expectancy theory could explain the current choices of behavior, while reinforcement theory explains how the valences and expectancies came to be learned. The TOTE model is a very general and powerful model which integrates learning, decision making, information processing, and behavioral control and modification. Hilton's adaptation is diagrammed in Figure 7 (Hilton 1962).

Hilton's stored premises correspond to the TOTE model's image; his accept tentative plan corresponds to exit; all the boxes, except test dissonance, are elements of the TOTE model's operate.

The occupational decision-making process is initiated by input from the environment which raises cognitive dissonance above a threshold of tolerance. For example, a high school student's parents might tell him/her it is time to decide what he/she wants to be, or he/she may have to choose between a vocational or college-preparatory program. The individual may either make a tentative change in his/her premises, or make a tentative occupational decision, or both. When the test of the tentative decision or change results in reduced dissonance, the change or decision is accepted. As long as dissonance remains high, he/she continues to search for new alternatives.

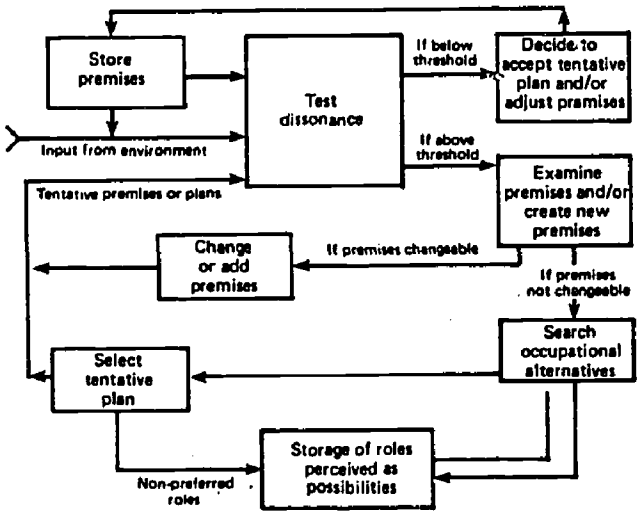

FIGURE 7. Hilton's career decision-making model.

Hershenson and Roth's decision process model. Hershenson and Roth (1966) propose a somewhat different logic-flow type of theory. Occupational decision making is seen as a process of ever-narrowing alternatives combined with ever-increasing certainty about the choices. They propose four principles by which this process takes place:

1. Each vocationally relevant decision limits the range of possible subsequent experiences for the individual.

2. As the range of experiences becomes narrower, the range of alternatives open to him/her becomes narrower.

3. As the range of alternatives becomes narrower, the individual becomes more focused on a given course through one or more of the following causes:

   a. positive choice
   b. adaptation to existing conditions
   c. ignorance of other possibilities
   d. inability to shift to other alternatives

4. The more focused on a given course the individual becomes, the more likely it is that he/she will perceive or structure future events as consistent with that course, thus reinforcing it (Hershenson and Roth 1966). The process is presented graphically in Figure 8.

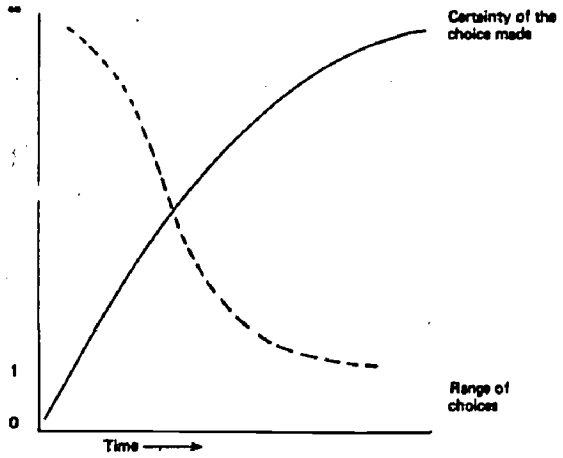

FIGURE 8. Hershenson and Roth's decisional process model.

The range of alternatives may sometimes be narrowed prematurely, as in Figure 9.

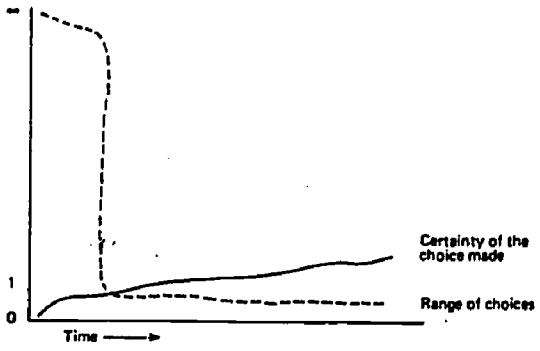

FIGURE 9. Decisional process illustration of premature decision making.

In this case, the certainty of choice tends to remain rather low. This can happen when an occupational decision is made because of environmental pressure and the individual has little commitment to it.

Commentary

Expectancy theories should be fairly easy to test empirically. The theories are relatively simple and straightforward, the predictions made are clear, and only a few variables are involved; these can be operationalized in a number of ways. Vroom (1964) suggests six ways to operationalize valence--verbal reports, analysis of fantasy, rate of change in response probability, choices made among alternatives presented, consumatory behavior, and decision time. As measures of expectancy, he suggests both verbal reports and observed probability of behavior under conditions of constant valence.

The logic-flow models of occupational decision making have not stirred much excitement among those interested in occupational decision making. The only commentary the authors are aware of is that of Jepsen and Dilly (1974), who conclude that there is not much to be said about them because they are not clearly defined and there is not sufficient research evidence to evaluate them. (Their comment actually was applied to all information-processing models, but the authors do not agree with their conclusions as regards expectancy models.) It does appear that the major problem is the highly speculative nature and lack of operational definition of the logic-flow models. However, this is true only of the models as applied to occupational decision-making. In the general behavioral realm, there is considerable, though indirect, evidence in support of the Miller et al., TOTE model (Hunt 1960; Miller, Galanter, and Pribram 1960), of which Hilton's model is an adaptation. Operational definition, though not easy, can be achieved. It should be possible, for example in an experimental situation, to give subjects a certain psychological set and then give them varying degrees of discrepant information. In any event, the model has the potential of being a powerful framework for integrating different kinds of behavior theory and is well worth further development.

Learning Theories

Theoretical Framework

Background. Learning theories are those behavior theories primarily concerned with relationships between input and output.

In traditional learning theories, classical conditioning and operant conditioning, this emphasis is quite strict, the information-processing component being ignored. (Pavlov 1927; Hull 1943; Guthrie 1952; and Skinner 1938). These have been characterized as stimulus-organism-response (S-O-R) theories.

Learning theories have not, until very recently, been much applied to the problem of occupational choice. Miller (1968) presented an argument for the use of learning theory in understanding occupational decision making. His perspective is traditional stimulus-response (S-R) learning theory, and he views occupational decisions and the antecedent behaviors that lead to them as learned responses governed by such things as reinforcement, discriminatory stimuli, and S-R chains. He does not, however, present a formal learning theory of occupational choice. Ewens (1975) makes a similar argument, but takes a more cognitive learning perspective, along with some elements of expectancy theory and social-learning theory. He presents eleven postulates for a "behavioristic theory of career development."

Krumboltz's Social Learning Theory of Career Selection. Krumboltz's theory is the only well-developed learning theory of occupational choice (Krumboltz, Mitchell, and Jones 1976; Mitchell, Jones, and Krumboltz 1975). Like Miller and Ewen, Krumboltz views occupational decisions as being the end result of a lifelong series of learned responses. However, the social learning theory upon which Krumboltz's theory is based is far more cognitive and information-processing oriented. What gets learned are not just overt behaviors, but also cognitions (ideas, concepts, expectations, beliefs, and attitudes) and affect. Learning occurs not only through direct experience, but also through observation of other's experience, and vicariously by means of cognitive manipulation of symbolic representations of real events.

Four categories of behavioral influences are postulated: First, genetic endowment and special abilities, such as race, sex, intelligence, or musical ability; second, environmental conditions and events, such as number and nature of job opportunities, labor laws and union rules, technological developments, and the educational system; third, learning experiences, both instrumental and associative; and fourth, task approach skills that are viewed as strategies and abilities for coping with problems. The first two categories of influence originate outside the individual, but the last two are learned.

Three categories of consequences of learning experiences are postulated. The first are self-observation generalizations (SOGs). These are based on individual's observations of his/her performance, and are generalizations from or evaluations of that

behavior. For example, Roger, a seventeen year old white, male, high school student, is a good writer and a poor athlete. Based on his observations of his writing ability and his knowledge of American history, he concludes that he could never be as great a writer as Thomas Jefferson. A second category of consequences are task approach skills (TASs), which are defined in the previous paragraph. For example, Roger, from his observation that he is a good writer and bad athlete, considers going to law school. He speculates on the possibility of success in law school and decides to seek more information. A third category of consequences are overt behaviors or actions. The particular kind of action the theory is concerned with are entry behaviors, or overt steps in a career progression.

All of a person's learning experiences and the consequences thereof combine to produce the occupational decisions. "It is the sequential cumulative effects of numerous learning experiences affected by various environmental circumstances and the individual's cognitive and emotional reaction to these learning experiences and circumstances that cause a person to make decisions to enroll in a certain educational program or become employed in a particular occupation" (Krumboltz et al. 1976).

A series of theoretical propositions and illustrative hypotheses concerning the effects of positive and negative influences on performances, career decisionmaking skills, and entry behaviors is presented. These are essentially a restatement of reinforcement principles in a social-learning context.

Commentary

There appear to be no studies intended as a direct test of the theory, but a large number that provide indirect evidence. Krumboltz provides a list of eighty studies that he claims provide support for the theory. In addition, there are ninety-five data banks available which contain data bearing on the theory and which Krumboltz believes might provide evidence if subjected to secondary analyses.

Providing operational definitions could be a serious problem. The theory relies heavily on historical reinforcement experiences and complex interactions between them to explain career decision making at the current time. Obtaining historical self-report data from subjects is likely to produce only crude information. If experimental research is considered, some variables might be operationally defined and manipulated, but it is difficult to see how a large number of influences could be controlled over a long enough period of time to produce the necessary "sequential cumulative effects" that the theory demands.

A theory such as social learning theory that attempts to be sufficiently comprehensive to explain complex, real-life phenomena also makes any direct test of its propositions difficult. Support for the theory will most likely have to come from a gradual convergence of diverse evidence, no single bit of which will be very compelling by itself.

Trait-Factor Theory

Theoretical Framework

Trait-factor theory is the oldest of all theoretical viewpoints related to vocational choice. Explicitly, it is theory of vocational guidance, not choice; that is, it is theory about what careers people ought to choose, rather than what they do choose or how they choose it. A theory of vocational choice is, however, implied by its basic tenets.

Trait-factor theory is based on the psychology of individual differences. It has four basic propositions:

1. Individuals differ along a variety of dimensions (traits, factors), such as various aptitudes, abilities, interests, and personality dimensions. A person possesses these traits in some quantity that can be measured by some suitable assessment instrument.

2. Occupations differ along a variety of job requirement dimensions that can also be measured.

3. People will be most successful and satisfied when the requirements of the career they choose properly match their particular combination of traits.

4. People tend to gravitate toward those occupations for which their particular combination of traits makes them most suitable, although sometimes mistakes are made because of environmental pressures or faulty information about occupational requirements (Crites 1969; Williamson 1968; Katz 1963).

Trait-factor theory has not been explicitly articulated by any one theorist. It is, rather, a set of assumptions that have evolved over some ninety years through the writings of a number of persons concerned with differential psychology. Galton (1883) and J.M. Cattell (1890) were two of the pioneers in the measurement of human abilities. Parsons (1909) was the first to apply this work to the problem of vocational choice. Others who have made notable contributions to this approach are Hull (1928), Thurstone (1931, 1935), Allport (1931, 1946), Strong (1943), and Guilford (1954).

Commentary

Although the oldest and most long-lived of all viewpoints of vocational choice, interest in trait-factor theory has been waning as it has come under serious criticism. One of the major criticisms is not so much that it is wrong, but that it is insufficient. It is overly simplistic--it does not provide any mechanism by which individuals gravitate toward "correct" occupational choices. It is too static--it assumes that traits remain constant throughout life and can be known sufficiently early to allow long-range career planning. Further, it implies that behavior is determined largely by internal traits, or at least that traits are generalized tendencies to respond in certain consistent ways regardless of circumstances. It fails to consider the well-established phenomenon that behavior is often contingent upon external circumstances and events, a proposition nearly as old as trait-factor theory itself. The concensus of opinion at the present time about trait-factor seems to be that it is useful as a practical technique for vocational guidance, or as one aspect of a more comprehensive theory of vocational choice, but is inadequate by itself (Katz 1963).

The amount of research that has been done on trait-factor theory throughout the years is overwhelming (Williamson 1972; Welsh and Dahlstrom 1956; Duorak 1956). Much of it has been directed toward improving measurement of traits and occupational requirements, and determining the proper match between the two. Substantial effort also has been directed toward finding predictors of success in various occupations. A fair amount of work, has, however, tested the proposition that persons actually do tend to enter those occupations for which trait-factor theory would predict they are best suited. Because of the strongly empirical nature of the theory, it is relatively easy to determine what needs to be done to test its propositions, but very tedious to actually carry it out. The heavily multivariate nature of the theory demands complex statistical analyses and very large samples. The most ambitious project to data having implications for trait-factor theory is Project TALENT, which may very well have reached the point of diminishing returns in terms of size, complexity, and thoroughness. It may also provide the most definitive test to data of the trait-factor theory of vocational choice.

Conclusions

This chapter has defined the scope of the study and presented a review of several theoretical perspectives relating to occupational choice. The survey of theoretical perspectives provides the reader a convenient summary of alternative

viewpoints; it also is the basis for selecting a small set of theories for intensive review in succeeding chapters.

Five theoretical orientations are selected for detailed evaluation in chapters two through six. These are as follows:

Super's self-concept and career development work
Holland's personality trait theory
Status attainment theory
Economic theory of individual labor supply decisions
Decision Theory (Vroom and related material)

These selections represent a wide cross section of current work dealing with occupational choice. Super's and Holland's work represent contrasting viewpoints within vocational psychology and comprise two of the best known theoretical perspectives within vocational psychology. The status attainment research reflects contemporary sociological work on occupational mobility. Theory of individual labor supply decisions is based on micro-economic theory involving the relationships among price, income, and occupational choice. Finally, decision theory illustrates psychological thought outside of vocational psychology. Although this area is probably least thoroughly developed with specific reference to occupational choice, it does present psychological thought on the general process of choice irrespective of the object of choice.

Super's work is selected because of its wide influence in changing the orientation of vocational study from trait-and-factor approach to emphasis on developmental aspects of career encompassing self-concept. The influence of these ideas is too widespread to be ignored. Further, certain aspects of Super's theorectical viewpoint have stimulated empirical work, particularly self-concept theory and vocational maturity.

The work of Holland is examined because it has stimulated a substantial amount of empirical study and has been widely influencial in vocational psychology.

Status attainment theory is included because it contains a massive amount of empirical work and combines the traditional sociological viewpoint--that factors such as social class influence occupational choice--with a social psychological view--that interpersonal relationships strongly influence occupational decisions. Additionally, the theory is relatively easy to operationalize and is expressed in precise language of path analysis.

Although economic work has not led to very much empirical work regarding individual occupational choice, it presents a unique point of view that is expressed in a way to encourage

formal theory building. Economists use theory about individual labor supply decisions mostly to derive results for other variables of more interest in economic study, such as earnings functions and aggregate-supply behavior.

Finally, although only a small quantity of occupational choice theory has been based on decision theory, it states an explicit hypothesis about how choices are made and does it with enough precision to encourage further work.

The work in the next five chapters presents highly critical analyses of the five selected theories. These analyses serve two functions. First, each chapter is a relatively self-contained critique of one theorectical viewpoint. These critiques are intended to stimulate constructive re-evaluation of each theory. Secondly, in the final chapter the detailed evaluations in earlier chapters are considered a sampling of available occupational-choice theory and tentative generalizations are drawn regarding the need for further theory and research.

CHAPTER 2

THE VOCATIONAL DEVELOPMENT PERSPECTIVE OF SUPER

Eclecticism characterizes Donald Super's work regarding occupational choices. He draws on differential psychology, developmental psychology, sociology, and, to some extent, economics in formulating his major ideas about careers. As often happens when one attempts a broad coverage of a topic, however, much of Super's material lacks the specificity needed for rigorous empirical study. Still, Super makes several arguments that seem important in the study of occupational choice that are overlooked by the proponents of other viewpoints summarized in this volume.

The summary and critique of Super's work is organized into four sections. The first section briefly reviews trait-factor theory. Because Super often does write in sweeping generalizations, it is difficult to appreciate the importance of his vocational development viewpoint without a brief summary of the setting out of which his writings emerged; the summary of the trait-factor approach describes the setting. Section two reviews the theory, section three summarizes related empirical work, and the final section contains commentary on Super's work. Super is generally associated with two major themes: occupational choice is a development process, and self-concept is an important part of that process. Section two, therefore, is subdivided into one part addressing career development, and one subsection dealing with self-concept.

Background: Trait-Factor Approach

Until about mid century a fairly simple philosophy dominated vocational psychology and vocational counseling practice. The fundamental idea is stated in a classic statement by Frank Parsons:

> In the wise choice of a vocation there are three broad factors: (1) a clear understanding of yourself, your aptitudes, abilities, interests, ambitions, resources, limitations, and their causes; (2) a knowledge of the requirements and conditions of success, advantages and disadvantages, compensation, opportunities and prospects in different lines of work; (3) true reasoning on the relations of these two groups of facts (Parsons 1967: 5).

In Parson's view, the main counseling processes are defined by these elements. The counselor is to help individuals learn about themselves by administering tests and via interviews,

provide information about available work and help the client to draw accurate conclusions based on the information.

Parsons generally is credited with initiating the career guidance movement in general and the trait-factor approach in particular. The central concept of the trait-factor approach can be drawn from Parsons' prescription: match worker characteristics to the demands of the work.

The ideas propounded by Parsons have been broadly influential (see, e.g., Bell 1940; Williamson 1968; Crites 1969; Weinrach 1975; Paterson and Darley 1936; and Paterson 1949). For example, in 1940 Howard Bell published Matching Youth and Jobs in which he succinctly expresses the main theme of the trait-factor approach.

> To the extent that the individual succeeds in matching his aptitudes, abilities, and interests with the requirements and demands of his job, he may regard occupational adjustment as a fact in his personal life.
>
> The person who, as a worker, is a round peg in a square hole is neither happy nor productive (Bell 1940: 1)

While Parsons focuses on the process of counseling, Bell emphasizes what might be termed the structure of job placement; he advocated establishment of a national system, interwoven with active local organizations, to help youth learn about their capacities and interests, and about features of available jobs. To justify the system, Bell points to societal benefits that should result from matching individual traits to job demands.

> It is estimated that about 1,750,000 young people enter the national labor market every year. The extent to which each of them will make his maximum contribution to the general welfare will be determined in large measure by whether he succeeds or fails in finding the kind of work for which he is best suited (Bell 1940: 244).

An important assumption underlying the trait-factor approach is that people can, and do, make decisions in a rational manner. Edmund Williamson stands as an instrumental figure in development of the trait-factor viewpoint and techniques, having played a central role in forming the "Minnesota Point of View." Williamson is quite explicit about the rationality of human beings; he states "...I wish to be counted among those who have very strong prejudices in favor of 'man's' rational processes, in contrast with any intuitve capacity he/she might possess" (quoted in Weinrach 1975: 85).

The trait-factor viewpoint set in motion a sustained effort to develop objective measurements of individual traits and to

produce and distribute occupational information. Instruments such as the General Aptitude Test Battery (GATB), Differential Aptitudes Tests (DAT), and the Flanagan Classification Tests (FACT) reflect efforts to measure aptitudes. General intelligence tests such as the Wechsler or Stanford-Binet are also used. Personality tests include the Minnesota Multiphasic Personality Inventory (MMPI), the Kuder Preference Record, and the Edwards Personal Preference Schedule (EPPS). Interest inventories have also played an important role. Examples include the Strong Vocational Interest Blank (SVIB), the Minnesota Vocational Interest Survey, and the Strong-Campbell Interest Inventory.

Descriptive analysis of occupations has been even more extensive than the measurement work regarding individual traits. The fourth edition of the Dictionary of Occupational Titles (DOT), was published recently by the Department of Labor. The DOT contains information on industry, status group, worker function (data, people, things), etc. for 20,000 job titles. The Occupational Outlook Handbook is updated every two years by the federal government and contains information concerning jobs such as earnings, working conditions, training requirements, and employment outlook. In addition, private scholars have invested substantial time in occupational description (see, e.g., McCormick, Cunningham, and Gordon 1967; Holland et al. 1970; Holland et al. 1969; Roe 1956; Roe and Siegelman 1964; Hoppock 1967; and Shartle 1959).

In the past two decades, negative evaluations of the matching people-and-jobs viewpoint have multiplied. One of the earliest critiques indicated that trait-factor theory fails to account adequately for the dynamic aspects of vocational choices (e.g., Ginzberg et al. 1951; 1957; 1972; Super and Bachrach 1957. The essential point is that testing procedures and counseling methods associated with the trait-factor approach foster the impression that occupational choices are made over a short interval of time and are based on enduring personal traits and job features. In contrast, developmental theorists such as Super continue to argue that vocational development is an ongoing process that continues throughout one's life span.

Although Super reacted strongly against the static conception of occupational choice which dominated vocational psychology and vocational counseling at the time of his early writing, he was heavily influenced by the trait-factor approach: "How can people select jobs that match their personal characteristics in such a way that vocational adjustment is optimum?" Super claims that this match occurs over an extended period and describes a framework by which the matching process can be studied. In contrast, much of counseling practice prior to the 1950s did not recognize the extended process required to effect a proper match.

Overview

The breadth of Super's eclecticism is reflected in a set of ten propositions set forth in an early paper. Although these propositions are often quoted, they bear repeating here for two reasons. First, they give an excellent overview of Super's viewpoint. Secondly, they forecast most of the important themes contained in his later writing. These propositions are as follows:

1. People differ in their abilities, interests, and personalities.

2. They are qualified, by virtue of these characteristics, each for a number of occupations.

3. Each of these occupations requires a characteristic pattern of abilities, interests, and personality traits, with tolerances wide enough, however, to allow both some variety of occupations for each individual and some variety of individuals in each occupation.

4. Vocational preferences and competencies, the situations in which people live and work, and hence their self concepts, change with time and experience (although self concepts are generally fairly stable from late adolescence until late maturity), making choice and adjustment a continuous process.

5. This process may be summed up in a series of life stages characterized as those of growth, exploration, establishment, maintenance, and decline, and these stages may in turn be subdivided into (a) the fantasy, tentative, and realistic phases of the exploratory stage, and (b) the trial and stable phases of the establishment stage.

6. The nature of the career pattern (that is, the occupational level attained and the sequence, frequency, and duration of trial and stable jobs) is determined by the individual's parental socioeconomic level, mental ability, and personality characteristics, and by the opportunities to which he is exposed.

7. Development through the life stages can be guided, partly by facilitating the process of maturation of abilities and interests and partly by aiding in reality testing and in the development of the self-concept.

8. The proces of vocational development is essentially that of developing and implementing a self concept; it is a compromise process in which the self concept is a product of the interaction of inherited aptitudes, neural and endocrine makeup, opportunity to play various roles , and evaluations of the extent to which the results of role playing meet with the approval of superiors and fellows.

9. The process of compromise between individual and social factors, between self concept and reality, is one of role playing, whether the role is played in fantasy, in the counseling interview, or in real life activities such as school classes, clubs, parttime work, and entry jobs.

10. Work satisfactions and life satisfactions depend upon the extent to which the individual finds adequate outlets for his abilities, interests, personality traits, and values; they depend upon his establishment in a type of work, a work situation, and a way of life in which he can play the kind of role which his growth and exploratory experiences have led him to consider congenial and appropriate (Super 1953: 189-190).

Propositions one, two, three, and ten reflect the influence of trait-factor theory. The first three indicate that, within some degree of latitude, personal characteristics of incumbents must be matched with job requirements, and proposition ten states that vocational adjustment is optimum when close matches are made. Even the first three propositions show some change in emphasis when compared to trait-factor theory; however, they emphasize that appropriate matches can be effected over a range of jobs and incumbents; although the ranges are limited, there is no single best job for most people as might be inferred from trait-factor theory.

The emphasis on the dynamics of vocational development is stated in propositions four, five, and nine.[1] The importance of self-concept is revealed in four, seven, and eight. Finally, recognition of the significant impact of variables beyond the individual's control is revealed in proposition six, which points out that parental status, mental ability, and opportunities narrow the choices open to any person.

Without doubt, the major contributions of Super stem from his

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[1]Super uses interchaneably the terms vocational development and career developemnt; this practice is followed in the present volume.

writings about the dynamics of vocational development and about the role of self-concept in vocational decisions; hence, the remainder of this section is subdivided into discussions of the dynamics of vocational development and of self-concept.

The Vocational Development Perspective

The importance that Super places on the idea that occupational choice is dynamic is reflected in terminology that has come to symbolize the distinction between trait-factor theory and more recent work in vocational psychology. The symbolic importance of terminology is reflected well in distinctions between terms such as career and occupation (Super 1972: 14-16), or vocational choice and vocational development (Super 1957: 184-185). Following Shartle, Super defines an occupation as a set of similar jobs, while, career is defined as a sequence of occupations (Super 1972: 15). Clearly, the term career suggests a dynamic process that occurs over a life-span; whereas, the term occupation does not. Similarly, the term vocational choice implies (though it does not denote) a static outlook, but vocational development refers to change over time.

The emphasis on career development is associated with a recommendation to substitute career for occupational choice as a dependent variable (Super 1954; 1957; 1961; 1964; 1972). According to Super, this recommendation generates unusual methodological difficulties. While regression methods or discriminant analysis can be used to predict occupation at one time point, using a constellation of independent variables at an earlier time, they are not designed to predict a lifetime sequence of occupations. This type of application of statistical methods to predict occupation, as opposed to career, Super terms the actuarial method. In contrast to the actuarial method, he has suggested use of "thematic extrapolation" (Super 1957: 170). In thematic extrapolation, one uses clinical analysis to uncover fundamental themes in a client's vocational history and extrapolates these into the future. This suggestion is not proposed naively. In making it, Super cites Meehl's work showing the general superior accuracy of statistical over clinical methods of prediction. The claim is that since statistical methods for predicting a sequence of occupations are unavailable, alternatives must be sought.

While it is not true that statistical methods for projecting an entire career are unavailable, application of available methods has been tightly circumscribed. Still, it does seem that intensive exploration of methods such as Markov chains, difference equations, and differential equations holds more promise in the long run than clinical methods. Important work with the

quantitative methodology might include careful conceptualization to assure the model reflects the theory and predictive tests over relatively short segments of an entire career.[2]

Life Stages

The concept of vocational life stage is fundamental to the vocational development perspective of Super. A vocational life stage is a segment of one's lifespan during which certain tasks typically are accomplished. Successful accomplishment of tasks in one stage is important to success in later stages (Super 1954; 1957; 1963c; 1964; Super et al. 1957; Super and Overstreet 1960). Drawing on the work of Charlotte Buehler and others, Super and his associates propose five life stages. An overview of these stages is given in the following excerpt taken from the first monograph in the Longitudinal Career Pattern Study directed by Super.

1. Growth Stage (birth-14) Self-concept develops through identification with key figures in family and in school; needs and fantasy are dominant early in this stage; interest and capacity become more important in this stage with increasing social participation and reality-testing. Substages of the growth stages are:

   FANTASY (4-10). Needs are dominant; role-playing in fantasy is important.

   INTEREST (11-12). Likes are the major determinant of aspirations and activities.

   CAPACITY (13-14). Abilities are given more weight, and job requirements (including training) are considered.

2. Exploration Stage (age 15-24) Self-examination, role tryouts, and occupational exploration take place in school, leisure activities, and part-time work. Substages of the exploration stage are:

   TENTATIVE (15-17). Needs, interests, capacities, values, and opportunities are all considered. Tentative choices are made and tried out in fantasy, discussion, courses, work, etc.

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[2]Prediction of an entire career seems hopeless within the foreseeable future. In fact, such an accomplishment will probably never be achieved without continual readjustment of the prediction equation as a career progresses.

TRANSITION (18-21). Reality considerations are given more weight as the youth enters labor market or professional training and attempts to implement a self-concept.

TRIAL (22-24). A seemingly appropriate field having been located, a beginning job in it is found and is tried out as a life work.

3. Establishment Stage (age 25-44) Having found an appropriate field, effort is put forth to make a permanent place in it. There may be some trial early in this stage, with consequent shifting, but establishment may begin without trial, especially in the professions. Substages of the establishment stage are:

   TRIAL (25-30). The field of work presumed to be suitable may prove unsatisfactory, resulting in one or two changes before the life work is found or before it becomes clear that the life work will be a succession of unrelated jobs.

   STABILIZATION (31-44). As the career pattern becomes clear, effort is put forth to stabilize, to make a secure place, in the world of work. For most persons these are the creative years.

4. Maintenance Stage (age 45-64) Having made a place in the world of work, the concern is now to hold it. Little new ground is broken, but there is continuation along established lines.

5. Decline Stage (age 65 and on) As physical and mental powers decline, work activity changes and in due course ceases. New roles must be developed; first that of selective participant and then that of observer rather than participant. Substages of this stage are:

   DECELERATION (65-70). Sometimes at the time of official retirement, sometimes late in the maintenance stage, the pace of work slackens, duties are shifted, or the nature of the work is changed to suit declining capacities. Many men find part-time jobs to replace their full-time occupations.

   RETIREMENT (71 on). As with all the specified age limits, there are great variations from person to person. But, complete cessation of occupation comes for all in due course, to some easily and pleasantly, to others with difficulty and disappointment, and to some only with death (Super et al. 1957: 40-41).

In a later publication, Super (1963c) suggests some modification in the substages associated with the establishment stage; he relabels the trial substage "trial and stabilization," and the stabilization substage he renames "advancement." These new labels reflect Super's observation that trial and stabilization behaviors are very similar to each other.

Although the term life stage may connotate discrete jumps between stages, Super and his associates are quick to point out that vocational development is an ongoing continuous process. The behavior occurring in one stage grows gradually from tasks performed in previous stages (Super et al. 1957: 42).

The utility of the concept of life stage for research on career development is not clear from a cursory overview of the stages. Super (1957: 78-79) identifies six research questions associated with the life stages: (a) What is the sequence of events in the career pattern? (b) How do personal traits of individuals (e.g., intelligence, interests, aptitudes) affect the career pattern?[3] (c) How does an individual's view of self and work evolve over the life cycle? (d) How can study of the interactions among traits factors, job sequences, and self-perceptions be unified into a comprehensive model? (e) What are the important sex differences in career development? and (f) What factors explain the sex differences? These questions do not clarify the importance of the life stage concept very much, however, for how the concept of life stages bears on study of these questions is unclear.

There seem to be two fundamental problems with application of life-stage concept to quantitative research. First, the variables specifying life stages are inadequately defined. Secondly, the pattern of change in these variables that defines a life stage is not specified. These two difficulties resolve into a broader question--"How can one separate empirically one life stage from its adjacent life stages?" Until this question is answered in specific, operational terms, empirical research with life stages is not likely to progress very far. Super (1963c: 92) attempts to answer this question by noting that there are vocational tasks specific to each stage and these can be used to separate the stages. The tasks are not defined with sufficient precision to permit this procedure, however.

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[3]Career pattern is identified by Super (1957: 71), as the sociological equivalent of the psychological concept of life stage. As used here in the text and by Super, however, career pattern seems to imply the entire sequence of stages.

The life stage concept might contribute to scientific understanding of careers without empirical classification of individuals into life stages, if the concept can be used in the derivation of hypotheses that do not require measurement of life stages for their testing. This type of application of life stages, nevertheless, demands clear conceptualization of what separates one life stage from another, even if operational separation is not required. The conceptual distinctions between life stages offered by Super and his associates do not seem adequate to this task.

In spite of the lack of specificity in conceptualization of vocational life stages, informal observation suggests that the concept (life stage) does capture an important aspect of occupational choices not addressed by the other approaches studied in this volume (Holland's theory, status attainment work, economic work, and decision theory). For example, status attainment research in sociology deals with the entire lifespan of an individual, as does Super's writing. Recognition of the qualitative differences between different ages (same cohort) is noticeably lacking from this sociological work, however. Yet it is unlikely that an adequate model of the occupational life cycle can ignore some of the ideas associated with life stage theory.

In Super's writing, by far the most attention is given to the exploratory and establishment stages. A series of vocational development tasks are identified spanning these two stages. Tasks in the exploration stage are (a) crystallization of a vocational preference, (b) specification of a vocational preference, and (c) implementation of a vocational preference. The tasks faced in the establishment stage are (a) stabilization in a vocation, and (b) consolidation of status and advancement in a vocation (Super 1963c: 81). The tasks associated with the exploration stage may be interpreted as describing a gradual narrowing of one's occupational choice from broad preferences to selection of a specific job. Crystallization of preference refers to development of somewhat vague ideas about the type of work with which one might be satisfied; crystallization occurs during the early and middle teen years. Specification of preference denotes a narrowing down of the jobs under active consideration to a specific few. Finally, implementation is the process of job application and other activities associated with labor market entry.

For the most part, status attainment research in which high school aspirations are used as independent variables predicting occupational prestige of adults ignores these distinctions. Yet it seems obvious that measurements taken while the respondent is crystallizing a preference will not predict later attainment as accurately as measurements taken during late specification of a

preference. Similarly, whether the occupational attainment variable is measured during stabilization or consolidation is probably important. Predictive accuracy is likely to be higher if attainment is measured after consolidation than if it is measured during stabilization, since job shifts are more frequent during the early period. The sociological work needs a model that accommodates these distinctions. While Super's work does not supply such a model, it does provide a description that can be used for developing such a model. The problem with adapting the tasks for use in a model is that the tasks are defined only in broad terms. For example, how does one distinguish between crystallization and specification, or are these two points on a single continuum? Similarly, what are the distinguishing features of stabilization as opposed to consolidation?

Vocational Maturity

Nowhere is Super's tie to vocational counseling more prominent than in his work on vocational maturity. The motivating factor in this work is to identify ways to help in the counseling process (e.g., Super 1974: 9). There are two ways in which assessment of vocational maturity may enter into counseling. First, measurement of degree of maturity can indicate whether an individual or group is ready to benefit from, say, vocational exploration or vocational training. Secondly, manipulation of maturity may help to improve vocational adjustment in later life. This point is, perhaps, implicit in Super's writing, but is quite explicitly stated by one of Super's students (Crites 1974: 31).

Super defines vocational maturity as a point on the continuum of vocational development (Super 1957: 186; Super et al. 1957: 55). In operational terms, vocational maturity is tied to life stages and developmental tasks; there are two such definitions. Vocational maturity I (VMI) refers to the life stage in which an individual is classified as compared to the life stage of others in the same age cohort. Vocational maturity II (VMII) is based on the vocational development task with which an individual is currently dealing, compared with his/her peers (Super 1955; 1957; 1963c; 1974; Super et al. 1957; Super and Overstreet 1960). Empirical work of the Career Pattern Study is based on the second definition.

In early theoretical writing Super and his coworkers (Super 1955; 1957; Super et al. 1957) defined five dimensions of VMII. These are listed and defined below.

1. Orientation to vocational choice refers to one's recognition of the need for choice, degree of utilizing school, home, and community resources relevant to

vocational choices, and amount of occupational information.

2. Information and planning about preferred occupations refers to the amount of knowledge about the occupation(s) for which one has some preference.

3. Consistency of vocational preferences refers to the degree of similarity between the several occupations for which one expresses some attraction.

4. Crystallization of traits refers to the degree to which an individual's intelligence, aptitudes, interests, attitudes, and values are differentiated from the same traits in other people.

5. Wisdom of vocational preference refers to the degree to which one's occupational aspirations are in line with abilities and available opportunities (paraphrased from Super et al. 1957: 60-62).

Wisdom of vocational preferences is viewed as the culmination of the other dimensions. By implication, wisdom of preference is improved to the extent that one is cognizant of the need to choose, acquires vocational information, develops consistent vocational preferences, and crystallizes personal traits (Super et al. 1957: 62).

Although empircial work later led to modification of these dimensions, their content reflects the pervasive theme implicit in Super's writing--how can vocational counseling be improved to promote vocational adjustment?

Vocational adjustment means degree of satisfaction the individual derives from work and the sources with which one performs the work. A definite causal connection between vocational maturity and vocational adjustment can be inferred from Super's five dimensions of maturity. Certainly, it is easy to picture wisdom of vocational preferences as being related by a positive function to vocational adjustment, and since the other dimensions of maturity, by hypothesis, affect the wisdom of preferences, maturity evidently affects adjustment. This idea is explicit in several instances (e.g., Super 1957; 1974; Super, Kowalski, and Gotkin 1967). A passage from one of the more recent writings of Super is particularly informative:

> ...adjustment is appropriately defined as the outcome of behavior, i.e., in terms of success and satisfaction. Maturity is best defined as the repertoire of coping behavior leading to outcomes, compared with the behavioral repertoire

> of the peer groups, thus making it a developmental rather than an outcome construct. The degree of maturity attained by an individual determines, in part, his adjustment, for adjustment requires an appropriately developed behavioral repertoire for satisfactory outcomes; at the same time, adjustment is a determinant of maturity, for adjustments made in the past facilitate or impede the development of new modes of behavior appropriate to new life stages (Super 1974: 11).

The causal imagery is present clearly in this passage--in fact, a two-directional feedback loop is postulated. Maturity affects adjustment which, in turn, affects maturity. Also, one detects a definite shift in emphasis regarding the definition of maturity. Whereas the original definition states that vocational maturity is a point on the continuum of vocational development--the definition offered here nearly identifies vocational maturity with whatever influences vocational development--it is "...the repertoire of coping behavior leading to outcomes."

The theoretical construct of maturity has generated substantial efforts to develop vocational maturity scales that can be used in empirical research and as a technical tool to assist vocational counseling (e.g., Super and Overstreet 1960; Super and Forrest 1972; Forrest and Thompson 1974; Crites 1971; 1974; Gribbons and Lohnes 1968; Westbrook and Mastie 1974). The scales have also been used as short-run outcome measures in lieu of longitudinal work (Forrest and Thompson 1974). These scales have been evaluated via standard psychological tools for assessing tests, e.g., internal consistency, test-retest reliability, construct validation, criterion validation, or factor analysis.

The advisability of such efforts, however, must be doubted. If the ultimate application is to promote vocational adjustment, then it seems that one must learn what factors affect vocational adjustment. Generating knowledge of the causes of adjustment requires lengthy basic research. First, one must develop accurate measurement of the components of adjustment--vocational satisfaction and success. This is no easy enterprise (see, e.g., the review by Thurman 1977). Secondly, measures of independent variables must be constructed. Finally, in the absence of a controlled experiment, one is left with few systematic alternatives other than structural equation models reflecting hypotheses about, say, variables during the exploration years that affect adjustment, say, during the establishment stage. Those independent variables over which individuals have some control and that also influence adjustment could then be defined as maturity variables and individuals' scores on such variables interpreted as degree of maturity.

Assuming that such a program had been carried out, and that it had been discovered that occupational information, for example, is positively and monotonically related to adjustment, after controlling for factors such as intelligence, parental status, school grades, etc., then one might argue that research supports expenditure of resources to increase occupational information. Of course, many would argue on the basis of common sense that it is desirable to increase occupational information (the present writers among them).[4] The point is, however, that scaling methods such as factor analysis and reliability tests, as used in the construction of vocational maturity scales have little bearing on determination of the causes of adjustment; thus, it is difficult to justify using vocational maturity scales, so constructed, as diagnostic tools in vocational counseling aimed at promoting vocational adjustment.

This argument regarding the application of vocational maturity scales to counseling practice has a definite bearing on theoretical work. Super's writings about the dimensions of vocational maturity, for example, may be viewed as a fruitful source of ideas about the determinants of adjustment, and these ideas can be written into structural equations expressing the hypotheses. Consider the remarks about independence of work experience of teenagers offered by Super and his associates in the first Career Pattern Study monograph (Super et al. 1957: 62). According to this argument, independence of work experience is one aspect of "crystallization of traits." Independence of work experience, itself, consists of several dimensions; these are: (a) degree of initiative displayed in obtaining work, (b) whether one works for family, friends, or strangers, (c) closeness of supervision on the job, (d) complexity of work tasks, and (e) duration and number of jobs. Independence of work experience is indicated by personal initiative in obtaining work, working for strangers rather than family or friends, lack of close supervision on the job, high task complexity, and long duration of work. By implication, all of these dimensions of independence affect vocational adjustment in later life.

To illustrate how Super's comments on vocational maturity may be built into a structural-equation model, a highly simplified example involving independence of adolescent work experience as

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[4]Even if the causes of vocational adjustment were unambiguously known (a big assumption), many would, undoubtedly question the desirability of promoting it (e.g., Bowles and Gintis, 1975). Economists, on the other hand, might argue that the market would generate a demand for occupational information if it were useful (and its usefulness were known).

one independent variable and vocational satisfaction as the chief dependent variable is presented. For the sake of simplicity, independence of work experience is treated as a single variable; it is assumed that a scale has been constructed from the five dimensions summarized in the preceding paragraph. This may or may not be advisable in a bona fide research setting.

Before proceeding with the model, it is necessary to discuss briefly the concept of satisfaction. There are a minimum of two ways to define vocational satisfaction with respect to a particular occupational dimension such as status, earnings, or self-direction on the job (on the last concept, see, e.g., Kohn 1977; Kohn and Schooler 1978). One way is to ask each respondent straight away, "How satisfied are you with (for example) the prestige your job gives you in the community?" A second method is to define satisfaction as the algebraic difference between aspiration and achievement. In this definition, aspiration refers to a goal that one hopes to obtain, and achievement refers to a past accomplishment. Although these terms often connotate occupational status, no such limiting connotation is intended here. In Super's work, satisfaction may refer to the discrepancy between a goal and a subjective experience--to the difference between one's self-concept and one's view of work. The terms aspiration and attainment as used here are general enough to accommodate Super's viewpoint.

A goal or aspiration, of course, is a mental state oriented to the future, and an achievement may encompass achievement of a subjective experience. Alternatively, one may visualize a two-step flow as follows: objective achievement ⟶ subjective interpretation. In this case, satisfaction could be viewed as the discrepancy between aspiration or goal and subjective interpretation of achievement. Whichever view is adopted, the results of the model to be presented apply. For simplicity, hereafter, we use the general terms aspiration and attainment as convenient shorthand.

Subtracting aspiration level from achievement level creates a variable for which negative values indicate dissatisfaction, and positive values denote satisfaction; the magnitude of positive or negative values measure the degree of satisfaction and dissatisfaction, respectively. Since the illustration is more interesting if the second definition is adopted, the difference measure is used. The results may indicate some useful considerations even in applications where operational procedures do not depend on difference scores for defining satisfaction.

Use of structural-equation models in occupational choice research is simplified considerably if occupations are scaled along some dimension. Although prestige scores or socioeconomic

status (SES) scores are routinely assigned to occupations, the present illustration is, perhaps, more pleasing if a measure of self-direction on the job is assigned to each occupation, since the chief independent variable is independence of adolescent work experience. Rough indicators of self-direction have recently been developed for the detailed census occupational categories, so this exercise is not as academic as it once might have been (Temme 1975).

For simplicity, the model assumes a linear form, but to insure some element of realism, three independent variables in addition to independence of work experience are included; these additional independent variables are measured mental ability (IQ), number of years of schooling, and self-direction of the father's occupation. A specific type of vocational satisfaction is posited--satisfaction with degree of self-direction on the job. A specific type of vocational goal or aspiration is also assumed: goal regarding degree of self-direction on the job. Finally, the first occupation attained by each individual after completion of schooling is assumed to be assigned a self-direction score. Thus, satisfaction regarding self-direction on the job is defined by the (signed) difference between self-direction of attained occupation and self-direction of the occupation to which one aspired prior to labor market entry.[5] Four equations are written to express the single idea regarding influences on satisfaction. The first equation treats satisfaction as the dependent variable, the second and third equations treat the components of satisfaction as dependent variables, and the last equation expresses the identity that satisfaction is defined as attainment minus goal.

With these preliminary comments, consider the following highly simplified model.

$$(1a)\quad SAT = a_o + a_1FO + a_2IQ + a_3SCH + a_4IND + u_1$$

$$(1b)\quad ASP = b_o + b_1FO + b_2IQ + b_3SCH + b_4IND + u_2$$

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[5] A more complete model, of course, would define satisfaction as the difference between current attainment and current level of aspiration. Current aspiration could, in this case, be written as a function of past aspiration (and other variables). The illustration in the text is equivalent to the assumption that aspiration remains fixed; if the aspiration measure is taken just before employment, and attainment taken just following employment, this may be a good assumption. In other cases it would not apply.

(1c) $ATT = c_o + c_1FO + c_2IQ + b_3SCH + b_4IND + u_3$

(1d) $SAT = ATT - ASP$

where

SAT = satisfaction with the degree of self-direction on the job

ASP = level of self-direction of the job to which one aspires

ATT = level of self-direction of the first job attained after completion of schooling

FO = level of self-direction of father's occupation

IQ = measured mental ability

SCH = number of years of schooling

IND = degree of independence of adolescent work experience

a_j, b_j, c_j = (regression) constants

u_k = disturbance or error measures

While the first equation expresses the basic idea--that, ceteris paribus, independence of adolescent work experience affects satisfaction with self-direction on the job--the equation is difficult to interpret without the other three equations. It seems plausible to assume that satisfaction is related as a positive function of the independent variables in equation (1a) i.e., $a_j > o$, $j = 1, \ldots, 4$), but more careful analysis may generate some doubt about this. Subtracting equation (1b) from (1c) for all observations, setting $u_1 = u_3 - u_2$, and using (1d) yields the following result: $a_j = c_j - b_j$, all j.

Referring to the effect of independence of adolescent work experience (IND) as an example, one sees immediately that the effect of IND on satisfaction (SAT) is a composite of the effects of IND on attainment (ATT) and on aspiration (ASP). Clearly, only if the effect of IND on attainment is greater than its effect on aspiration will the composite $a_4 = c_4 - b_4$ be positive (assuming b_4 and c_4 are both positive). In fact, it seems likely that the effect of IND on ASP exceeds its effect on ATT, so that IND might very well exhibit a negative relationship with SAT ($a_4 > 0$). In any case, it appears likely that none of the effects on SAT will be large, since each is a difference between two other effects which are presumable positive. This result is likely to be obtained irrespective of whether the

operational definition of satisfaction is given as a difference measure or as coded responses to a question inquiring directly about satisfaction, since responses to such "satisfaction" questions probably are based on respondents' perceptions about discrepancies between desired and achieved outcomes.[6] A useful insight is gained from this analysis. Any variable exhibiting a strong influence on satisfaction is likely to affect aspiration and attainment in opposite directions. Such a variable is difficult to conceive; alteration of the model may be more productive.

The discussion of vocational maturity has been quite lengthy because of the conceptual confusion which, in the present authors' view, surrounds the idea, not only in Super's writings but in related publications. A brief summary of the argument presented in the preceding pages follows. First, the definition of vocational maturity is ambiguous, some discussions define it as a point along a continuum of vocational development; other discussions come close to identifying maturity with factors that affect vocational adjustment. The implications of much of Super's work seem to be that the primary reason for interest in maturity stems from the second conceptualization. Secondly, if maturity is closely associated with, or defined by, variables that influence adjustment, then study of maturity should rely more on methodologies designed to study cause and effect relationships (such as path analysis) and less on the construction of vocational maturity scales using internal consistency evaluation criteria. Finally, it was observed that Super's work on vocational maturity, despite the conceptual difficulties, may serve as a source of hypotheses regarding factors that generate vocational satisfaction, and an example of a path model drawing on Super's writing was presented. The example points out the care that must be taken in constructing and interpreting models of vocational satisfaction (satisfaction taken as an element of adjustment). Satisfaction is probably the difference between attainment and aspiration; this fact must be built into models involving satisfaction.

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[6] In a dynamic model of satisfaction it would be important to study the path of movement over time of the two components of satisfaction--aspiration and attainment. In evaluation of vocational counseling, for example, whether the client achieves vocational adjustment by achieving or surpassing early aspirations or by gradually reducing high aspirations to meet achievement levels is an important consideration.

Vocational Adjustment

The concept of vocational adjustment was encountered in the previous subsection; in this subsection its meaning is examined in more detail. Although vocational adjustment is a general construct referring to the ultimate dependent variables in Super's thinking, it has not been the subject of the same amount of empirical investigation associated with vocational maturity. The last monograph in the Career Pattern Study series (Super, Kowalski, and Gotkin 1967) investigates numerous career behaviors at age twenty-five, including several variables conceptually close to vocational adjustment, but the investigation does not follow very closely earlier conceptual discussions by Super and his coworkers.

In his text, Super (1957) seems to identify adjustment with satisfaction--though no definition of adjustment is given. Super reviews the literature on job satisfaction, noting that job satisfaction has been divided into numerous specific referents such as satisfaction with earnings, independence, or hours. The discussion concludes by noting the desirability of classifying specific types of satisfaction into broad groupings such as satisfaction with work tasks, satisfaction with concomitants of work such as supervisory policies, social setting, and independence, and satisfaction with rewards such as pay and prestige.

A broader conceptualization is offered by Super and associates (1957) in the first career pattern study monograph. Here, a distinction is drawn between adaptation, adjustment, and integration. Adaptation refers to behaviors promoting "survival," adjustment behavior is tension reducing behavior, and integrative behavior or "integrative adjustment" refers to attainment of "...long-term socialized objectives with satisfaction for himself and benefit (or at least no harm) to society" (Super et al. 1957: 65). It is clear from the context that the ultimate interest of the authors is to promote integrative adjustment through promoting vocational maturity (see p. 68 of Super et al. 1957).

There persists substantial confusion with the concept of vocational adjustment and integrative vocational adjustment, however. Associating adjustment with satisfaction clearly identifies adjustment as an outcome. There seems little doubt that this is the intent, yet Super and associates (1957: 64-67) repeatedly refer to adjustment as behavior leading to satisfaction, thus implying that adjustment is an instrumental behavior reminiscent of the concept of maturity. Furthermore, adjustment may encompass both vocational satisfaction and vocational success (e.g., occupational prestige, earnings, etc., Super et al. 1957: 67). While there is no reason why adjustment cannot be

arbitrarily defined to include both success and satisfaction, it seems inadvisable to do so. First, since success and satisfaction are sufficiently complicated concepts, it appears that there is little to be gained by grouping them further into a larger category. Secondly, grouping them together probably tends to discourage careful reasoning about the causal relationships between them. As argued in the preceding subsection, it may prove useful to define satisfaction as the discrepancy between attainment (degree of success) and aspiration. Super and associates claim that success has a causal impact on satisfaction. If, however, satisfaction is, in part, defined by success, then the causal argument must be made with great care.

In conclusion, it is difficult to determine what the discussions of adjustment add beyond the concepts of satisfaction and success. If the distinction between vocational adjustment and vocational satisfaction and success cannot be drawn clearly, then it seems advisable to drop the term adjustment and concentrate on clear conceptualization of satisfaction and success.

Self-Concept

Emphasis on the importance of self-concept in vocational psychology probably is associated with Super more than with any other individual. Paradoxically, however, Super's theoretical work gives at least as much attention to other ideas as to self-concept, and the empirical work in the career pattern study does not address the effect of self-concept on career decisions. Until 1963, work on self-concept theory was relatively diffuse. With the publication of Career Development: Self Concept Theory (Super et al. 1963), however, the theory became considerably more detailed; but much work remains before the role of self-concept in vocational choices is thoroughly understood.

Before proceeding, it is useful to identify Super's definition of self-concept. He views self-concept as descriptions a person believes characterize him/her as an individual. This definition is contrasted by Super (1963b) to definitions such as those used by Tiedman that refer to evaluations of oneself. Self-evaluations comprise self-esteem; whereas, self-descriptions define self-concept.

The underlying theme in the self-concept theory is that agreement between self-concept and the demands of work roles promotes vocational adjustment. This point is quite explicit in the following passage taken from Super's text:

> Underlying all of these definitions of vocational satisfaction...lies the proposition that vocational

adjustment is a function of the degree to which an individual is able to implement his self-concept, to play the kind of role he wants to play, to meet his important needs in his work and career. This means self-realization (Super 1957: 300).[7]

Of course, there is more to Super's view of self-concept in vocational choices than this hypothesis, but much of the elaborations is related to it in fairly obvious ways.

In a later publication Super (1963a) collects previously published ideas on self-concept and organizes them into a systematic framework. Three elements of a comprehensive theory of self-concept and vocational behavior are identified. First, each individual gradually forms a self-concept through the processes of exploration, self-differentation, identification, role playing, and reality testing, this process is termed self-concept formation. Exploration refers to engaging in untried activities. These result in changed impressions of one's capabilities. Self-differentiation indicates development of clear distinctions between oneself and others. Identification means choosing some role models that one admires. Role playing refers to pretending that one is carrying out a role. Reality testing refers to checking hypotheses about one's nature against experience. Role playing is an important part of such experience. Self-concept formation occurs most intensively during childhood and teen years, but continues throughout life.

The second element of the self-concept theory refers to self-concept translation into occupational terms. This translation means to answer the question: How do my (self-concept of my) personal characteristics relate to occupations--for what type of work am I suited? The answer to this question arises through experiences such as identification with adult workers, job experiences, and careful investigation of personal and occupational characteristics. Two of Super's close associates, Starishevsky and Matlin (1963), postulate that people effect the translation by use of two vocabularies or languages--psychtalk and occtalk. Psychtalk consists of statements characterizing oneself on a psychological variable; occtalk relates oneself to occupations. The distinction rests in the nature of the predicate of the sentence; oneself or "I" is the subject of both psychtalk and occtalk sentences, but occupation is part of the predicate in

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[7]It is interesting to note the implication in this quotation that satisfaction (by virtue of being a component of adjustment) is defined by the discrepancy between aspiration and attainment.

occtalk, while psychological variables are part of the predicate in psychtalk. An example of psychtalk is: "I am good at explaining ideas." An example of occtalk is: "I am planning to be a teacher." The basic idea in the paper by Starishevsky and Matlin is that people translate between psychtalk and occtalk.

The value of the terminology introduced by Starishevsky and Matlin is not clear from their paper, but, if such terms are to be introduced, it is curious that the predicate of a sentence is selected as the focus of the conceptual distinctions, and the subject of the sentence is left unclassified. Certainly, the subject of sentences such as those analyzed by Starishevsky and Matlin could be an occupation as well as the pronoun "I." The distinction between self and occupation as the subject of the sentence may be at least as important as the distinction between psychtalk and occtalk. For example, a person might state (or think) the following psychtalk: I am honest, and the following description of an occupation: auto salespeople are dishonest. These descriptions about self and about an occupation would probably generate the following translation of self-concept into occtalk--I do not want to be a car salesperson.

The third and final element that Super (1963a) identifies as important to self-concept theory of vocational development is implementation of self-concept in selecting an occupation. Implementation refers to selection of an occupation or job that corresponds to one's self-concept. In the discussion of implementation Super (1963a: 14), makes a curious observation. By describing one example of a high-status professional implementing a self-concept entailing high self-esteem and a second example of a person with low self-esteem implementing his/her low opinion of self by taking an unskilled job, Super implies that satisfaction and adjustment may depend on a great deal more than how accurate a match can be found between one's self-concept and one's occupation.

In particular, Super's illustration implies that people may develop an abstraction that is sometimes termed "ideal self," namely that personality which one would like to become. The ideal self may differ substantially from the self-concept, viz, one's view of what one is, as opposed to what one would like to be. It seems likely that satisfaction is achieved to the extent that one's ideal self and self-concept match rather than, or in addition to, depending on a match between self-concept and nature of one's work. In this sense, the concept of self-esteem as employed by Super may also refer to a discrepancy between ideal self and self-concept and, thus, be closely related to satisfaction.

Although it is difficult to identify specific propositions with Super's theorectical discussions, for purposes of this monograph an effort to draw specific hypotheses about the influence of self-concept on occupational-choice variables appears worthwhile. From several sources it is possible to infer the following hypotheses (e.g., Super 1957; 1963a; 1972; Super et al. 1957).

1. There is a close correspondence between the characteristics of the occupation selected as a goal and the characteristics of one's self-concept ("translation").

2. There is a close correspondence between the characteristics of the occupation one attains and the characteristics of one's self-concept ("implementation").

3. The degree of correspondence between the characteristics of one's self-concept and the characteristics of one's occupational attainment affects degree of adjustment (satisfaction) by a monotonically increasing function.

4. The degree of vocational adjustment (satisfaction) affects the probability of changing jobs or occupation by a monotonically decreasing function.

Super also discusses at length the factors that generate self-concept during childhood and teenage years (e.g., exploration, identification, etc.), but in a volume focusing on occupational choice, hypotheses implied by these discussions need not be analyzed.

Cursory inspection of these hypotheses suggest a certain similarity between self-concept theory and the trait-factor approach proposed by Parsons. As noted above, Parsons advocated three steps in vocational counseling: (a) learn as much as possible about alternative occupations, (b) learn as much as possible about oneself, and (c) engage in "true reasoning" about the relationship between self and occupation in order to effect as close a match as possible. The closer the match, the better the vocational satisfaction. The idea of implementing a self-concept in one's occupational choice exhibits these same features--implementation means to choose an occupation with features resembling the features of oneself (Super 1957: 197).

What is the difference, then, between self-concept theory and trait-factor theory? There seem to be two important differences of emphasis. First, Super's self concept theory emphasizes the dynamics of choice; whereas, trait-factor theory does not. Since a thorough reading of Parsons reveals more sensitivity to the

dynamics of occupational choice than he generally is credited for, the vocational development movement probably represents a response to mid century guidance practices more than to Parsons. Super's text (1957) devotes one chapter to the interplay (feedback) between vocational behavior and self-concept at each stage in the life cycle. The idea of feedback is succinctly summarized by Super and his coauthors in the first Career Pattern Study text: "The self-concept is not only in part a product of social roles but also seems to be a major determinant of occupational role taking, that is, of occupational choice (Super et al. 1957: 47-48).

The second major difference between the hypothesis of self-concept implementation and trait-factor approach is implicit. Super implies more emotional content in selecting an occupation than is implied by trait-and-factor counseling. This point is succinctly expressed in a paper by Morrison:

> This process of matching self and occupational role is seen by Super to be central to goal setting and decision making at various choice points presented by the educational and prevocational environment of the individual. In contrast, the traditional test-oriented approach to vocational counseling assumed a much more rational decision making process and failed to incorporate emotional and unconscious elements in motivation (Morrison 1962: 255).

This type of implication in Super's writing suggests that he may be more interested in self-esteem than his emphasis on self-concept as self-description rather than self-evaluation might lead one to believe.

In addition to the discussions of relationships between self-concept and vocational behavior, Super (1963b) proposes an elaborate conceptualization of self-concept and related terms; this discussion is intended to promote development of operational measures of self-concept. Distinctions are drawn between several types of beliefs about oneself. Self-percept refers to an individual's observations regarding simple facts or characterizations of himself/herself. Self-concept refers to self-percepts that have "...acquired meaning and which have been related to other self-percepts" (Super 1963b: 18).

The self-concept system is comprised of several self-concepts; it is "...general and inclusive, the self-concept more specific and limited" (Super 1963b: 18). The vocational-self-concept is "...the constellation of self attributes which the individual considers vocationally relevant..."(Super 1963b: 19).

The precise distinction between self-percept, self-concept, and self-concept system is unclear. Distinguishing self-percepts having "meaning" from those without "meaning" seems difficult. Further, the reader is not informed about how or to what extent self-percepts must be related before they become self-concepts. Similar difficulties arise regarding distinctions in which self-concept system is one element in the pair being compared. In addition to ambiguities regarding the definitions of these terms, no clear hypotheses are advanced suggesting how the terms are useful in theory and research in which vocational outcomes are the dependent variables.

A set of "metadimensions" of self-concept and self-concept system is proposed. A metadimension is a variable describing some feature of another variable. For example, a variable may be defined by the dichotomy--belief in a deity vs. belief that no deity exists. A metadimension in this instance is illustrated by degree of emotional attachment to the belief regarding the existence of a deity. Super sketches a large number of metadimensions, but complete catalogue of these seems unnecessary here. An example of a metadimension of self-concept is certainty; it refers to the confidence in the accuracy of a given self-concept. The term regnancy exemplifies the metadimensions of self-concept system. Regnancy indicates the degree of emotional investment one has in a self-concept (system).[8] Brief commentary regarding possible methods of operationally defining each metadimension is offered by Super, and suggestive ideas about the effect of the metadimension on vocational variables are made. The exposition is in such general terms, however, that much work remains to be done before the metadimensions are likely to be useful in research. For example, concerning the metadimension "clarity," Super suggests the following hypotheses:

> Clarity of the self concept is a metadimension which may be expected to increase with age and to be related to intelligence and adjustment, but these relationships are still to be ascertained (Super 1963b: 26).

Suggestions for operationalizing clarity are stated in similarly broad terms; for example,

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[8]Although regnancy clearly is intended to describe self-concept systems (Super 1963b: 24, table 2) the discussion in the text (Super 1963b: 30) refers to regnancy of a self-concept --not a self-concept system.

> It may be possible to analyze this type of interview material [regarding respondents' self-concepts], and to devise measures of self-concept based on the specificity or sharpness of definition of adjectives volunteered in self descriptions, or on the ease with which they are produced by the subject, as indicated by some such measure as the ratio of self-descriptive terms to other subject words or to interviewer words (Super 1963b: 26).

While Super's writings as a whole do suggest useful propositions regarding occupational choices (see the list on page 63), the detailed distinctions made in the 1963 paper (Super 1963b) appear to require substantial work before they become very useful. First, the differences between self-percepts, self-concepts, and self-concept system are not drawn clearly, though the three terms are suggestive of the complexity involved. Further, just how these three terms enter into hypotheses in which career outcomes are predicted is unclear. Similar ambiguities surround the definitions of the metadimensions. Operational criteria are vague, and the relationship of the several conceptual distinctions to vocational-outcome variables is unclear. Of course, it is not necessary that operational criteria be devised in order for a concept to be useful. The notion of utility in economic theory is a prime example, but Super does not elaborate how terms such as clarity can be used to derive testable propositions as has been done so frequently with the concept of utility. Still, applications of formal reasoning in which some of the metadimensions enter without being subject to observation might be a useful strategy in dealing with self-concept.

Empirical Research

The scope of Super's writing is so broad that it is difficult to define clear boundaries separating relevant from irrelevant research. For purposes of this report, however, two areas of research are addressed; vocational maturity studies and self-concept studies. These two areas seem to reflect the most prominent research related to Super's theoretical writing.

Vocational Maturity Research

The basic theoretical prediction regarding the concept of vocational maturity is that maturity influences vocational adjustment--more mature individuals should exhibit more satisfactory adjustment. Testing this hypothesis requires a

carefully specified model in which specific measures of maturity make up the set of independent variables of primary interest. In addition, it is necessary to gather information on nonmaturity variables such as parental status, ability, grades, schooling, etc., and include them in the model as independent (or "control") variables. (Numerous technical discussions on the logic of causal influence in the absence of experiments are available. See, for example, Blalock 1964; Duncan 1966; Heise 1975; Duncan 1975; and Goldberger 1973.) No program of research such as this has been reported, although some of the needed data were collected during the Career Planning Study.

Two types of data regarding career maturity are available. First, the final monograph of the Career Pattern Study (Super, Kowalsky, and Gotkin 1967) reports numerous correlations between maturity variables measured during respondents' high school years and numerous vocational outcomes (some of which might be interpreted as vocational adjustment measures) taken when respondents were age twenty-five. Secondly, as noted in the previous section, a few vocational maturity scales have been developed and checked for internal consistency; some of these checks have been quite extensive (e.g., Crites 1974). As argued in the preceding section of this chapter, however, the scale development has only indirect bearing on the main hypothesis; hence, review of development of career maturity scales in this volume would lead too far afield.

The Career Pattern Study followed a long-term longitudinal design. Two samples were taken, one beginning when respondents were eighth graders and one when respondents were in the ninth grade. Both samples were all male, attended a small city school system in New York State in the early 1950s, and consisted of just under 150 respondents (see Super, Kowalsky, and Gotkin [1967] for a thorough description). Both samples were interviewed first while in grade eight or nine, again in the twelfth grade, three years after high school, and at age twenty-five. Response rates to the second and succeeding panels were unusually high. Also, Super and associates present demographic analyses to support their view that the sample is a reasonable cross section of a much larger population than small cities in the state of New York.

Fifteen vocational maturity variables measured at the first panel and seventeen measured during the senior year were used. These were selected from an original pool of sixty-two items by an unusual method. The sixty-two items were factor analyzed and factor scores created. Items loading high on the nine factors exhibiting good prediction to career behaviors at age twenty-five were selected. Correlations are reported between vocational

maturity items, as selected, and the career-outcome measures at age twenty-five. Four classes of vocational outcome measures are used: (a) career development scales, (b) type of vocational coping behavior, (c) demographic variables regarding employment history and education, and (d) characteristics of respondent's occupation. Career development scales include measures of judges' ratings about features of job shifts such as whether the shift permitted improved use of the subjects' abilities. The vocational coping behaviors are based on judges' ratings of whether the respondent's employment history exhibited floundering or purposiveness. The demographic variables include number of years of schooling, number of months unemployed, and number of months the subject was financially self-supporting. Finally, characteristics of respondents' occupations include occupational satisfaction scores, occupational prestige, and perception of opportunities for self-expression.

Correlation between the career maturity variables and the outcome variables uniformly were low. Enough were statistically significant for the authors to interpret relative importance of different maturity variables, but the number of correlations is so great that their patterns are difficult to summarize briefly; hence, interested readers are referred to the original source (Super, Kawalsky, and Gotkin 1967).[9] It is, perhaps, noteworthy that standard variables such as parental status, school grades, and IQ tend to correlate more highly in the Career

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[9] It is difficult to resist some comments on these efforts, however. The concept of career maturity seems so broad that one wonders about the value of developing a scale to measure vocational maturity--even when the global construct is divided into separate dimensions as is customary in this research. An alternative strategy is to use career maturity as a sensitizing construct to suggest specific hypotheses of cause and effect. Certainly as noted in the text, the theoretical writings of Super are replete with commentary and examples that might serve as useful springboards for such an effort. Still, one must concede that career maturity is not the only psychological construct of high complexity for which scales have been constructed; the work on intelligence testing provides a prominent example of such efforts. In the long run, of course, the preferred strategy in research must be judged by the results, and the results regarding vocational maturity certainly are not all accumulated yet.

Pattern Study data with career outcomes than the vocational maturity variables.[10]

Self-Concept Research

A massive quantity of research is available regarding influence of self-concept on various career behaviors. A complete review is far beyond the scope of this volume, but a brief summary is in order. Several studies deal with topics that are related loosely to the hypothesis that people select occupations that are congruent with self-concept, i.e., in choosing an occupation one "implements" self-concept. Bedeian (1977) found a positive correlation between self-esteem and status level of occupational aspiration among 144 male college students. In contrast, Faulkner, Wimberly, and Garbin (1977) found no such relation, but their sample consisted of junior college students with vocational curricula, so the range on their dependent variable is undoubtedly narrow. Ziegler (1973) reports closer agreement between self-concept and concept of most preferred occupation, than between self-concept and least preferred occupation. His sample consists of 428 male college students. Morrison (1962) reports data from forty-four first-year nursing students and forty-three first-year education majors. He found that both samples exhibit closer agreement between self-concept and concept of the occupation implied by their educational curricula than between self-concept and other occupations. On the other hand, Warren (1961) studied 525 National Merit Scholar candidates finding no tendency for those with low agreement between self-concept and concept of college major to shift majors more than those with close agreement.

Some studies show closer agreement between occupational choice and "ideal" self-concept than between realistic self-concept and occupational choice. Pallone and Hosinski (1967) report this result among 168 student nurses in their sample. Wheeler and Carnes (1968) found a similar outcome among male college students. Several studies suggest a statistical interaction between self-esteem and self-concept regarding impact on vocational choices. In these studies, the degree to which people implement their self-concepts in an occupation varies positively with the level of self-esteem, i.e., the higher the self-esteem, the higher the agreement between self-concept and characteristics of one's chosen occupation. Healy (1973) reports this result for a sample of one hundred male undergraduates.

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[10] An erratum in the Super, Kowalsky, and Gotkin volume (1967) indicated some data had been miscoded. Therefore, the comment in the text must be interpreted cautiously.

Korman (1969) reports four independent studies, all using samples of forty to seventy undergraduates, in which similar results prevail. Oppenheimer (1966) finds a positive correlation between self-concept and concept of preferred occupation to be positively related to self-esteem. On the other hand, Greenhaus (1971) fails to support this result.

This overview of empirical research using self-concept theory suggests several generalizations about this line of inquiry. First, most of the samples are small and highly specialized, generally consisting of college students. The restricted samples not only limit the generalizability of the data, but also probably tend to work against the major hypotheses, because the variance on dependent variables such as status of preferred occupation is quite restricted. Secondly, the analysis methods generally must be considered exploratory. It is common to report bivariate correlations or partial correlations controlling for one or a few variables (e.g., Bedeian 1977). Yet, a large research literature on status attainment processes (see chapter four) shows the importance of using multivariate statistical methods. The methodological discussions of causal inference (cited earlier in this chapter) in the absence of experiments also points out the importance of carefully constructed structural-equation models. Many of the correlations observed in these studies are low, suggesting that partial regression weights would not be statistically significant if variables such as grade point average, parental status, mental ability, and significant other expectations were controlled. For example, Tuckman and Ford (1972) present a multivariate model in which continuation of education for a sample of junior college students is the dependent variable. Controlling for variables such as college major, rank in high school class, parental desires, and father's educational level, the measure of self-concept regarding "mastery" over one's environment failed to exhibit a statistically significant effect. In addition, measurement of phenomenological variables such as self-concept and concept of occupation remains an unsettled issue, as witnessed by the variety of measurement procedures used in the self-concept studies (e.g., adjective check lists, Q sorts, and Kelly's Role Construct Repertory Test). In summary, much work must be completed before a clear description of the role of self-concept in occupational choices is supportred unambiguously by empirical research.

Commentary and Conclusions

It is clear that Super's work presents a vantage point on occupational-choice theory not supplied by other theories reviewed in succeeding chapters of this volume. It is far more phenomenological than Holland's theory, for example, and

emphasizes aspects of vocational choices other than occupational prestige and earnings. Further, especially the work on maturity presumes that individuals direct the course of their own careers far more than sociological viewpoints would admit. Finally, self-concept theory incorporates a type of cognitive balance or cognitive dissonance theory that appears to conflict with the basic incentive model offered by utility theory and decision theory.

The balance theory in Super's work derives from the view that occupations are selected to match (balance) attributes of the self with occupational attributes. An extended quotation from a paper by Abraham Korman is highly instructive in defining the difference between balance theory and incentive theory:

> The hypothesis advanced here (balanced hypothesis)...has some implications for other work behavior theories in comtemporary industrial psychology. In particular, it provides a possible explanation for the relative inability of traditional 'incentive' theory to account for considerable variance in work behavior. The basic logic of this theory is that individuals will be motivated to perform to the extent that an incentive which is generally agreed on as being desirable by most individuals is contingent on their work performance, and is attainable on the basis of such behavior. Such a theory implies a model of man which suggests that such incentives or rewards will have similar influences on behavior, if they have the same affective characteristics, and thus will serve as a similar incentive to behavior, independently of previous levels of performance and perceived appropriateness of the specified incentive. As suggested, such a model may not be a very accurate one, since it seems to imply man is self-enhancing and rational in the sense that he will try to attain what he thinks is most desirable, a hypothesis which is oversimplified at best (cf. Blumenfeld, 1965; Schletzer, 1966). This paper, on the other hand, argues that man is "consistent," not self-enhancing, hence the suggestion that in the industrial situation incentives as motivators of performance are circumscribed in their effects by their perceived appropriateness for the individual (Korman 1970: 34-36).

In spite of the interesting perspective contained in Super's writings, much of the conceptualization and most of the propositions are too broadly expressed to be translated easily into empirical research. First, the life stages are difficult to operationalize, and if they are not intended to be directly measured, it is not clear how they contribute to precise theory building. Nevertheless, informal observation suggests that life stages do characterize people's lives; the problem is how to

incorporate this observation into research. Secondly, the nature of vocational maturity is not stated clearly; at present, it seems that discussions of maturity might be viewed chiefly as sources for generating specific hypotheses related to the manner in which individuals shape the course of their own careers. Thirdly, conceptualization and measurement related to self-concept theory lacks the specificity needed to advance measurement and theory.

Methodology is often fairly primitive. Samples are small and specialized and analysis techniques seldom make use of a wide variety of available multivariate methods. While appropriate analytical methods are important, it may be premature to advocate widespread use of advanced regression methods (e.g., two-stage least squares, three-stage least squares, maximum likelihood full information) before problems involving conceptualization, measurement, and generation of specific, systematic hypotheses are tackled. It does seem likely, however, that careful use of mathematical concepts and mathematical reasoning could contribute to accomplishment of these three tasks. Expression of concepts in mathematical terms often clariries the concepts. Further, use of mathematical reasoning can sometimes be used to derive testable results from a set of postulates involving difficult-to-measure constructs. Thus, some of the phenomenological ideas may prove useful even if one never attempts their measurement. This strategy is missing in Super's writing and in much of the related literature. Certainly, application of mathematics to problems of conceptualization, measurement, and hypothesis generation is no cure-all, but, in view of the tremendous complexity of the subject material, it may be worth more effort than it has received so far. One very simple example of the application of mathematics to conceptualization of occupational satisfaction and hypotheses building is contained in this chapter. The result did produce rather interesting conclusions, viz, that variables most likely to affect satisfaction must be related to occupational aspiration in the opposite direction of its relation to occupational attainment.

CHAPTER 3

HOLLAND'S PERSONALITY THEORY

Background

As frequently noted, Holland's model of vocational choices is a comtemporary version of the trait-factor idea that people select jobs with characteristics matching their profiles of interests, capacities, and values (Crites 1969; Holland and Gottfredson 1976). Holland's work is highly theoretical, however, in contrast to the empirical orientation of most of the early trait-factor work (e.g., Strong's work on the Strong Vocational Interest Blank SVIB). At the same time, one of the chief features of the theory is the tie to operational procedures; consequently, empirical work based on the theory is voluminous--it includes a substantial quantity of work carried out by Holland and his colleagues as well as numerous studies done by other investigators.

Description of the Theory

Although, as with any theory, most of the key features of the Holland theory are rooted in earlier work, the theory does present a unique combination of earlier work. In very brief outline, it is hypothesized that, "in American culture" there are six personality types and six corresponding types of occupations. People gravitate to occupations that match their personalities. Numerous writers posit a relationship between personality and occupational choice (see Osipow 1973 for a review), and Roe, for example, proposed an occupational classification scheme using eight categories that approximate Holland's six categories of occupations. The distinctive feature of Holland's proposal is the creation of personality types to match the occupations (or environments, more generally). The widespread appeal of the theory is due probably, in large measure, to the simplicity of the hypothesis that persons of a particular personality type seek occupations of the same type. Most of the essential aspects of the theory and related empirical work rest on conceptualization of the six personality types and six environmental models (occupational types). The first subsection in this review of Holland's theory, therefore, describes the six types and comments on their conceptualization. The second subsection summarizes the "hexagonal" pattern that, according to the theory, characterizes the relationships among the six types. The hexagon is an important idea in the theory because some key hypotheses are based on it. A third subsection reviews the main hypotheses that are based on the six types in their hexagonal relationship. A final

subsection contains commentary.

Although the most recent comprehensive statement of the theory (Holland 1973) purports to be more explicit than earlier versions (Holland 1966, 1959), the theoretical presentation lacks the specificity needed to communicate a precise understanding of the definition of Holland's types; the operational definitions are required to be clear about the meaning of each type. The first section, therefore, addresses both the conceptual and operational definitions of the six personality types.

Conceptual Definitions of the Types

The theory stipulates six types of personality and six corresponding types of environment. The environments include occupations as well as other settings such as schools. The six types of personality and environment are characterized six adjectives--"realistic," "investigative," "artistic," "social," "enterprising," and "conventional"--each adjective refers to a category of personality and to a corresponding environment.[1] These theoretical publications describe the six types in detail (Holland 1959; 1966; 1973), and partial descriptions appear in numerous empirical investigations (e.g., Campbell and Holland 1972). The monograph entitled Making Vocational Choices (Holland 1973) presents the most authoritative statement, however, and the summary presented here is based largely on it.

Each of the types is described in terms of four umbrella concepts. These four concepts are activities, competencies, perceptions, and values. Each of the six types encompass all four of the umbella concepts. In addition, each type is characterized by a lengthy list of adjectives.

The realistic type.[2] A long list of activities and competencies describe the realistic personality. In Holland's words, the realistic person likes

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[1] In the original statement of the theory the acjectives were different but referred to essentially the same ideas. Listed in the same order as given in the text, the original terms are: "motoric," "intellectual," "esthetic," "supportive," "pursuasive," and "conforming" (Holland 1959).

[2] Holland (1973) often uses the term "type" to reference personality and the term "model" to reference environment. In this volume type references both personality and environment.

...activities that entail the explicit, ordered, or systematic manipulation of objects, tools, machines, animals, and an aversion to educational or therapeutic activities. These behavioral tendencies lead in turn to the acquisition of manual, mechanical, agricultural, electrical, and technical competencies and to a deficit in social and educational competencies (Holland 1973: 14, emphasis added).

Further, the realistic person perceives himself/herself as competent in mechanical and athletic pursuits and lacking in human relations skills. Concrete things such as money, power, and status are valued. The following list of adjectives describes the realistic personality.

asocial (shy)
conforming
frank
genuine
masculine
materialistic
natural
normal
persistent
practical
self-effacing
stable
thrifty
uninsightful
uninvolved

A realistic environment affords opportunities for realistic activities, i.e., "explicit, ordered, or systematic manipulation of objects, tools, machines, and animals" (Holland 1973: 29). Further, realistic environments contain a high proportion of realistic activities, competencies, and self-perceptions; it rewards those who value conventionalism, display of money, power, and goods. It fosters pragmatism, masculinity, conventionalism, preference for realistic occupations, and discourages skills in interpersonal affairs. Several adjectives describe characteristics reinforced in realistic environments.

conforming
frank
genuine
masculine
materialistic
normal
persistent
practical
self-effacing
shy
stable
thrifty
uninsightful
uninvolved

The investigative type. The activities and competencies defining the investigative personality are stated in the following terms by Holland. An investigative person likes

...activities that entail the observational, symbolic, systematic, and creative investigation of physical,

biological, and cultural phenomena in order to understand and control such phenomena; and an aversion to persuasive, social, and repetitive activities. These behavioral tendencies lead in turn to an acquisition of scientific and mathematical competencies and to a deficit in persuasive competencies (Holland 1973: 14, emphasis added).

An investigative person displays a self-conception characterized by scholarship, intellectualism, self-confidence, scientific ability, and lack of leadership ability. These views are his/her perceptions. Finally, investigative persons value science. A long list of adjectives describe investigative persons:

analytical	passive
cautious	pessismistic
critical	precise
curious	rational
independent	introverted
intellectual	reserved
introspective	unassuming
methodical	unpopular

An investigative environment offers opportunities for and demands "...observation and symbolic, systematic, creative investigation of physical, biological, or cultural phenomena" (Holland 1973: 30). These features are the activities and competencies. In addition, the environment rewards scientific values and fosters investigative self-perceptions. People in the environment become increasingly affected by abstract ideas, are attracted to investigative occupations, and tend to apply rational, analytic, and indirect methods to solving problems. The investigative environment contains a preponderance of investigative personalities. The environment reinforces several traits. These are described by the following adjectives:

analytical	methodical
cautious	passive
critical	pessimistic
curious	precise
independent	rational
intellectual	reserved
introspective	unassuming
introverted	unpopular

The artistic type. In describing the activities and competencies defining the artistic personality Holland notes the artistic type engages in

> ...ambiguous, free, unsystematized activities

that entail the manipulation of physical, verbal, or human materials to create art forms or products, and to an aversion to explicit, systematic, and ordered activities. These behavioral tendencies lead, in turn, to an acquisition of artistic competencies--language, art, music, drama, writing --and to a deficit in clerical or business system competencies (Holland 1973: 15, emphasis added).

The self-perception of artistic persons includes expressiveness, independence, lack of orderliness, and artistic and/or musical ability. An artistic person values esthetics. Numerous adjectives characterize artistic persons; these are:

complicated	impulsive
disorderly	independent
emotional	introspective
feminine	intuitive
idealistic	nonconforming
imaginative	original
impractical	

An artistic environment requires and provides opportunities for "...ambiguous, free, unsystematized activities and competencies to create art forms or products... (Holland 1973: 30, emphasis added). The environment is dominated by artistic personalities. The environmental setting stimulates artistic self-perceptions and fosters artistic values. The environment also tends to generate people who are influenced by emotions, people who prefer artistic occupations, and people who deal with other persons in unconventional, emotional, and personal ways. The artistic setting stimulates development of traits characterized by the following adjectives:

complicated	impulsive
disorderly	independent
emotional	introspective
feminine	intuitive
idealistic	nonconforming
imaginative	original
impractical	

The social type. The social personality is attracted to:

...activities that entail the manipulation of others to inform, train, develop, cure, or enlighten; and to an aversion to explicit, ordered, systematic activities involving materials, tools, or machines. These behavioral

tendencies lead in turn to an acquisition of human relations competencies such as interpersonal and educational competencies and to a deficit in manual and technical competencies (Holland 1973: 16, emphasis added).

The self-perception of the social personality includes helping others, understanding others, teaching ability, and lack of scientific and mechanical ability. Social and ethical activities are valued. The social type is described by several adjectives; these are:

ascendant	insightful
cooperative	kind
feminine	persuasive
friendly	responsible
generous	sociable
helpful	tactful
idealistic	understanding

The social environment displays opportunities for "...manipulation of others to inform, train, develop, cure, or enlighten.." (Holland 1973: 31). These factors characterize the activities and competencies in social environments. Further, the environment fosters self-perceptions and values of the social type. Social environments generate susceptibility to religion and humanitarian appeals and lead people to prefer social occupations. Friendliness and helpfulness is encouraged. Social personalities dominate social environments. Several adjectives describe personal traits that flourish in social settings; these are:

ascendant	insightful
cooperative	kind
feminine	persuasive
friendly	responsible
generous	sociable
helpful	tactful
idealistic	understanding

The enterprising type. One with an enterprising personality likes:

> ...activities that entail the manipulation of others to attain organizational goals or economic gain; and an aversion to observational, symbolic, and systematic activities. These behavioral tendencies lead in turn to an acquisition of leadership, interpersonal, and persuasive competencies, and to a deficit in scientific competencies (Holland 1973: 17, emphasis added).

Self perceptions include aggressiveness, popularity, sociability, confidence, leadership ability, speaking ability, and low ability in science. Political and economic pursuits are valued. The following list of adjectives characterize enterprising personalities:

acquisitive
adventurous
ambitious
argumentative
dependent
domineering
energetic
exhibitionistic
flirtatious
impulsive
optimistic
pleasure seeking
self-confident
sociable
talkative

An enterprising environment fosters several activities and requires several competencies. These are "...manipulation of others to attain organizational or self-interest goals..." (Holland 1973: 32). The environment contains a preponderance of enterprising personalities. Further, the environmental setting encourages incumbents to value enterprising activities and competencies and leads them to perceive that they have strong abilities in enterprising activities. People in the environment are influenced to react to social, emotional, and materialistic influences, come to favor enterprising occupations, and deal with other people via dominance and loquaciousness. Several adjectives describe personality traits that are fostered in enterprising environment:

acquisitive
adventurous
ambitious
argumentative
dependent
energetic
exhibitionistic
flirtatious
impulsive
pleasure seeking
self-confident
sociable

The conventional type. The conventional personality type likes:

> ...activities that entail the explicit, ordered, systematic manipulation of data, such as keeping records, filing materials, reproducing materials, organizing written and numerical data according to a prescribed plan, operating business machines and data processing machines to attain organizational or economic goals; and an aversion to ambiguous, free, exploratory, or unsystematized activities. These behavioral tendencies lead in turn to an acquisition of clerical, computational, and business system competencies and to a deficit in artistic competencies (Holland 1973: 17, emphasis added).

Conventional persons perceive themselves as orderly, conforming, having clerical and numerical competencies; they value business and economic success. Such people are characterized by the following adjectives:

conforming	orderly
concientious	persistent
defensive	practical
efficient	prudish
inflexible	self-controlled (calm)
inhibited	unimaginative
obedient	

Conventional environments offer several activities and demand several competencies, which are "...explicit, ordered, systematic manipulation of data, such as keeping records, filing materials, reproducing materials, organizing written and numerical data according to a prescribed plan, operating business and data processing machines..." (Holland 1973: 33). The environment is characterized by a high percentage of conventional personalities. Incumbents are encouraged to develop self-perceptions of clerical abilities to perceive the world in "conventional, stereotyped, constricted, simple, dependent ways (Holland 1973: 33). Conventional values such as money are fostered. People develop susceptibility to materialism, position, power, are attracted to conventional occupations, and tend to develop conventional relationships. The environment stimulates people to develop traits described by several adjectives; these are:

conforming	orderly
consciertious	persistant
defensive	practical
efficient	prudish
inflexible	self-controlled
inhibited	unimaginative
obedient	

Evaluation. The preceding summaries are very detailed and are a close paraphrase of Holland's own formulations. The definitions of the six types are the foundation of the theory; thus, it is important to present them in detail as a point of reference for the remainder of the chapter. In particular, the comments offered in this section rely heavily on the detailed definitions.

The definitions of the six types exhibit two outstanding features. First, they are not explicit enough to suggest immediately what operational criteria distinguish between them. The meaning of adjectives such as practical, curious, cautious, and

implusive is not specified, for example. Further, the reader is not informed whether a person or environment must exhibit all the defining traits or just some of them. Or, more accurately, the question to be answered is: "To what degree must each of the defining traits be manifest before a person or environment fits a given type?" Secondly, the definitions are composed of numerous dimensions, each of which is complex considered in isolation. For example, the realistic type is self-effacing, stable, thrifty, etc. It is easy to imagine multi-item scales to measure each of these concepts and difficult to imagine that any of the scales would be factorially "pure" or that the scales would correlate very highly with each other.

A complete list of the dimensions used to define the six types would be difficult to construct and would serve no useful purpose here. On the other hand, abstracting some of the critical dimensions may prove instructive. Accordingly, it is suggested that profiles on the following variables (dimensions) form important segments of the definitions: orientation to things (things), orientation to people (people), degree of task structure (structure), degree of physical strength (strength), degree of manual dexterity (dexterity), degree of creativity (creativity).

A profile for individuals or environments could, in principal, be created using these six dimensions; certain profiles could then be used to define the six types. For example, a realistic person likes things, does not favor extensive contacts with people, prefers high task structure, is strong, is intermediate on manual dexterity, and is not creative. Each of the six types can be described in a similar fashion as illustrated in the tabulation shown in Table 1. Table entries are: H=high, M=medium, L=low.

In each case the designation of magnitude refers to the degree to which the type exhibits, by definition, the trait in question.

It must be emphasized that the tabulated profiles are not represented as a comprehensive and precisely accurate reflections of Holland's definitions; rather, they serve two heuristic purposes. First, for each type, some of the profile codes (H, M, L) are difficult to determine from Holland's definitions; these are often given a code of M (medium). This difficulty in determining codes implies that the definitions may be incomplete. Secondly, the table contains only six distinct profiles, yet, with three codes and six dimensions there are 729 (3^6) possibilities. Why are there 723 (729-6) unused profiles? Does the theory imply that these are empirically empty, or what?

Table 1.

Use of profiles to define Holland's types.

	Things	People	Structure	Strength	Dexterity	Creativity
Realistic	H	L	H	H	M	L
Investi-gative	H	L	H	L	M	H
Artistic	M	M	L	L	H	H
Social	L	H	L	L	L	L
Enterpris-ing	L	H	M	L	L	L
Conven-tional	H	M	H	L	H	L

Holland identifies four additional dimensions that are completely crossed with the above six (and/or whatever other dimensions careful study of Holland's definitions might uncover). These four are activities, competencies, (self) perceptions, and values. "Completely crossed" means that one may be high, medium, or low with respect to the degree to which one (1) prefers activities using things, people...creativity, (2) is competent in situations involving things, people ... creativity, (3) perceives himself/herself as capable in activities involving people... creativity, and (4) values activities involving people... creativity.

Given these considerations, Holland's types appear very complex indeed. If, in addition to the above dimensions, one adds a dimension for each of the adjectives not already included, additional complications arise.

Of course, the use of the three discrete levels for the six dimensions can be generalized to continuous dimensions; in this case, profile scores could be substituted for the three codes (H,

M, L). If fact, conceptualizing the six dimensions as continuous probably is desirable.

Table 2.

Profiles of three "artistic" types.

	Things	People	Structure	Strength	Dexterity	Creativity
Musician	H	L	H	L	H	M
Painter	H	L	H	L	H	H
Author	L	M	L	L	L	H

Realization that the definitions of the types depends on profiles of several continuous dimensions suggests a certain lack of discriminatory power. For example, performing musicians, painters, and authors of nonfiction are all classified as artistic types. Yet these occupations probably exhibit important differences in their profiles, as illustrated in Table 2.

Some readers may quarrel with the specifics of these profiles, but it is doubtful that many would assign identical profiles to all three occupations.

It is important to recognize that one of the important claims that Holland makes for the typology is the parsimony introduced by imposing a classification composed of six types of personalities and environments. The question posed here, then, is: Does the parsimony achieved by the six-category typology justify the loss of discriminatory power implied by use of the typology? To date, no empirical tests have been executed to discover how much information loss is implied by using the typology rather than the continuous variables used to define it.

In the final analysis, the most important questions regarding the typology are: Do the several variables entering into the definitions of the types affect other variables and/or are they affected by other variables in the same way? If so, does the typology capture these cause and effect relationships? If the answers to these questions are yes, of course, the typology

serves a useful purpose; otherwise, it needs revision. At present there is substantial doubt about the answers to these questions. Although Holland's theory probably has stimulated more research than any other theory of occupational choices, none of the research is designed to test such questions. Even the preliminary step of carefully analyzing the dimensions of the types has not been carried out.

Operational Definitions of the Types

Due to the general language in which the six types are defined, understanding of the theory and associated research demands some knowledge of the operational procedures used to separate one type from another. In spite of the apparent ambiguities in the conceptual definitions, all operational definitions create classifications that identify each unit being classified (individual or environment) with a single type (or subtype), i.e., the empirical work achieves classifications that are mutually exclusive and exhaustive. Further, when used in empirical study, the classifications often produce results that agree roughly with the theory. The discussion is divided into four subsections. The first subsection reviews operational definitions of personality type, the second discusses classification of occupational environments, the third briefly reviews the Environmental Assessment Technique, and the last contains some commentary.

Classification of personalities. Holland is a pragmatist par excellence with respect to measurement. In typically flamboyant style, for example, Holland has responded to methogological criticisms of his procedures (Prediger and Hanson 1976) in the following terms:

> Finally, I would like to add my contribution to this psychometric literature: "Tested effects beat methods, or if it works, do it!" (Holland 1976: 355).

This attitude is prevelant in much of Holland's work completed long before the acriminous debate between Holland and Prediger and his colleagues developed.[3]

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[3]It is difficult to resist the opportunity to comment on Holland's psychometric advice. Taken in context, it resolves into a pleasingly succinct statement of construct validation. In this sense, the viewpoint must be applauded, but we hasten to add that Holland's view of what "works" does not always coincide with our own view.

Several methods for classifying individuals into a unique personality type are identified by Holland (1973). These include (a) assignment of the individual to the personality type corresponding to the type of the occupational environment that the individual prefers or in which he/she is employed, (b) assignment of the individual to the personality type corresponding to the type of some nonoccupation environment such as college major, (c) assignments based on Holland's Vocational Preference Inventory (VPI), (d) assignments based on Holland's Self Directed Search (SDS), and (e) assignments based on other interest inventories such as the Strong Vocational Interest Blank (SVIB) or the Kuder Preference Record. The first two methods depend on assigning individuals to types corresponding to the type of environment in which the person is located. Once the method of classifying environments is known, the personality classification is straightforward and needs little elaboration here; methods of classifying environments are summarized in succeeding subsections. The other methods require some explanation, but there is no need to review all methods that have been used; here, brief summaries of the Vocational Preference Inventory, the Self Vocational Interest Blank are provided. These three instruments probably include the most frequently used operations and provide a fair sampling of such techniques.

The Vocational Preference Inventory (VPI) has undergone numerous revisions (Holland 1958; 1965). All versions consist entirely of occupational titles to which respondents express interest or disinterest. The current version contains 160 titles; there are three possible responses to each title--yes, indicating the occupation interests the respondent, no, indicating no interest, and blank, indicating undecided.

Each of the occupations included on the VPI is classified into one of the six environmental types using largely subjective classification criteria. Respondents receive a profile of six scores. Each score is defined by the number of "yes" responses to occupations classified as one of the six environmental types. For example, if the types are arrayed in the following order: realistic, investigative, artistic, social, enterprising, and conventional (RIASEC), and a respondent receives the following profile: 15, 22, 15, 10, 8, 10, it means that the respondent checked 15 yes options on occupations classified as realistic, and 22, 15, 10, 8, and 10 yes codes on occupations typed as investigative, artistic, social, enterprising, and conventional, respectively.

The profile is used to classify each respondent into one of the personality types; the class corresponding to the highest profile score is the person's personality type. In the above

example, the person is investigative (I). Holland refers to the entire profile as the personality pattern (Holland 1973), but he seldom uses the entire profile in empirical work. Two and three level subtypes are used frequently, however, and in principal, six level subtypes may be constructed. The subtypes are defined by the rank order of the profile and assigned letter codes. The letter codes are R for realistic, I for investigative, and so forth. The letter codes are permuted to reflect the order of scores in the profile. For example, one who scored 8, 20, 10, 6, 3, 5 (RIASEC) would receive a two-level subtype of IA, and a three-level subtype of IAR. It never is explicit why this procedure is adopted in lieu of the more natural use of the profile scores directly in statistical analyses. Holland (1965) reports evidence that the VPI scales are reliable and valid.[4] Reliabilities range above .8.

Classifying individuals' personalities on the basis of their responses to an interest inventory is predicted on a fundamental assumption in the theory: Holland states repeatedly that interest inventories are expressions of personality (Holland 1966; 1973).

The Self Directed Search (SDS) was designed primarily as a practical guide to aid vocational choices (Holland 1971; 1972), but it has been used repeatedly to gather data used in research (e.g., Holland, Gottfredson, and Nafziger 1975; Holland and Gottfredson 1975; Touchton and Magoon 1977; Schaefer 1976; Fishburne and Walsh 1976; Horton and Walsh 1976).

The SDS is comprised of five sections with the following titles: "occupational daydreams," "activities," "competencies," "occupations," and "self-estimates" (Holland 1971; 1972); it is based on the theory. The "occupational daydreams" section requests that respondents list occupations that they have considered entering, in order from most to least recent. The title of the section derives from the fact that the instructions indicate to list occupations about which one has daydreamed as well as those discussed with others. As with all the sections, respondents are instructed to code their own answers into three-level subtypes. This is done by looking up the occupations listed by the respondents in an accompanying booklet entitled "The Occupations Finder." This booklet contains codes for numerous occupations.

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[4]There are eleven scales altogether drived from the VPI, but only the six associated with the six types are of immediate interest.

The "activities" section lists activities that are a priori associated with one of the six types. Activities in the instrument are grouped by type and clearly labeled as such, reflecting Holland's view that respondents should be informed about such matters. Responses are dichotomous--like or dislike. The "competencies" section follows exactly the same format, except that lists of activities are judged by respondents according to their perceived level of competency in each activity. Responses are dichotomous: yes (competent) and no (not competent). The "occupations" section lists occupational titles as in the VPI, but titles are grouped into types. The "self-estimates" section asks respondents for self-ratings regarding mechanical ability (realistic), scientific ability (investigative), artistic ability (artistic), teaching ability (social), sales ability (enterprising), and clerical ability (conventional).

Respondents are instructed how to generate three-level subtype codes for each section of the SDS and how to combine these into a summary code. The results then are used by the respondent, according to directions in the instrument, to help in vocational planning.

Reliabilities for each of the scales and subscales are uniformly of acceptable magnitude (mostly .7 and above, Holland 1971). Also, the SDS summary codes correlate with corresponding VPI scores (Horton and Walsh 1976; Fishburne and Walsh 1976).

The Strong Vocational Interest Inventory (SVIB) has been adapted by Campbell and Holland (1972) for generating measurements of each of Holland's six personality types. Two versions were developed, one consisting of fourteen items from the SVIB for each personality type and one consisting of twenty items from the SVIB for each personality type. The items consist primarily of occupational titles to which respondents indicate like, indifferent, or dislike. The long version generally is preferred because of increased reliability, but the short version has the virtue of containing no items not on the old version of the SVIB; thus only with the short version can the SVIB archival data be used.

The method of associating items with the Holland types is characterized by Campbell and Holland in the following terms: "The actual technique used here might be called 'informed, empirical, interactive intuition" (1972: 357). The authors make three points in defense of the method: (a) the intuition is well informed, (b) the psychometric characteristics are studied and found acceptable, and (c) several specific criteria are applied to promote quality, e.g., items are occupationally oriented, are without "ambiguity," represent a spread in response distributions, etc.

Internal consistency and test-retest coefficients are not reported by Campbell and Holland (1972), but they do report a large table calculated from the Strong archives showing that mean Holland scales (RIASEC) based on the Strong do differentiate men in different occupations according to the environmental type of the occupations.

Classification of Occupations. The occupational classification is a continuing process. In an early paper Holland (1966) used VPI scores of college students to classify a limited number of occupations; separate analyses by sex produced mildly differing outcomes. Since the method used in this early paper (Holland 1966) is repeated in later revisions, it is worthy of review. Large nonrandom samples of male and female college students were administered the VPI, and respondents were asked to name their vocational choices. VPI profiles were averaged across respondents (within sex) producing an average score on each of the six types for each vocational choice; these averages comprise the profiles for occupations. Three-letter occupation codes were then assigned to each occupation according to the rank order of the profiles--first letter corresponding to the environmental type with the highest mean VPI, and so forth. In a later study, Halland, Whitney, Cole, and Richards (1969) applied the same method to add more occupational titles to the classification; some of the classifications were based on adults as well as college students.

A major effort to classify all major occupations is reported by Holland, Viernstein, Kuo, Kuweit, and Blum (1970). This study combines previous VPI codes with adults as well as students, with information from work on occupational classification done at Purdue (McCormick, Jeanneret, and Mecham 1969). By combining factor scores on selected factors from the Purdue data with previous work, one or more profiles were developed for most of the important occupations in the U.S. The factors from the Purdue data were selected intuitively to measure five of the six Holland types (too few artistic occupations were available). Numerous occupations had conflicting profiles taken from different sources; these conflicts were resolved by "...a variety of numerical, clerical, and artistic strategies..." (Holland et al. 1970: 18). The current classification rests largely on this effort, but minor revisions continue (Holland 1973).

The occupational classification is based on three important assumptions. The first is that, according to Holland (1966; 1973), choice of an occupation is an expression of personality. Thus, VPI scores are personality scores. The second assumption is also fundamental to Holland's work; it is: people carry occupational stereotypes that are roughly accurate. Finally, it is assumed that characteristics of incumbents or those who aspire to

an occupation, form an essential element of the occupational environment.

In addition, Viernstein (1972) has developed two methods of combining the Dictionary of Occupational Titles (DOT) job profiles to classify the DOT jobs into Holland's three-letter types. Thus, all titles in the DOT can be classified. Holland has used these methods to extend the 1970 classification to a small number of additional titles (Holland 1973).

In each study, validation tests are presented. Viernstein (1972) reports fairly high agreement between her DOT codes and the Holland et al. (1970) results. Holland et al. (1970) report "good" discrimination between the six occupational types and thirty-two factors reported in the Purdue data. As is common with these reports, however, much depends on subjective judgments. For example, in order to test mean differences in factor scores across the six types, it was necessary to classify subjectively over 800 occupations into one of the six environmental types. Eighty-one percent agreement was achieved among the judges and discrepancies were resolved by discussion (Holland et al. 1970: 13). The criteria for such judgments are not explicit.

The Environmental Assessment Technique (EAT) is intended to classify a variety of environments such as colleges, businesses, dormitories, and so forth. The method consists of aggregating individual types for each environment and converting to percentages. The individual profiles may be generated by use of an instrument such as the VPI or SDS, by coding occupational aspirations of youth or occupations in which adults are employed. Types and subtypes are assigned to institutions using the institutional profiles in exactly the same manner as individual profiles are used to classify peoples' personality types and subtypes.

In the final analysis, the quality of the EAT rests largely on the quality of classification of individuals, but validation evidence has been reported showing persons in different environments differ in accordance with the theory (e.g., Astin and Holland 1961).

Evaluation. Most of the operational procedures rest on subjective assignment. Occupations listed on the VPI are assigned subjectively to one of the six types, then individual VPI profiles are aggregated across individuals to classify occupations not appearing on the VPI, later, individuals may be classified according to their type of occupation; so, a great deal of the structure depends on these subjective judgments. A need to make them explicit and develop training manuals for judges seems apparent.

An important theoretical hypothesis proposed by Holland (reviewed later in this chapter) indicates that people select occupations of a type matching their personality type. This hypothesis cannot be tested by indiscriminant choice of measurement methods. For example, if the VPI were used to establish personality type, and responses to an open-ended question asking for occupational aspiration were used to measure type of occupational aspiration, then a positive association would be interpreted as evidence favoring the hypothesis of congruence between personality type and occupational choice. In reality, however, the two measurements border on alternate forms of the same variable, since the VPI asks respondents to indicate which occupations they like and dislike.

This type of difficulty can be avoided by careful scrutiny of the measurement procedures; still, in the interest of avoiding such dangers and in the interest of conceptual precision, it does seem desirable to classify the instruments more carefully. Measurements based on preference ratings for a list of occupations and open-ended occupational aspirations/expectation measures should be viewed as such and not indiscriminantly labeled personality. Some of the subscales on the SDS (e.g., interests, competencies, and self ratings) might be better labeled personality measures. If one prefers, like Holland, to view all such variables as personality measures, then separation of the personality measures by type (e.g., occupational personality, interests, etc.) would still be useful. Such distinctions surely would promote clarification of the hypotheses and empirical work.

The occupational classifications are based on an unknown mixture of personality traits of incumbents and other on-the-job characteristics. Some of the occupations are classified with the VPI, reflecting personal environment, some are classified with the Purdue data, reflecting nonpersonal environment, some are classified by a combination of these two methods, and a few are classified from the DOT using Verinstein's methods. Thus, it is difficult to interpret the comparability and quality of codes assigned to different occupations.

Holland and his coworkers (1970) overlooked a useful opportunity to reexamine the basis for the six-category typology. The Purdue data which they used to extend the Holland classification contains thirty-two factors derived by the Purdue group from a factor analysis of several hundred occupations. If occupations can be classified into six groups, why did the Purdue data reveal thirty-two factors? What is the logical relationship between the factors and the six Holland types? If, as seems natural, the six categories are conceived as reflections of six continuous dimensions, then the Holland theory suggests that six

factors should (or five since few artistic occupations are contained in the Purdue data) be evident in a factor analysis of occupational data. In fact, Holland and associates do select factors from the Purdue data to measure Holland's types but do not comment on the implications of the fact that the data contain far more factors than the number of Holland types.

Probably the most puzzling aspect of the operational definitions is the use of profiles to assign units to discrete types; why not use the profiles directly? Holland does not discuss this question. In general, typologies discard substantial amounts of information contained in profile scores; it therefore seems incumbent on Holland and his colleagues to explicate the rationale for use of the typology in lieu of profiles. This is especially true in view of the fact that many of the important hypotheses in the theory can be directly transferred from the typology to a theory about the six continuous dimensions, each dimension corresponding to a type. In the final subsection of the review of the theory this topic will be raised again and discussed in some detail. At that time readers will profit from having previously reviewed the hexagonal model and the key hypotheses of the theory.

Relationships Among The Types: The Hexagonal Model

In early versions of the theory there were no formal distinctions drawn regarding the degree of similarity among the six types (Holland 1959; 1966). In 1969, however, Holland, Whitney, Cole, and Richards reported an update on the classification of occupations which contained a hexagonal configuration representing the six types. Each of the corner points on the hexagon represents one of the six types listed in the following order: RIASEC (realistic, investigative, artistic, social, enterprising, conventional). The distances between members of pairs of these points measure the degree of dissimilarity between the corresponding types. The arrangement is shown in Figure 10. The upper panel shows empirical correlations taken from Holland (1972: 14), and the lower panel shows the theoretical correlations and relative distances (in parentheses) that would prevail among the standardized variables representing each type, if the hexagonal model perfectly fit the data.[5]

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[5]Correlations are cosines of angles between standarized vectors. Starting from an arbitrary corner point on the hexagon, succeeding angles between the starting point and the other points are 60°,

The theoretical values in the bottom panel of Figure 10 are given for comparison with the observed correlations; so far as is known, this type of comparison has not been displayed previously in the literature. Quick comparison between the two panels reveals very poor correspondence, thus generating some doubt about Holland's conclusion that the hexagon provides a good fit (Holland 1972: 16).

The hexagon is the basis of some important concepts in Holland's theory, because it defines degree of similarity among the six types. A paper by Cole, Whitney and Holland (1971) apparently is the first to suggest technical definitions based on the hexagon. Some of these ideas have been incorporated into the theory (Holland 1973) and applied in numerous research studies (e.g., Frantz and Walsh 1972; Holland, Gottfredson, and Nafziger 1975; Nafziger, Holland, Helms, and McPartland 1974). Some of these concepts are discussed in the following paragraphs.

The consistency of a profile is based on the degree to which the distances between the profile scores match the distances between corresponding corner points on the hexagon. Holland (1973: 24) defines consistency by assigning arbitrary weights based on

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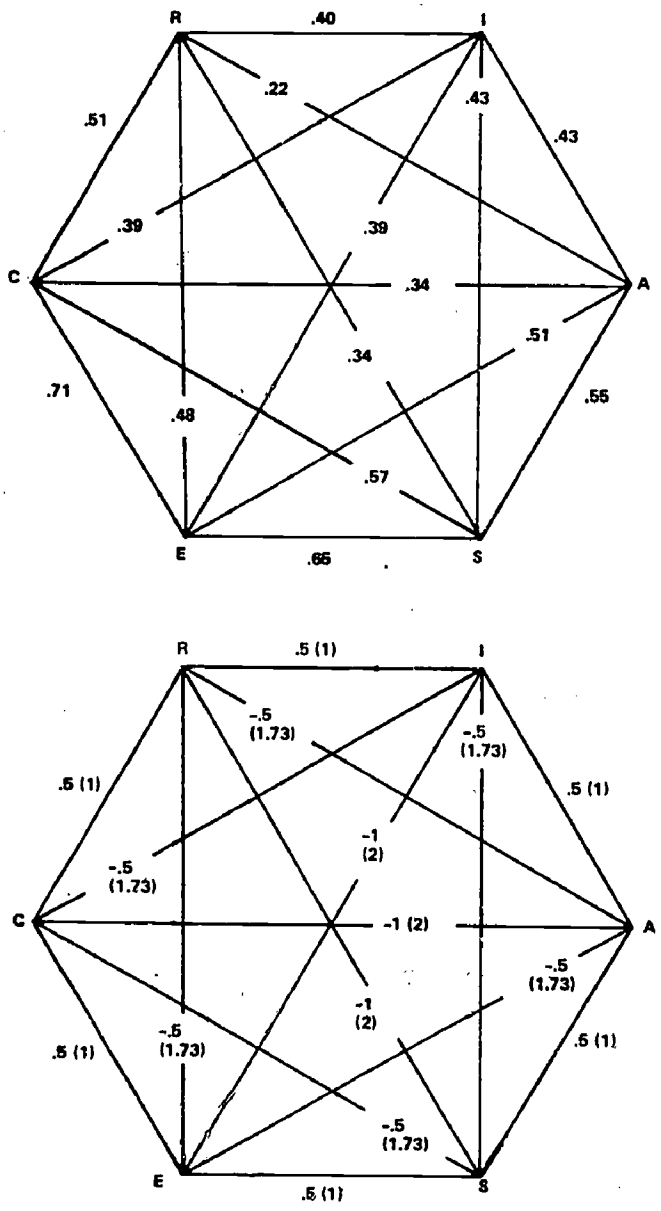
120°, 180°, 240°, and 300°. Corresponding cosines (correlations) are .5, -.5, -1, -5, and .5. Applying the standard formula for the distance between two points in a two-dimensional cartesian coordinate system yields, upon some algebraic manipulation, $D_{ij} = \sqrt{2(1-r_{ij})}$, where D_{ij} is the distance between the two vectors standardized to zero mean and unit length, and r_{ij} is the correlation between these two vectors. Note that the difference between usual standardized scores with zero mean and unit variance are just ND_{ij} (N=number of cases), so the results given here give the relative distances among the usual standardized variables.

The empirical data in Figure 10 were taken from the professional manual for the SDS (Holland 1972) rather than from the article by Holland, Whitney, Cole, and Richards (1969) because the former values are clearly labeled as correlations by Holland, whereas, the numbers in the 1969 report are not identified as correlations. The correlations are among scales from the VPI measuring the six types. The data were collected originally by Crabtree (1971) from a sample of rural high school seniors.



The top panel displays empirical correlations, and the bottom panel shows theoretical correlations and theoretical distances (in parentheses).

R = realistic I = investigative A = artistic
S = social E = enterprising C = conventional

SOURCE: Holland (1972: 14)

FIGURE 10. Hexagonal configuration for Holland's six types.

the two highest scores on a profile. If the two highest scores appear in adjacent locations on the hexagon, are separated by one type, or opposite each other, they receive high, medium, or low consistency scores, respectively.

Cole, Whitney, and Holland (1971), on the other hand, define a measure of similarity between jobs which has the same conceptual basis as consistency. Cole and associates (1971) define job similarity as the distance between the projections of the jobs on a plane (containing the hexagon).

The technical features of these definitions do not seem optimum. The first definition fails to make use of the entire pattern, and the second is based on projections of the six dimensional points on a plane (two dimensions); hence it implies some error. A simple alternative is to define a theoretical pattern conforming to the hexagonal configuration and to define consistency as some inverse function of the distance between the point defined by the observed profile and the point defined by the theoretical profile. Several options could be developed readily from the bottom panel in figure 10 and tried in empirical studies.

The degree of match of an individual's personality pattern (e.g., VPI profile on the six types) with the pattern of the occupation (or other environment) in which the person is situated is termed congruence. Prior to discovery of the hexagonal pattern, congruence could be assessed only by noting whether the personality type and environmental type matched. With the introduction of the hexagon, a mismatch in which the two types are in adjacent locations is less incongruent than one where the two types are separated by one type (on the hexagon), and opposite types are least congruent. Again, Cole and associates (1971) define a measure of congruence based on the distance between the individual profile and job profile projected on a plane. As with consistency, the advantages of such a measure over a more straightforward definition based on the distance between the individual and job profiles is unclear.

Cole and her associates (1971) also define differentiation of a profile in terms of the projection of the six-dimensional profile on a plane. In this definition, differentiation is the distance from the origin of a point defined by a profile projected on a plane. Holland (1973), on the other hand, defines differentiation as the difference between the highest and lowest scores in a profile. The intent of the measure is to reflect how narrow a range of (occupational) interests a person has or the degree to which an environment is specialized. For example, a person with a perfectly flat profile is undifferentiated and a

person with a profile full of zeros, except for one, is highly differentiated. Holland's (1973) measure of differentiation is simple, but does not use all the data in a profile. The measure proposed by Cole and associates (1971) is quite remote from the concept and is, again, based on the projections of six dimensional points onto a plane; hence, the relative positions of more than two points cannot be maintained simultaneously. A simpler measure seems desirable, such as the variance or kurtosis on each profile.

The relationship among the types based on the hexagon also can be used to reflect degree of stability of a profile over time (moves to adjacent types represent less change than moves to types farther away on the hexagon) and to assess the maturity of interest changes (maturity is reflected by increasing consistency) (Cole, Whitney, and Holland 1971).

Two research questions based on these ideas are suggested by Cole and associates. The first asks whether congruence leads to stability of occupational choice, and the second asks whether differentiation generates stability (Cole, Whitney, and Holland 1971). Later Holland (1973) incorporates these ideas and related postulates into hypotheses. These hypotheses will be discussed in a later section.

Several studies have analyzed correlation matrices of the VPI variables or similar variable sets and have concluded that the relationships among the variables can be approximated reasonably well by a hexagon (Cole and Cole 1973; Cole, Whitney, and Holland 1971; Cole and Hansen 1971; Cole 1973; Hansen and Prediger 1973; Roth, Hansen, and Cole 1973). These studies are based on a wide variety of samples, units of analysis (e.g., jobs, schools, individuals), and variables (although the variables are closely related to the six Holland types). The discrepancies between the observed and theoretical correlations shown in figure 10, however, raise some doubt about this conclusion.

Major Hypotheses

A large number of hypotheses are inferred from the theory in the most recent comprehensive statement (Holland 1973). Because there are such a large number of hypotheses, this review is limited to those that are relevent directly to predicting occupational choice; even with this narrowing of focus, a substantial number of hypotheses remain. In the review that follows, closely related hypotheses as stated by Holland are sometimes grouped into a single statement. The numbering of the hypotheses has no particular significance.

Hypothesis 1: Each person tends to choose a type of job that matches his/her type of personality. This process applies not only to the primary types (RIASEC), but also to second-level and third-level subtypes (e.g., RI, IA, and RIC, SEC). Holland refers to this type of selection as the "direction" of choice (Holland 1973: 24).

Hypothesis 2: The environmental types attract incumbents with matching types; in particular, this hypothesis applies to occupational environments (Holland 1973: 35).

The operational difference between hypotheses 1 and 2 is not clear, but it is possible that the second one applies to aggregate data, and the first to individual-level data. In any case, these two hypotheses summarize the most central features of the theory.

Hypothesis 3: Consistency of one's personality pattern is positively related to job satisfaction (Holland 1973: 25).

Hypothesis 4: The consistency of an occupational environment leads to vocational satisfaction.

Hypothesis 5: Consistency of one's personality pattern is positively related to stability of occupational choice (Holland 1973: 25).

Hypothesis 6: Consistency of an occupational environment is related positively to stability of occupational choices and occupational history. Both the number and magnitude of changes are affected (Holland 1973: 35). The distinction between choice and history is somewhat vague, but the content implies that choice refers to aspiration or expectation rather than incumbency and history refers to a sequence of incumbencies.

Hypothesis 7: Differentiation of a personality pattern promotes stability of occupational choice (Holland 1973: 25).

Hypothesis 8: Differentiation of an occupational environment promotes stability of occupational choice (Holland 1973: 25).

Of those hypotheses included in the above list, it seems that most can be captured in a two by three classification. There are three independent variables: congruence, differentiation, and consistency. Also, there are two dependent variables: satisfaction and stability. Crossing these yields the scheme shown in Table 3.

Table 3

Summary of Holland's Hypotheses

	Congruence	Differentiation	Consistency
Satisfaction	+	+	+
Stability	+	+	+

The plus sign in the table indicate positive relationships. The congruence hypotheses refer to person-environment interaction, but differentiation and consistency refer both to personalities and to environments. Holland (1973: 40) does not consider the three types of hypotheses to be of equal importance; the rank order of importance is congruence, differentiation, and consistency.

The magnitude of the relationships implied by the congruency hypotheses, according to Holland, depends on the degree of consistency and differentiation. These ideas are stated as follows:

> ...the interactions of consistent persons and consistent environments will result in more predictable outcomes, and these outcomes will influence both the persons and their and their environments to a greater degree.
>
> ...the differentiation of the personality or environmental pattern increases both the possibility that the hypothesized behavior in the formulations will occur and the magnitude of the hypothesized behavior (Holland 1973: 39).

The summary of hypotheses so far leaves the appearance that the theory is static; this appearance is deceiving. Even in early statements of the theory (Holland 1959; 1966) reference is made to the manner in which the types develop over time, and

recent reformulations (Holland 1973; Holland and Gottfredson 1976) are even more explicit, especially the paper by Holland and Gottfredson. The basic idea of the dynamics of the theory is that both environments and individuals can be classified according to type at any point in time from early childhood to late adulthood. The hypotheses stipulate how the person-environment interactions affect growth over time. During childhood, the home is the most important environment, and parents tend to communicate values, beliefs, attitudes, and feelings associated with their personality types to their children. At age five or six, the school environment begins to have an effect, and peers become increasingly important up to adulthood. The job environment becomes a dominant factor throughout the adult years.

Although it is impractical to propose a comprehensive model reflecting all of Holland's ideas, a model capturing even an important foundation would be superior to the isolated statements of hypotheses about two-variable relations. Figure 11 presents a first approximation. This simple model obviously does not account for the hexagonal pattern of the typology nor does it consider hypotheses about job satisfaction, stability, and degree of predictability based on concepts of differentiation and consistency. Also, only selected environments are included in the diagram, to maintain simplicity of presentation. In spite of the incompleteness of the model, it does imply the central concept of congruence. It also embodies the developmental character of the theory emphasized in recent publications.

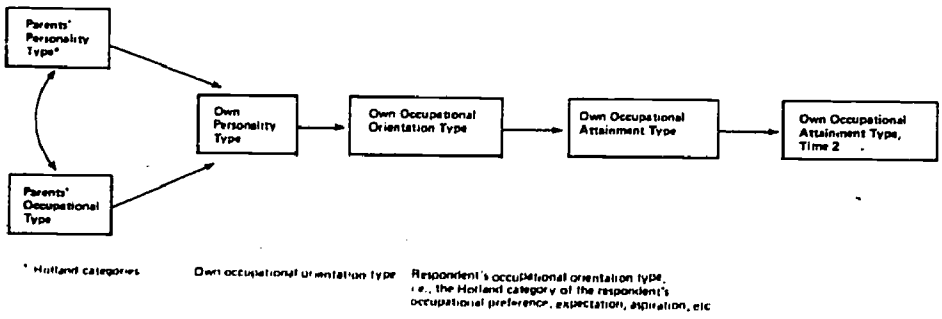


FIGURE 11. Simplified model of Holland's theory.

One of the main values of the model is that it helps to identify the necessary data and types of data analyses required to test the dynamic congruency hypotheses. Tests of the model imply: (a) gathering data on all variables, (b) use of

multivariate statistical analyses, and (c) checks on the hypothesized one-directional causal links. Absence of several possible arrows in the model imply that certain relationships are zero when other variables are controlled, e.g., the relationship between "own personality type" and "own occupational attainment" (time 1) when "own occupational orientation type" is "controlled."

Tests of the one-directional causal links imply collection of longitudinal data and certain cross-lagged partial relationships are zero, e.g., the relationship between "own occupational orientation, time 1" and "own personality type, time 2" when "own personality type, time 1" is "controlled."

The model is a heuristic device because of its relative simplicity; testing for possible two-directional causation requires a considerably more complex working model. In addition to causal feedback between personality type and occupational orientation type during one's youth, it also is probably necessary to permit causal feedback among adult occupational attainment type, occupational orientation type, and personality type. The model shown in Figure 12 incorporates these features.

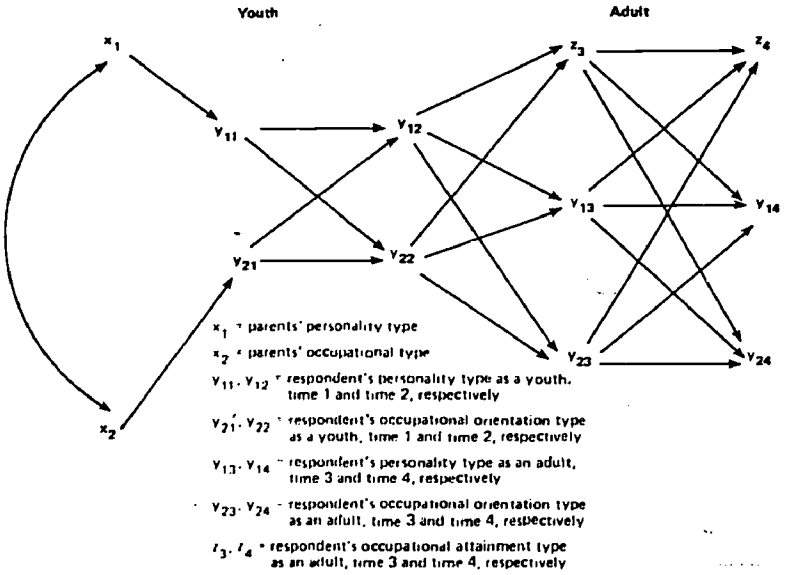


FIGURE 12. Expanded model of Holland's theory to allow for feedback loops.

This elaboration of the model permits a closer approximation to reality than does the original model, and it places correspondingly more rigorous demands on data collection and analysis. The fact that each variable in the model is a different form of Holland's six-category typology renders multivariate statistical analyses virtually impossible--a complete cross tabulation of all variables in the model requires

$6^{12} = 2.177 \times 10^9$, more than two billion cells, far exceeding the entire population of the United States. Addition of only one more six-category nominal variable increases the number of cells to over thirteen billion, more than the human population of the earth. Obviously, some simplifying assumptions are mandatory. The most obvious assumption is that the relationships are all additive. The analysis could then be handled by a series of "dummy" regression analyses or by a "log-linear" methodology. Even with the assumption of additivity, however, a series of sixty dummy regression analyses (ten of which are dependent on the other fifty) would be required. Yet, the revised model in Figure 3 is still far from complete.

The hexagonal hypothesis suggests a particular pattern of percentages in the contingency tables that could be used to introduce parsimony; this pattern is not reflected in the two models. It seems worthwhile to present a mathematical statement of this pattern and check Holland's empirical work to see if the pattern emerges and to see if the empirical publications have tested for the pattern. The following simple model of transition between occupations illustrates how to derive expected patterns of percentages in contingency tables showing shifts among the six Holland occupational types. One may hypothesize that:

$$(1) \quad P_{ij} = a - bD_{ij} \ , \ a > 0 \ , \ b > 0$$

where P_{ij} = the probability that a person in occupation j at time 1 will be in occupation i at time 2, and D_{ij} = the distance (degree of dissimilarity) between occupation i and occupation j, as defined by the hexagonal pattern. The hexagonal pattern of the distances and the fact that $P_{jj} = 1.0$, all j imply:

$$(2) \quad a = P_{jj}, \ j = 1, \ldots, 6$$

$$(3) \quad b = \tfrac{1}{2}(6P_{jj}-1)/(2+\sqrt{3}), \text{ all } j = 1, 2, \ldots, 6$$

If a and b are required to be the same regardless of the origin occupational type, an extremely rigid structure is implied for the percentages; this can be relaxed somewhat, by permitting a and b to vary across the j subscript.

Since regression coefficients calculated from binary regression analysis are closely related to the percentages in a contingency table, the hexagonal model can also be used to derive expectations for the regression constants. This derivation could be used to provide theoretical predictions to guide interpretation of "dummy" regression statistics calculated to test the models shown in Figures 11 and 12. It should be emphasized, however, that the particular form of equations (1)--(3) depends

on initial assumptions that could be changed to reflect empirical results.

The unity of the theory would be improved if the hypotheses about vocational satisfaction and job stability were incorporated into a single model also incorporating the idea of person-job congruence. Although no such model is presented here, it does seem feasible to develop one. Drawing on the work in Chapter 2, satisfaction could be defined as the difference between aspiration and attainment (aspiration and attainment broadly defined) and worked into a model using proper modifications of results for testing difference hypotheses. In simple terms, the idea would be to reflect the following notion: congruency ⟶ satisfaction ⟶ stability. All of these variables are difference measures, so models would have to be constructed with great care (see, e.g., Blalock 1966). Also, translations from continuous variables into binary regression models would require careful thought.

Commentary

As the reader will be quick to note, the preceding pages contain ample commentary; this subsection is, therefore, narrowly focused, making no effort to recap previous evaluative comments. The section addresses the question of whether it would be advisable to conceive of the six types as continuous dimensions. Previous pages provide the background necessary to consider every aspect of this question. It probably has been surmised already that the authors of the present volume believe that it is advisable to define continuous dimensions corresponding to the six types. Before doing so, however, the definitions of the types must be reconsidered and shorn of their factorial complexity, as discussed in the preceding pages.

In general, much information is lost when a typology is used. Consider the six Holland types as continuous variables; unless each person (occupation) classified as e.g., realistic has a specified profile on all six interval variables (including the realism variable) information is discarded by simply classifying the individual (occupation) "realistic." The same thing is true when subtypes are used--even when six-letter subtype codes are used. In addition, classification into subtypes cannot always be carried out unambiguously. Consider the four hypothetical cases shown in Table 4 as an example.

These data illustrate several points: (1) Although all four persons could be classified into the same subtype, SAECIR, treating the four persons as the same discards considerable information contained in the four profiles--the four profiles are quite different even though they all may belong to the same subtype;

Table 4

Examples of Individual Profiles
for Holland's Types

Degree to which one's occupation is:	person 1	person 2	person 3	person 4
Realistic	7	15	20	20
Investigative	16	17	21.34	28.04
Artistic	40	25	25	50
Social	64	30	30	80
Enterprising	37	20	25	50
Conventional	17	18	21.34	28.04

NOTE: The numbers are arbitrarily selected for the example on a scale from one to one hundred.

while use of subtypes retains more information than use of types, the subtypes still do not capture all the information in a profile. (2) Classification of person 3 and 4 is ambiguous; both persons could be classified into any one of the following subtypes: SAECIR, SAEICR, SEACIR, or SEAICR. It is especially important to note that this type of ambiguity always arises when one's profile matches the hexagonal pattern predicted by Holland's theory--profiles for person 3 and person 4 were purposefully calculated to fit exactly the hexagonal pattern. (3) As illustrated by comparing the profile for person 3 to the profile for person 4, even when types are the same and profiles satisfy the hexagonal model, they may not be identical; hence, the theory does not associate a unique profile with each subtype and, a fortiori, does not associate a unique profile with each type. In fact, since a hexagon is a two-dimensional figure, two numerical values (on any two of the types) are required to calculate the theoretical profile--empirical data may or may not correspond to the theoretical profile.

The fact that the procedures for classifying persons or environments into types fails to capture degrees of differences among units has been recognized explicitly or implicitly on repeated occasions. Nafziger et al. (1974) imply the need for assessing degree in using a weighting procedure to assess the degree of association in contingency tables. The use of subtypes

is pervasive and also implies the need to account for continuity (Holland et al. 1973; Nafziger et al. 1974; Holland and Whitney 1968; Holland and Lutz 1968; Holland et al. 1969; Holland et al. 1970). In creating a set of measurements for Holland's types from the SVIB, Holland and Campbell wrote:

> The two main problems were: (1) an unequal number of items were available for each type; and (2) some items cut across several different types. "Statistician," for example, has elements of both investigative and conventional and "Stockbroker," cuts across Enterprising and Conventional (Campbell and Holland 1972: 358).

The second point in this excerpt clearly implies that the types are a matter of degree rather than being categorical. In the preface to the 1973 restatement of the theory, Holland writes:

> Degrees and patterns of resemblance to models have been substituted for all-or-none distinctions among types so that the theory can cope more successfully with the complexity of human behavior (Holland 1973: viii).

In view of this attitude it is difficult to understand why profiles of scores generated from instruments such as the Strong, the SDS, and the VPI are used to generate types and subtypes rather than used directly.

It is important to note that essential aspects of the theory need not be discarded by adopting continuous variables to replace each of the six types. Environments and personalities could be given profiles on each of the six variables, and structural equations written to reflect hypotheses concerning congruence, consistency, and differentiation. Excellent measures of these concepts can be based on the profiles, as suggested in the previous discussion of the hexagonal arrangement. Other advantages accrue. The "jerky" changes noted in the occupational classification (Holland 1973 : 83) would probably be smoothed. The parsimony and power of continous mathematics could be applied. The sample sizes required for multivariate analyses would be reduced drastically (see Holland 1966: 90; Nafziger et al. 1974). It becomes feasible to study change rates defined on (approximations to) continous variables rather than using ad hoc measures such as assigning arbitrary codes reflecting degree of change depending on the proximity of two types on the hexagon. Finally, many of the difficulties associated with the fact that empirical distributions across the six types are extremely uneven (c.a. 60 percent realistic in some studies) could be reduced.

Empirical Research

An immense empirical literature has developed around Holland's theory. It is, therefore, necessary to classify the work and narrow the focus. Accordingly, this review focuses on research in which occupational choice (orientation and/or attainment) is the dependent variable. Since occupations are classified into six types in Holland's theory and important independent variables such as personality and early occupational choice are classified also into the typology, one can anticipate that much of the empirical work entails examination of six-by-six contingency tables. The focus on occupational choice as the dependent variable does not reduce unduly the scope of work, but it does eliminate many findings showing relationships between the six personality types and a large assortment of personality inventories (e.g., the MMPI or 16PF).

The presentation is organized into three subsections plus concluding commentary. The first of these subsections addresses issues of assessing degree of association in contingency tables. The discussion is narrowly focused on data and practices found in the empirical work on Holland's theory and is important preparation for scrutiny of the substantive work. The first subsection also reviews the skewed marginal distributions observed for Holland's typology--sometimes over 60 percent of samples fall into the realistic type. The uneven distribution across the types affects interpretations of summary statistics frequently found in the literature. The second subsection reviews the evidence for the congruency hypothesis. Both orientation and attainment data are considered. This subsection covers the most extensive and important part of empirical study relating to Holland's theory. Subsection three deals with consistency and differentiation hypotheses.

Uneven Distribution of Marginals And "Hit Rates" in Contingency Tables

Consider a six-by-six contingency table with both rows and columns representing Holland's six types, and the rows arranged in the same order as the columns. One variable in the table could be personality type and the other occupational type, or both measures could represent personality type or occupational type measured at different times. Other possibilities arise, but the main purpose here is to motivate consideration of the six-by-six array. In most, if not all, applicatoins with Holland's theory the major prediction of the congruency hypothesis is that the number of cases in the major diagonal of the table will predominate. Because of this, the percentage or proportion of all cases located in the major diagonal (sometimes termed the

"hit rate") has frequently been reported as a summary measure assessing the accuracy of the congruency hypothesis. Under any circumstance, this hit rate is not optimum, partly because it fails to account for the null hypothesis of statistical independence and partly because it is difficult to compare with more common measures of association.

Consider first the impact of skewed marginal distributions on the interpretation of hit rates. If all row and column totals were equal in a six-by-six table, the hypothesis of statistical independence indicates one sixth (16.7 percent) of the cases fall in the six diagonal cells. Thus, hit rates must fall above 16.7 percent to give better than random prediction. On the other hand, if two marginal distributions (row and column totals) are distributed identically as follows: 70, 6, 6, 6, 6, 6, then nearly 51 percent of the cases fall in diagonal cells when there is no association between the two variables; hence, hit rates must exceed 51 percent to show support for the theory.

The effect of uneven marginals on hit rates is of more than academic interest in assessing empirical work associated with Holland's theory. Table 5 shows marginal distributions calculated from four different sources, all based on national data. Note that the first three columns refer to attainment, and the last column refers to aspiration. All data are for males; some combine blacks and whites and others are for whites alone, as noted in the table. Also, age ranges vary widely, as indicated in the notes to the table. For present purposes, the most important feature of the table is the uneven distributions across Holland's six types. Expected hit rates are shown below the totals for each column. These hit rates were calculated by assuming that both statistical independence and column and row totals were equal to the distribution given in the column above each expected hit rate. Two conclusions are clear from these data. First, expected hit rates in observations based on Holland's classification may be fairly high. Secondly, expected hit rates may differ substantially from table to table; hence, hit rates should be compared between tables only with great care.

Table 5 contains some very interesting observations of substantive as well as methodological interest. Although the present discussion is focused on methodology, a brief diversion may prove rewarding. The age ordering of the second through the fourth samples is approximately as follows: sample 3 (forty-five to fifty-nine), sample 2 (fourteen to twenty-four), sample 4 (high school seniors). Note that the percentage in the realistic type declines monotonically in the same order, and the percentage in the investigative category increases monotonically in the same order. The frequently noted adjustment to external reality is probably reflected in these data. (See Gottfredson, Holland, and

Table 5

Selected Percentage Distribution
Across Holland's Types

Type	Sample 1 (attain-ments)	Sample 2 (attain-ments)	Sample 3 (attain-ments)	Sample 4 (aspira-tions)
Realistic	63.9%	37.4%	55.6%	17.8%
Investigative	7.1	16.3	8.9	48.4
Artistic	1.1	5.6	3.2	2.4
Social	6.7	11.6	8.7	12.5
Enterprising	13.5	24.7	22.8	13.1
Conventional	7.5	4.3	.8	5.8
	100.0	100.0	100.0	100.0
N	757	2570	13564	10897
Expected hit rates	44.2	24.6	37.8	30.3

SOURCES:

Sample 1: Holland et al. (1973: 36) Calculated from the row totals of table 1. Data refer to males ages thirty to thirty-nine in 1968. The sample is a national sample. The data refer to job type five years after the first full time job, collected retrospectively. Those not classified into one of Holland's types were omitted from the percentage base.

Sample 2: Nafziger, et al. (1974: 340). Data are for white males aged 14 to 24, taken from Table 4. The sample is a national sample.

Sample 3: Parsons and Wigtil (1974: 324). The data are a national sample of males (Parnes' data) aged forty-five to fifty-nine. They are taken from the raw totals of Table 5, with "no answer" omitted from the percentage base.

Sample 4: McLaughlin and Tiedeman (1974: 180). Note that these data are twelfth grade aspirations of boys in the project TALENT study. Percentages were calculated from the column totals of the upper left panel of Table 1. McLaughlin & Tiedeman.

(Gottfredson 1975, for further discussion of this issue.) Sample 1 is difficult to classify because it refers to job type five years after the first job following completion of schooling; it is based on retrospective data collected when respondents' ages ranged from thirty to thirty-nine. At the time referenced by the inquiry, respondents would have been, on the average, fairly young; hence, sample 1 contradicts the pattern observed for the other three samples.

Early empirical work related to Holland's theory often presents hit rates (e.g., Holland et al. 1973; Holland and Whitney 1968; and Holland and Lutz 1968; Holland 1968). Some of this work reports expected hit rates and some of it does not. In regression and correlation.

The second kappa is a generalization of the first; the generalization is termed weighted kappa. The new measure permits researchers to assign dissimilarity (similarity) weights to every cell in a square table (see Cohen 1968). The dissimilarity weights reflect judgments about the severity of disagreement between the row and column categories of the cell; in work with Holland's theory, diagonal cells might be assigned dissimilarities of zero and off-diagonal cells given weights reflecting the hexagonal pattern of distances, for example. Observed and expected cell proportions multiplied by their corresponding weights are combined by a formula similar to that for unweighted kappa. Weighted kappa also equals the product moment correlation under specified conditions and is very close to, though somewhat less than, the product moment correlation when these conditions more recent research a measure of association based on observed and expected hit rates is reported frequently (e.g., Nafziger et al. 1974; Gottfredson and Holland 1975). The measure used in this work is termed kappa and was developed by Cohen (1960; 1968). It is a very useful measure for purposes of testing the congruency hypothesis, but probably is little known. Since the next section of this paper reports kappa, a brief review of the way it accounts for expected hit rates and its other features is needed.

Two kappa measures of association have been invented. Cohen (1960) proposed the following formula

$$\kappa = \frac{P_o - P_e}{1 - P_e}$$

where P_o is the observed proportion in the major diagonal and P_e is the expected proportion based on the independence hypothesis. The maximum value of is obviously 1.0, since $0 \leq P_o \leq 1$, and $0 \leq P_e \leq 1$. The minimum is more complicated, but asymptopes to 1.0 under certain conditions (see Cohen 1960).

It is important to notice what kappa measures: it measures deviations from a random pattern due to a preponderance of cases in the major diagonal and not just any deviation from a random pattern. This is extremely important for testing the congruency hypothesis. Measures such as those based on chi square are not appropriate for such tests since they reflect any pattern of deviation from statistical independence. A second useful, though not essential, property of kappa is that it equals the product moment correlation calculated on two-by-two tables (phi) if the column and row totals of the table are equal, and when the marginals differ by small to moderate amounts kappa and phi are very close (Cohen 1960). This feature is desirable because it promotes rough comparisons with other research based on are not met. The conditions include equality of row and column marginals and a specified pattern of weights for calculation of kappa and of scores assigned to categories for calculation of the product moment correlation (see Cohen 1968 for details). The weighted kappa is optimum for assessing the hexagonal pattern because no single set of scores could be assigned to Holland's six types to reflect the hexagonal arrangement; hence, correlations such as the Pearson correlation that depend on such scores are completely inappropriate.

The Congruency Hypothesis

For purposes of this discussion, congruency refers to several related hypotheses. When personality, occupational orientation (aspiration/expectation), and occupational attainment are classified into Holland's typology, congruency refers to (a) agreement between personality and occupational orientation or achievement, and (b) agreement between time 1 and time 2 orientation or achievement. While these special cases do not exhaust the logical possibilities, they cover most of the empirical work.

Although a large volume of research is related to the congruency hypothesis, most of it is based on haphazard samples of college students and/or adults.[6] Consequently, three available national studies of job shifts of adults among the six Holland types are particularly important (Holland et al. 1973; Parsons and Wigtil 1974; Nafziger et al. 1974). One study of changing aspirations from high school through eleven years after graduation (McLaughlin and Tiedeman 1974) is also important. In all of these papers kappas are reported or enough information is

[6]The National Merit studies are only a particularly extreme example. Holland and Gottfredson (1976) correctly note that only a small fraction of the work to date is based on the very specialized National Merit samples, but these authors overlook the fact that much of the remaining work is based on college samples.

presented to permit calculation of kappa. In addition, kappa and weighted kappas were calculated by the present authors from two national samples of social status mobility (Jackson and Crockett 1964; Blau and Duncan 1967) and are presented for comparison with the mobility studies based on Holland's typology.

The kappas and descriptions of data on which they were calculated are shown in Table 6. Several differences among the several variable pairs render exact comparisons impossible, but careful inspection of the data provide some useful impressions. First, however, a brief review of important differences is instructive. The TALENT data (McLaughlin and Tiedeman 1974) are aspiration information; all other data refer to occupational attainment. The two kappas calculated from the Jackson and Crockett (1964) data measure father-to-son mobility (intergenerational mobility); all other data sets assess intragenerational mobility. Some of the data depend on retrospective work histories (Parsons and Wigtil 1974; Holland et al. 1973; parts of Nafziger et al. 1974; Blau and Duncan 1967; and Jackson and Crockett 1964), and other data come from longitudinal designs (McLaughlin and Tiedeman 1974; most of Nafziger et al. 1974). Finally, the time interval between measurement periods varies from one year to a major part of one's working life; time interval between measurements varies within as well as between studies, as noted in Table 6.

Because of the important differences between these data sets, indiscriminant comparison between studies must be avoided. Luckily, two of the studies contain sufficient data to permit assessment of the probable effects of some of these differences. The paper by Nafziger and associates (1974) is the most useful in this respect. First, note the decline in correlations as the length of the measurement interval (males) increases. These declines are substantial and occur without exception. Secondly, the 1965 data for males and 1967 data for females are retrospective, collected in 1966 and 1968, respectively. Without exception, correlations based on data where information for both variables was collected during the same interview are dramatically higher than any other correlations. The substantial impact of length of time between data collections is documented for aspiration data in the paper by McLaughlin and Tiedeman (1974).

In view of these observations, it is clear that comparisons among studies differing according to length of measurement interval and by whether data were or were not collected retrospectively can be made only if some account of the differences is taken, and only then with great care.

Perhaps the most interesting comparison in the table is between the Blau-Duncan data and the data reported by Parsons and

Table 6

Mobility of Occupational Attainments and Aspirations Based on Holland's Types and Based on Occupational Status: Six National Samples

Parsons and Wigtil (1974: 325)*

	Blacks	Whites	Total
Kappa's	.226	.275	.280
Weighted Kappa's	.261	.307	.312

*Calculated by the present authors from table 1 by converting two-digit percentages to cell frequencies

Nafziger, et al., (1974: 336)*

Weighted Kappa's

Pairs of Years	Blacks	Whites	
	Males		
1965-66	.69	.72	1965 data is recall
1965-67	.42	.49	
1965-68	.44	.39	
1966-67	.43	.52	
1966-68	.27	.37	
1967-68	.40	.55	
1968-Aspiration	.19	.30	
	Females		
1967-1968	.80	.83	1967 data is recall
1968-Aspiration	.20	.34	

*Taken from Table 1

Table 6 (Cont.)

Holland et al. (1973: 36-37)*

1st job -- job 5 years later	.555
1st job -- job 10 years later	.419
all job transitions	.530

*Unweighted Kappas were calculated by the present authors from observed and expected frequencies embedded in the text. The realistic category was subdivided into subtypes.

McLaughlin and Tiedeman (1974: 188)*

Pairs of Years	Unweighted Kappas for Males' Aspirations
1960-61	.431
1960-65	.291
1960-71	.234
1961-65	.442
1961-71	.333
1965-71	.532

*Kappas were calculated by the present authors from expected and observed frequencies entered in table 3 of the article

Jackson and Crockett (1964: 7)*

Data for father-to-son occupational status mobility:

Unweighted Kappa	.216
Weighted Kappa	.395

*Data were calculated by the present authors from table 1 by converting three-digit percentages to frequencies.

Blau and Duncan (1967: 498)*

Occupational status mobility from first job to current job, males,

Unweighted Kappa	.148
Weighted Kappa	.468

*Calculated by the present authors directly from frequencies in table J2.3.

Wigtil. The former results are based on seventeen occupational categories defined in order to reflect occupational status, and the latter are based on mobility as defined by moves between Holland's six occupational types. Both results are based on comparison of retrospective data for first job and current job. The Blau-Duncan age span is twenty-five to sixty-four years old, and the Parsons-Witgil age span is forty-five to fifty-nine; the midpoint of the former interval is 44.5 years and that of the latter is fifty-two. Both samples are large national samples of men. It is impossible to assess precisely the effect of the different age intervals, but at least they are not as grossly different as a comparison between data based on a one-year interval and a twenty-year interval, for example, would likely be.

With due caution, then, it is noted that in this comparison the unweighted kappas are .15 and .28, respectively, for the vertical mobility study (Blau and Duncan 1967) and the Holland study (Parsons and Wigtil 1974). This ordering is reversed for the weighted kappas--.47 and .31, respectively. The difference in ages of respondents for these two studies is too large to permit confidence in these comparisons, but it appears that the unweighted kappa is larger for the Holland system and the weighted kappa is larger for the socioeconomic system.

Two points should be made, however. First, the social status mobility literature emphasizes the importance of shifting marginal distributions--"structural mobility"--and, therefore, does not predict exact correspondence between successive jobs, and this is what is reflected in the weighted kappa. Secondly, the emphasis Holland places on the hexagonal relations among his types leads one to expect a larger increase from unweighted to weighted kappa than revealed in the table, especially in view of the fact that the weights were assigned by the present authors in precise agreement with distances among the corner points on the hexagon.

In spite of these considerations, the test of Holland's theory is based on data for which the age span between first and current job is seven and one-half years longer than for the Blau-Duncan data, and the Blau-Duncan age span extends all the way down to twenty-five. It is, therefore, concluded that correlations based on the Holland system may be of the same order of magnitude as those based on the long tradition of status mobility research. This conclusion, of course, is far from firm. It would be interesting, indeed, to carry out such comparisons for several cases in which the same data where coded twice, once into Holland codes and once into status codes. If such comparisons were carried out, it would be useful to explore different procedures for addressing the following types of questions:

1. To what extent can mobility patterns in Holland's typology be attributed to status content of Holland's types?

2. To what extent can mobility patterns in status groups of occupations be attributed to overlap with Holland's typology?

3. To what extent can both types of mobility patterns be attributed to other structures in occupational shifts?

The need to think through the empirical implications of these questions is reinforced by additional data reported by McLaughlin and Tiedeman (1974). They show that occupational classification based on Holland, Roe, and Flanagan yield comparable results. Although these three classification systems are similar to each other, they are by no means identical. How, then, can one choose among them or create a more fundamental theory that will, in some way, generate the observations based on these classifications.

Most of the other correlations in Table 6 are of moderate magnitude, some are fairly high, and none are near zero. The overall picture suggested by this variety of data is encouraging--suggesting that useful elements of empirical regularity have been identified by the theory. The variety of relationships tends to support the robustness of the theory. In these data, the theory is applied to occupational aspirations over an eleven-year period, attainment over most of a lifetime, job shifts over one-, two-, or three-year intervals, and to the relationship between current job and aspiration for the future.

Several studies have examined the predictive validity of the congruency hypothesis using samples of college students. Holland (1968) and Holland and Lutz (1968) report comparisons between the ability of VPI scales and occupational preferences (coded into the RIASEC scheme) measured in the first year of college to predict occupational preferences of the same students about one year following the initial contact. The results showed the occupational preferences yield more accurate predictions, but the authors report "hit rates" and no expected hit rates. For males, these hit rates are .632 for the VPI and .712 for preferences. Calculation of unweighted kappas from tables provided in the article (Table 1) reveal an even more dramatic difference: Kappa = .71 for preferences, .36 for the VPI. Comparable calculations were not carried out for females, but examination of the tables suggests that similar results occur. When Holland and Lutz observed only students whose first and second most preferred occupation at time 1 were in the same Holland category, predictions improved. This study provides good evidence of the stability of occupational preferences within the Holland scheme, but it does

not show strong support for the idea that personality type influences choice, especially since the VPI measures personality via expressed occupational preferences, a fact that should generate a high correlation between the VPI and expressed choice.

Holland and Whitney (1968) use the same data used by Holland (1968) and Holland and Lutz (1968), to extend the analysis to three-level subtypes. The resulting tables are cumbersome, and no summary measure (like kappa) is reported. Observation of the table, however, suggests that Holland and Whitney are justified in their positive appraisal. These findings are supported in a later publication based on different college samples (Gottfredson and Holland 1975). Kappas reported in this paper are substantially larger when stated occupational choice at initial contact with respondents is related to choice at second contact than when SDS is used as the predictor of choice; the differences are not as large as those calculated from the Holland and Lutz paper, however.

A large number of studies report information on the concurrent validity of the congruency hypothesis. Holland (1963-64) reports results from a National Merit Finalist sample based on a question matching the "daydreams" section of the SDS. He found high congruence of first, second, and successively more remote occupational choices (choices are listed in order of most recent to most remote in the question). Touchton and Magoon (1977) report kappas for a sample of college women showing that current college major and occupational plan for three years later are estimated by the SDS daydreams and summary codes. Hearn and Moos (1976) show that a coeducational sample of college students' college major coded by Holland types tend to match the environmental type of their living unit. Smart (1976) reports results for college men indicating agreement between Holland type of college major (interpreted to mean personality type) and aspects of jobs that they believe to be important. Williams (1972) indicates agreement between VPI and three other inventories as continuous variables and Holland type of college major as the categorical variable. The tables resulting from crossing predicted choice by observed choice reveal good agreement. Walsh, Vaudrin, and Hummel (1972) find that first-year college males and females perceived changes on attitudinal scales designed to tap Holland's types that are congruent with the Holland type of the college major. A similar analysis of seniors shows larger relationships. Walsh and Lewis (1972) report that congruence between the Holland type of college major and VPI scores predict four personality variables taken from the Omnibus Personality Inventory. Osipow and Ashby (1968) show agreement between the VPI and educational preference among first-year college students. Their paper reports simultaneous cross-classification of educational choice (Holland categories) with first and second highest VPI codes, showing some

predictive accuracy of the second VPI type within constant first VPI type. The sample size is too small to permit definite conclusions regarding the three-way classification, however.

A few studies focus on small local samples of employed adults. Fishburne and Walsh (1976) find that the SDS mean scores differ among male workers employed in different Holland occupational types, but results were mixed for the VPI. Gilbridge (1973) reports no differences in VPI profiles among Catholic priests who resigned from the clergy and those who did not, thus failing to support the hypothesis that occupational change is more prevalent among those who are not congruent with their environments. The results do show, however, that resigned priests tend to find social occupations. Hughes (1972) failed to find congruence between job type and personality type as assessed by several instruments. The sample was comprised of National Guardsmen in New York State. Horton and Walsh (1976) report congruence for employed females between job type and both VPI and SDS scales.

Few studies have examined Holland's theory regarding transmission of personality type and type of occupational choice from parents to children. Consequently, a report by Grandy and Stahmann (1974) is of interest. Using discriminant analysis they found several family variables, including type of parental occupation and education predict type of occupational choice among first-year college students.

Consistency and Differentiation

Research regarding consistency and differentiation hypotheses is sparce, and most of what is available comes from small, specialized samples. One of the most impressive tests of the hypotheseis that consistent people are more predictable is presented by Holland (1968). This study is based on two large samples of college students from several schools. Respondents in both samples were contacted twice, contacts were about one year apart; attrition rates were high, however (61 percent in one sample and 56 percent in the other. The students' occupational choices (expectations/aspirations) at first and second contact were coded into the Holland typology and cross tabulated separately for "consistent" and "inconsistent" respondents. Consistency was operationalized by relating the highest and second highest VPI profile scores, apparently according to the a priori classification of consistency given by Holland (1966) in the second statement of the theory. This operational definition is similar, but not identical, to defining adjacent types on the hexagon as consistent and others as inconsistent. Results for females are negative and tables do not appear in the paper, but the results for males support the hypothesis.

Holland reports "hit rates" suggesting confirmation of the hypothesis. In view of the difficulty of interpreting hit rates, however, calculations of unweighted kappas were carried out for this volume, using data tabulated in the paper (Holland 1968: 28-29, tables 23 and 24; undecided and nonrespondents excluded from calculations). The results are kappas of .390 and .387 for the consistent groups in the two samples, and kappas of .271 and .267, respectively, for the inconsistent groups in the two samples. Using procedures outlined by Cohen (1960) statistical tests of the significance of the difference between consistent and inconsistent students were executed, revealing rejection of the null hypothesis in both instances with the level of significance of a one-tail test less than .01.

Holland (1968) also reports hit rates that suggest that differentiation affects predictive accuracy (stability) in the same way that consistency does; unfortunately, however, insufficient data are displayed to permit a more adequate assessment by calculation of kappas.

Other studies reveal mixed but predominantly negative findings regarding hypothesized effects of consistency and differentiation. Methodologies differ from sample to sample and the samples are often small and nonrepresentative. Several examples of such studies are summarized briefly below. Schaefer (1976) found no relationship between consistency or differiation and the congruence of SDS summary codes with open-ended occupational aspiration (coded with Holland's types) collected eight weeks after administration of the SDS. Villwock, Schnitzer, and Carbonari (1976) using a sample of university students found little support for the hypothesis that consistency and differentiation predict stability of choice. Although one measure of consistency correlated with stability, when measures of congruence, consistency, and differentiation were entered into a multiple regression to predict stability, only congruence was associated with a statistically significant coefficient. The measure of stability in this study is derived from a questionnaire completed at one sitting; hence, the results do not address change over time. Hughes (1972) reports no significant relationship between consistency and stability of retrospective work history or between consistency and job satisfaction. These findings are derived from a sample of Army National Guardsmen in New York State. Frantz and Walsh (1972) report that neither consistency nor differentiation are associated with school achievement or school satisfaction among graduate students.

In sum, the evidence regarding consistency and differentiation is mostly negative, but the negative findings are based on

poor procedures and specialized samples. However, Holland (1968) uses somewhat more convincing data supporting the consistency hypothesis among males but not among females; his results regarding differentiation are more ambiguous than those regarding differentiation due to exclusive reliance on "hit rates".

Concluding Comments

On first reading, Holland's theory is likely to appear simplistic, too simplistic to work. This impression quickly is reversed upon careful study. After careful inspection, the concepts appear highly complicated and ambiguous. The multidimensionality of the six types and ad hoc operational procedures suggest that the theory could never work. Nevertheless, there is a core of empirical work suggesting that the theory does work. Although much of the research relies on small, nonrepresentative samples and questionable procedures, the better quality data tend to support some of the most important hypotheses. Further, in spite of the ambiguity of key concepts, the theoretical formulations are stimulating; they suggest numerous alternative operational criteria and hypotheses that differ from routine postulates of linearity found, for example, in the status attainment literature (Chapter 4). Enthusiasm for such possibilities is moderated, however, by lack of convincing empirical support for some of the interesting ideas such as the differentiation and consistency hypotheses. Also, experience with tests of nonlinear hypotheses suggests that such relationships either do not occur or are difficult to detect. Part of the reason for this experience probably stems from careless translation of verbal postulates into operational tests.

Although some of the better research yields encouraging evidence of empirical regularities inferred from Holland's theory, a tremendous amount of work remains. Largely due to use of the discrete typology, multivariate analyses are practically nonexistent in this literature. The models shown in Figures 11 and 12 reveal some of the types of multivariate analyses that are needed to bolster the developmental aspects of the theory. Studies showing influence of parents on children's personalities, effects of children's personalities on occupational aspirations, effects of aspirations on attainment--all using Holland's six types (or dimensions)--are needed. The studies relating personality to aspiration by relying on instruments such as the VPI that assess personality type from occupational preferences must be discounted for purposes of demonstrating impact of personality on occupational aspiration.

Chapter 4

STATUS ATTAINMENT PROCESSES

Introduction

The concept of status attainment is somewhat loosely defined; it refers to the achievements of adults in areas of social life for which a degree of concensus exists that some outcomes are more desirable or highly valued than others. Important examples include educational achievement, occupational achievement, and income achievement. The concept originated in the field of sociology, having developed out of sociological interest in social mobility. Occupational prestige or status is probably the most commonly studied aspect of status attainment, hence the relevance of status attainment research to the study of occupational choice.

The main focus in the status attainment literature is on tracing out the mechanisms that account for the pervasive observation that the status of one's parents ("status origin") is related to one's own status attainment ("status destination"). Thus, for example, status origin may be indicated by the occupational prestige of one's parents, status destination may be indicated by one's own occupational prestige, and education can be taken as a linking variable interpreting the relationship between status origin and status destination. Education, however, may play two roles--one role as an intervening variable between status origin and status destination, and a second role as an indicator of status origin and/or destination. Parents' educational achievement frequently is used as an indicator of status origin, and one's own education often is considered one aspect of status attainment or status destination.

The remainder of this chapter is divided into three main sections. The first section summarizes the theoretical underpinnings of status attainment research and contains evaluative commentary. The second section identifies the empirical implications of the theory and reviews the main data testing these implications. The final section summarizes the chapter. The intent of the review is to abstract the most important features of the theory and research; hence, special attention is devoted to selected writings that, in the authors' view, are most important. Throughout this chapter the term occupation frequently is used to indicate occupational status. Although this practice cannot be condoned generally, it introduces no ambiguity here since all references to occupation in this chapter deal with occupational status.

Status Attainment Theory

Most of the theory surrounding status attainment research has emerged from empirical work. Blau and Duncan (1967) initiated the approach; they view the study of status attainment processes as a natural extension of previous research in sociology regarding intergenerational, occupational mobility. The Blau-Duncan model incorporates educational achievement as the chief variable intervening between status origin and occupational status destination.[1] A more complete set of intervening variables is introduced in a model presented by Sewell and associates (Sewell, Haller, and Portes 1969; Sewell and Hauser 1975). The more complete model frequently is termed the "Wisconsin model" because it was developed primarily by a group of scholars from the University of Wisconsin.

This section is divided into three subsections. The first subsection briefly reviews the basic concepts and procedures used in social mobility research. The second subsection summarizes and comments on the Blau-Duncan extensions and modifications of mobility studies. The final subsection abstracts the main features of the Wisconsin model.

Social Mobility Research

The literature on social mobility is extensive, but the present context requires only a broad review of the main themes. The purpose of the review is to develop the context out of which status attainment research grew.

In the broadest sociological usage, social mobility refers to a change in an individual's or group's social status or social-class standing. The major aspects of social status include familiar concepts such as power, wealth, income, lifestyle, and occupational prestige. Occupational prestige (or occupational status) has gradually come to occupy a central position in the concept of social status, the reason for the importance of occupational prestige depending in part on theory and in part on relatively easy access to occupational data (see, e.g., Kahl 1967: 253; Barber 1957; chs. 2 and 8; Taylor 1968: ch. 3; Blau and Duncan 1967: 117ff; or Sorokin 1927: ch 6 for discussions of the role of occupations in social stratification).

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[1]The emphasis on education in the Blau-Duncan volume was dictated primarily by the contents of the data rather than theoretical concerns, as is noted explicitly by Blau and Duncan.

One way to organize the vast literature on occupational mobility is to group the research into two broad types, one type of research dealing with social mobility as a descriptive feature of entire societies, and the other type of research focusing on individual mobility processes. Prior to development of the Blau-Duncan status attainment model, studies focusing on the societal unit of analysis generally (a) compared mobility rates between societies, or (b) described trends in a single society. Comparative studies tended to emphasize the relationships between mobility rates and other structural features of society such as the degree of industrialization. The hypothesis was advanced that industrialization generates similar mobility rates among societies irrespective of other variables such as social norms encouraging high or low mobility (e.g., Lipset and Bendix 1964; Lipset and Zetterberg 1956; Miller 1960; Smelser and Lipset 1966). Interest in comparative mobility has persisted since the introduction of the status attainment model, using the status attainment model as the basis for comparisons (see e.g., Treiman 1970; Treiman and Terrell 1975; Kerckhoff 1974). The study of mobility trends appears to reflect less interest in theory than the comparative work and often emphasizes "sober" description in response to ideological claims in the 1950s that mobility was declining in the United States (see, e.g., Rogoff 1953; Jackson and Crockett 1964; Warner and Abegglen 1955; and Blau and Duncan 1967: ch. 3).

Study of individual mobility processes has tended to emphasize (a) the effects of occupational mobility. Research and theory regarding the effects of mobility have hypothesized that mobility is a disturbing experience leading to various manifestations such as psychological disorders, decline in adherence to moral standards, political liberalism, and prejudice (see, e.g., Sorokin 1927; Srole et al. 1962; Turner and Wagenfeld 1967; Breed 1963). Some knotty methodological and conceptual problems regarding effects of mobility have been raised, however (e.g., Blalock 1967a; 1967b). Also, Sorokin (1927) emphasized desirable as well as undesirable consequences of mobility, but more recent work seems to concentrate more on "pathologies" associated with mobility.

The major themes contained in the status attainment model can be traced to theory and research regarding the causes of social mobility. The main factors generally viewed as important in promoting occupational mobility prior to introduction of the formal status attainment model by Blau and Duncan were educational attainment, achievement motivation, parental and peer influences, and intelligence (see, e.g., Anderson 1952; 1961; Kahl 1953; 1957; Havighurst and Rodgers 1952; Crockett 1962; or Barber 1957). Kahl (1957) presents a thorough review of early work and an extensive theorectical discussion. Other factors

thought to influence occupational mobility include migration, wealth, work organizations such as unions and professional associations, political influence, and opportunity structure (Barber 1957).

In summary, social mobility research prior to development of the formal status attainment model focused on (1) societies as units of analysis including international, comparative studies concerned with social structures affecting mobility rates and mobility-trend studies responding to claims of declining mobility in the United States, and (2) individual mobility processes involving identification of effects and causes of mobility. As discussed in the next subsections, the substantive elements of the status attainment model were anticipated in earlier work; the main contribution of the formal model appears to resolve into methodological and conceptual innovations and the corresponding, rapid accumulation of empirical evidence.

The Blau-Duncan Model

It would be difficult to overestimate the influence of The American Occupational Structure (Blau and Duncan 1967) on stratification research in sociology, yet, as noted, the chief contributions of the Blau-Duncan volume depend on conceptual and methodological innovations. Three important contributions may be identified. First, the method of path analysis was applied to some variables of central focus in stratification research; these variables were father's occupation, father's education, own education, occupation of one's first job, and occupation of one's current job. Path analysis promoted use of formal theory, facilitated application of formal reasoning in theory building, permitted simultaneous study of several variables comprising a system, and provided much needed parsimony in the representation of causal relationships.

Secondly, Blau and Duncan made use of a relatively finely graded scale reflecting the "socioeconomic" content of occupations. The scale is called the Duncan Socioeconomic Index (SEI). Although the Duncan SEI had been developed prior to publication of the Blau-Duncan volume (Duncan 1961),use of the scale in conjunction with path analysis provides a convincing illustration of the usefulness of scaling occupations.

Finally, Blau and Duncan proposed to shift the emphasis of stratification research from the study of mobility, per se, to the study of status attainment. Mobility is defined by a change of status, most commonly a shift from father's occupation to son's occupation, termed intergenerational occupational mobility. The dependent variable, in a sense, is the difference between father's and son's occupation. Blau and Duncan propose that it is

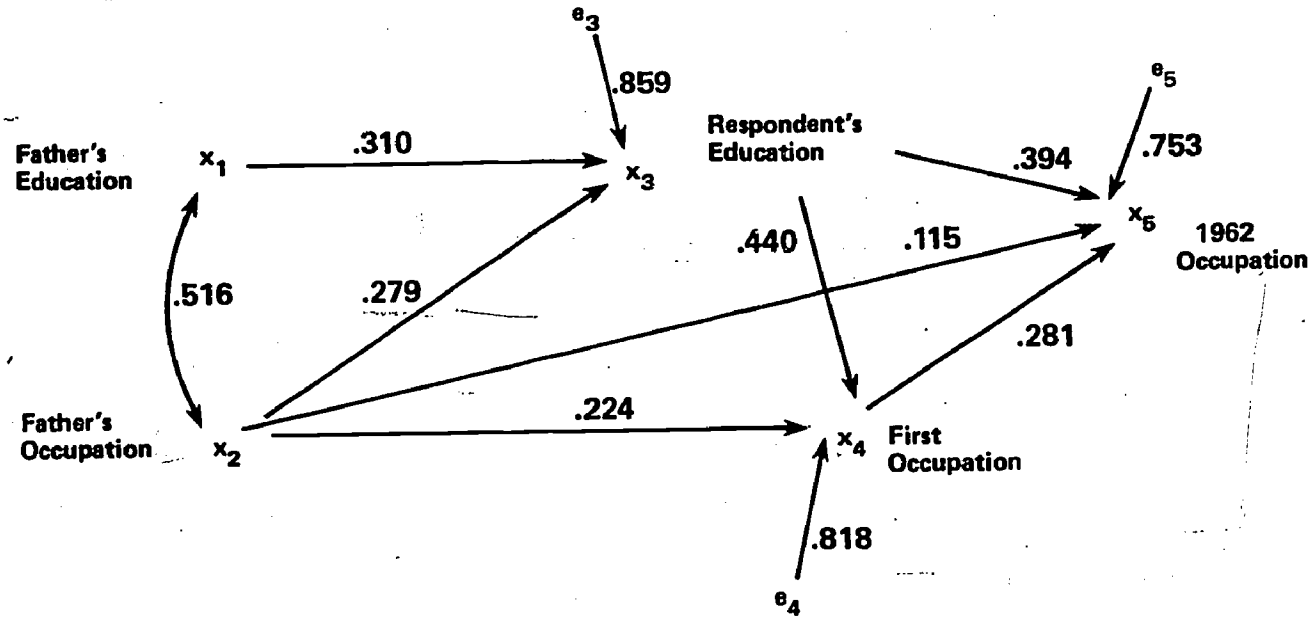
preferable to consider son's occupation as the dependent variable and include father's occupation as one independent variable. At first, this shift in emphasis may appear inconsequential, but the shift avoids several conceptual and methodological difficulties and thereby fostered a surge in research output.

The remainder of this review of the Blau-Duncan model fist summarizes the model then contrasts it to typical mobility research. A basic relationship in linear path analysis is summarized that shows the continuity of status attainment research and mobility research in a way that has not been noted in the past.

In a sequel to the American Occupational Structure, Duncan, Featherman, and Duncan describe an appealingly simple version of the basic idea in the Blau-Duncan model. They indicate the following heuristic diagram: "family ⟶ schooling ⟶ job" (1972:5). This simple diagram indicates that the social status of one's family of origin affects the amount of education one achieves which, in turn, affects the socioeconomic level of one's occupation; the influence of family status on the status of one's occupation is hypothesized to be indirect, operating through education.

The empirical realization of this basic idea studied in the Blau-Duncan volume is pictured by the path diagram displayed in Figure 13. (Readers familiar with path diagrams may wish to skip directly to the next paragraph.) The straight, single-headed arrows in the diagram indicate hypothesized direct effects running in the direction indicated by the arrow; the curved, double-headed arrow denotes a correlation between two variables whose possible effects on each other are left unanalyzed. The numbers associated with the straight arrows are path coefficients indexing the magnitude of the effect, and the number by the curved arrow is a bivariate correlation. Father's education and father's occupation are "exogenous," i.e., are independent variables not affected by other variables in the system. The remaining measured variables are "endogenous." Each endogenous variable is associated with a unique variable (e's) indicating the extent to which it is influenced by variables not contained in the substance of the model.

The particular manifestation of the model shown in Figure 13 extends the basic model (family ⟶ schooling ⟶ job) one additional step in an individual's career. Heuristically, the model in Figure 13 can be represented as follows; family ⟶ schooling ⟶ first job ⟶ current job. Father's educational level and father's occupational status represent two indexes of the general concept, family status or status origin;



x_1 = Father's educational achievement

x_2 = Father's occupational status level

x_3 = Respondent's educational level

x_4 = Occupational status of the respondent's first job

x_5 = Occupational status of the respondent's 1962 job

e_i = Unmeasured or unique variables

SOURCE: Blau and Duncan, 1967:170 (adapted)

FIGURE 13. Blau-Duncan path diagram of the basic status attainment model for U.S. men aged 20-64.

the other variables in Figure 13 represent fairly direct operational versions of the corresponding concepts. Note that the heuristic model shows no direct links between family and first or current job; whereas, the empirical model does show some direct links from father's education and father's occupation to respondent's occupation at first and current jobs. This discrepancy marks a real variation between the hypothesis and the data, but one of the virtues of path analysis is that it provides a quantitative means for summarizing the degree to which an intervening variable accounts for the relationship between an independent variable (or variables) and a dependent variable (Finney 1972; Alwin and Hauser 1975). To report these results in this discussion of the theory, however, would lead too far afield. The degree to which the basic intervening variable model is supported by data is discussed in the empirical section of the chapter. For the present, it is sufficient to anticipate Blau and Duncan's data by noting that education, indeed, does account for a substantial part of the total association between "family" and "job."

The concept of vertical social mobility is defined as the discrepancy between current status and a previous status (Sorokin 1927). Note that neither the full Blau-Duncan model (Figure 13) nor the heuristic version (family ——→ schooling ——→job) contains a mobility variable. Blau and Duncan are quite articulate about their reasons for excluding direct study of mobility defined as a discrepancy. Their objections to mobility scores in scientific analysis rest mainly on grounds that correlations calculated between variables, one or both of which are difference scores (e.g., mobility) are difficult to interpret. They derive formulas showing bivariate correlations involving difference scores in terms of the correlations among the component variables that define the difference scores. Their discussion of these formulas presents a convincing case that correlations in which one or both variables are difference scores are difficult to interpret. As a result of this analysis, Blau and Duncan conclude that empirical analysis of difference scores in correlation-regression-path methodologies is inadvisable.

Largely as a result of Blau and Duncan's objection to using mobility variables in path analysis and some difficulties with difference hypotheses identified by Blalock (1966; 1967), status attainment research has excluded direct study of mobility, relying on study of attainment instead. It appears likely that omission of mobility variables from path models of stratification processes has helped to avoid numerous misinterpretations of data. The shift from study of mobility to study of "status attainment" has created, however, a certain discontinuity in stratification research that is unnecessary.

In unpublished notes (available on request), the first author of this volume has shown the mathematical relationships between hypotheses involving status attainment and status mobility. Two cases are considered. First, status attainment and status mobility are considered as dependent variables. It is found that when mobility and comparable attainment variables are viewed as dependent on the same independent variables, the path models for mobility are equivalent to those for attainment in every important respect. Secondly, it is found that hypotheses in which the dependent variable is affected by mobility are identifiable (in the mathematical sense), thus solving the problem with such hypotheses raised by Blalock (1966; 1967).

The "Wisconsin Model"

The "Wisconsin model" extends the simple chain (family——→ schooling ——→ job) proposed by Blau and Duncan by adding two important types of variables--cognitive variables and social pshychological variables (see Sewell, Haller, and Portes 1969; Sewell, Haller, and Ohlendorf 1970; Haller and Portes 1973). In

schematic form, the basic substance of the "Wisconsin model" can be represented as shown in Figure 14.

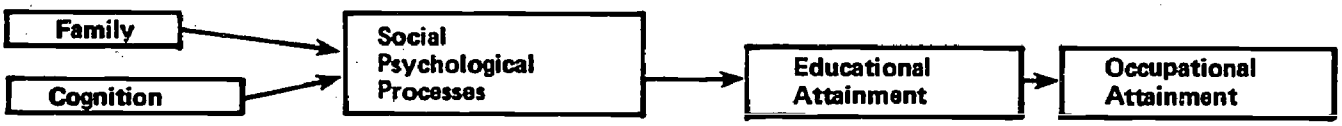
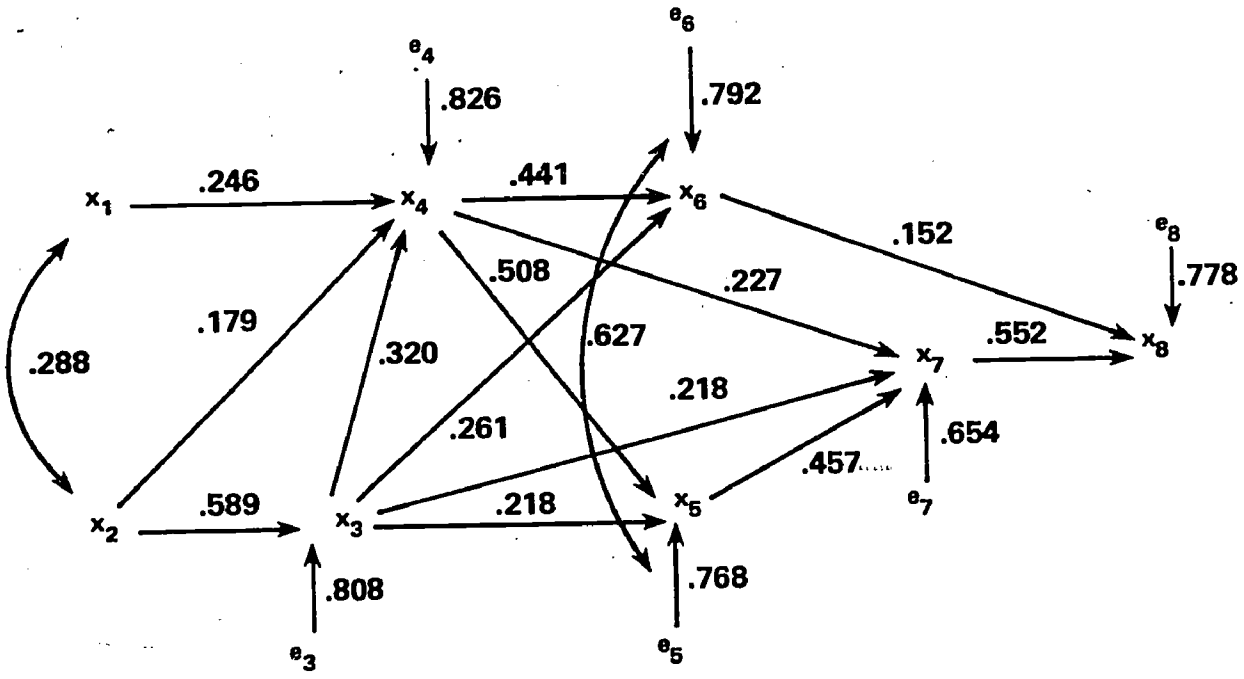


FIGURE 14. Schematic view of the "Wisconsin model."

Mental ability as measured by standardized tests and high school grade average are the two most common representatives of the box labeled "cognition." As with Blau and Duncan, parental-status variables such as father's education, father's occupational status and mother's education generally represent the box entitled "family." The most frequently used social psychological variables are level of education that significant others such as family members and peers expect of youth, level of occupation that significant others expect of youth, level of educational expectation that youth hold for themselves, and level of occupational expectation that youth hold for themselves. Educational attainment closely corresponds to the number of years of schooling completed by adulthood, and occupational attainment refers to the status of one's occupation following completion of schooling.

It should be emphasized that Figure 14 abstracts the basic ideas and does not correspond exactly to any empirical study. Empirical path diagrams are considerably more complicated. The seminal model presented by Sewell, Haller, and Ohlendorf (1970) is displayed in Figure 15.

Perhaps the most important substantive features of the model are the central role assigned to the significant other variable (x_4) in affecting educational and occupational expectations of youth (x_5 and x_6) and the importance of educational and occupational expectations in determining educational and occupational attainments (x_7 and x_8). These hypotheses draw on a substantial body of theoretical literature identified with symbolic interaction (see, e.g., Cooley 1902; 1909; Mead 1934; Sullivan 1940; Merton 1957; Sherif 1948; Haller and Woelfel, with Fink 1968). The basic idea is that persons form attitudes as a result of interaction with other people. These other people may comprise an interacting group, termed "reference group" or simply be identified as individual influencials, termed "significant others." The status attainment-models generally refer to



x_1 = parental status

x_2 = measured mental ability

x_3 = grade average

x_4 = composite significant other *educational* expectation of youth

x_5 = youth's educational expectation

x_6 = youth's occupational expectation

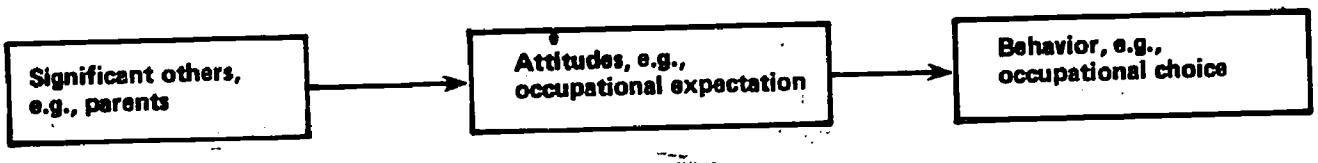
x_7 = educational attainment

x_8 = occupational attainment

e_j = residual variables

FIGURE 15. Status attainment model presented by Sewell, Haller, and Ohlendorf (1970).

significant others. Once the attitudes are formed, they affect behavior. In status attainment theory, educational and occupational expectations are viewed as particular attitudes (Haller and Miller 1971) influencing the behavior manifest in selecting an occupation and determining how long to pursue one's education. The social psychological sequence is, then:



As the schematic diagram in Figure 14 makes clear, the view that social psychological variables (significant others, educational and occupational expectations) intervene between parental status and educational attainment is an important feature of the theory. Also, social psychological processes intervene between cognitive variables and educational attainment. In order for the social psychological variables to play a meaningful role as intervening variables, however, it is necessary that they be affected by parental status and the cognitive variables. These effects are hypothesized for the following reasons. Parental status affects significant others' expectations of youth because: (1) parents tend to be important significant others and the educational and occupational expectations of parents for their progeny are positively related to the parents' own status, and (2) peers are important significant others and peer relationships tend to develop among youth of homogenous social status. The cognitive variables, mental ability and academic performance, influence significant others by providing evidence of ability that generally is presumed to affect the educational and occupational pursuits that one is capable of following.

While the version of the model shown in Figure 15 displays a much more detailed picture of the process of occupational attainment than does the Blau-Duncan model, it is far from complete. Possible elaborations are so numerous as to defy exhaustive listing, but examples of other variables of potential importance include school curriculum, occupational expectations of significant others for ego,[2] military service, quality of schooling, self-concept, need for achievement, income, Holland's personality types, extracurricular activities in school, labor market restrictions, migration, and number of siblings. Most of these variables have been studied one or two at a time within the framework of the status attainment model, but the present authors are aware of no case in which they have all been included simultaneously (see, e.g., Sewell and Hauser 1975; Duncan, Featherman, and Duncan 1972; Blau and Duncan 1967; Rehberg and Rosenthal 1978; Curry, et al. 1976; Otto 1976; Alwin 1974; Alexander, Cook, and McDill 1978). Although, in theory, all these variables and more, should be included in a single model, the complicated model and heavy demands on data that result lead one to doubt that such a model would be very useful at the present stage of understanding of status attainment processes. Careful work with a small set of important variables appears to be a more promising strategy for the immediate future.

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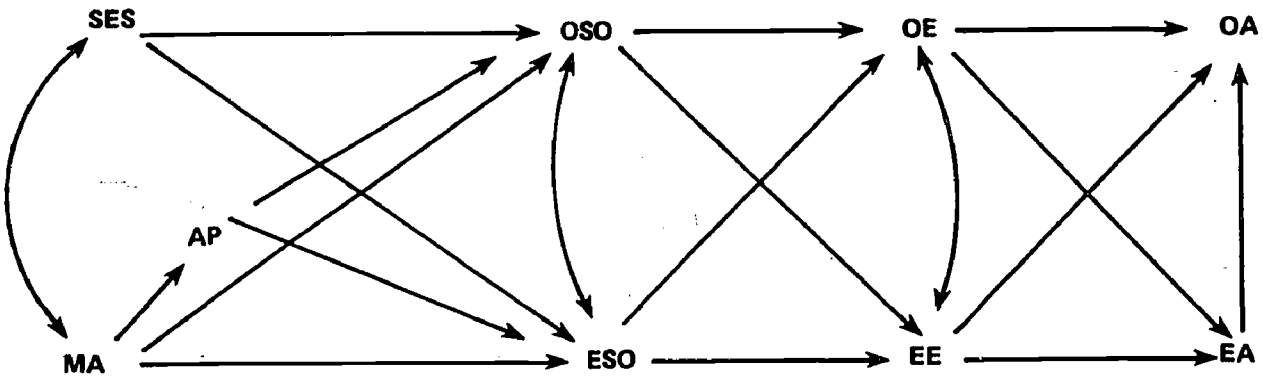
[2]The term ego is frequently used in this literature to identify the person whom significant others influence, in this case the person engaged in making career decisions.

There is one variable omitted from Figure 15, however, that does appear needed to present a symmetric view of the basic process; the missing variable is significant others' occupational expectations of ego. The omission by Sewell and associates is due primarily to the fact that the Wisconsin data contain no measure of significant other (SO) occupational expectations. Subsequent work has often included an SO occupational variable, however (e.g., Woelfel 1972; Woelfel and Haller 1971; Curry et al. 1976; Kerckhoff 1971). A schematic view of a basic status attainment model containing the additional variable is shown in Figure 16. The revision is intended to reflect the spirit of the extension represented by inclusion of SO occupational expectations of ego.



SES = parental socioeconomic status
MA = measured mental ability
AP = academic performance, grade average
OSO = occupational expectations of SOs for ego
ESO = educational expectations of SOs for ego
OE = occupational expectation of ego for self
EE = educational expectation of ego for self
OA = occupational attainment
EA = educational attainment

FIGURE 16. Simple extension of the basic Wisconsin Model to include occupational expectations of SOs for ego.

Although the modified diagram in Figure 16 does not correspond exactly to any published version of the Wisconsin Model, it closely approximates some empirical work (e.g., Curry et al. 1976) and captures the basic theoretical ideas without being unduely complex. This version of the model also reflects some of the major weaknesses of status attainment research and can, therefore, serve as a point of reference in the ensuing commentary.

As constituted, the Wisconsin model exhibits two rather obvious difficulties. First, the structural equations associated with the model do not reflect the dynamics of the process. Secondly, all the effects in the model are represented as unidirectional, although there is reason to believe that several pairs of variables exhibit two-directional effects. These issues are taken up in the following discussion.

There is ample theory suggesting that career decision making is a continous process (e.g., Super 1957; Ginzberg et al. 1951; Tiedeman 1961; Rodger 1966; Beilin 1955; Musgrave 1967; Blau et al. 1956). For example, Super and associates write:

> Vocational development is an ongoing continous and generally irreversible process. Vocational preferences and competencies...change with time and experience, making choice and adjustment a continous process (Super et al. 1957: 89, emphasis in the original).

After reviewing several "macro theories," Picou, Curry, and Hotchkiss indicate the following general characterization of the theoretical literature.

> The macrotheoretical approaches reviewed above have several common themes. First, all of the above theorists have implicitly or explicitly noted the developmental character of occupational choice and attainments are clearly limited to a life-cycle framework. Labor market entry and career patterns tend to be viewed in conjunction with individual maturation and growth (Picou, Curry, and Hotchkiss 1976: 12).

It undoubtedly is obvious to most of the research community that career orientations are formed in a gradual process overtime, yet the structural equations in status attainment research do not reflect this obvious point. Rather, the structural equation models are generally stated in terms of differences between individuals at a single point in time, no reference to time or change is contained in the equations. While the theoretical literature has been helpful in pointing out the dynamic nature of the process, a proposition stated in the general terms such as those used by Super and associates, quoted above, cannot be applied immediately in empirical research. It is necessary for the general idea to be translated into structural equations expressing exact hypotheses.

There are five variables in Figure 16 that may be viewed as career-decision-making variables: academic performance, significant others' educational expectation of ego, significant others' occupational expectations of ego, ego's own educational expectation, and ego's own occupational expectation. Figure 16 indicates that academic performance affects the other four career-decision-making variables but is unaffected by them. It also shows that significant-other variables affect occupational

and educational expectations but are unaffected by them. No assumption is made about the causal order between the two significant other variables and between occupational and educational expectations, but the consequences of these "nonassumptions" on certain coefficients in the model is the same as the consequences that would follow were it assumed that there is no effect running in either direction between the two significant other variables or between educational and occupational expectations. Neither variable in either pair is entered into the equation in which the other is the dependent variable. Since educational and occupational expectations are highly correlated (r = .771 in the Wisconsin data), entering educational expectation as a predictor of occupational expectation, and vice versa, would likely absorb a large part of the effects of the other independent variables. In particular, the large coefficients associated with significant other variables would likely be attenuated. Similar reasoning applies to the equations for the significant other variables.

None of these assumptions about the causal ordering of the career-decision-making variables can be defended rigorously. A plausible case can be made for the assumption that at least a part of the correlation between parents' educational and occupational expectations for their children and the children's own expectations to their parents. The same point may also apply to nonparental significant others. It also is likely that the two significant other variables affect each other and that two-directional links exist between ego's educational and occupational expectations. On the latter point, Woelfel and Haller write:

> Since there are two principal dependent attitudes measured in this research (educational and occupational aspirations) and since these two attitudes are known to be highly related to each other (in this research their zero order correlation is .70), we assume that each attitude exerts reciprocal influence on the other, independently of the other main variables (Woelfel and Haller 1971: 79).

Also, the assumption that significant others do not affect students' academic performance seems untenable. Similarly, it is doubtful that students' career expectations have no effect on their academic performances. In fact, Porter (1974) assumes that academic performance is affected by significant others and the two expectation variables but has no effect on those variables.

While the assumed causal order in the basic model cannot be defended rigorously, consequences of the assumptions are potentially important. For example, the calculated numerical values in the paper by Sewell and associates make it appear that mental ability has exceedingly strong effect on academic performance. If it had been assumed that academic performance

were affected by the other career-decision-making variables instead of a cause of them, however, the path coefficient indexing the effect of mental ability on academic performance would have been calculated including "controls" for the significant other variables, educational and occupational expectations. Since all four of these variables exhibit substantial correlation with mental ability and with academic performance, the direct path linking academic performance to mental ability would be reduced considerably by the controls. Even more importantly, the role of significant others in career decision making could be substantially distorted by the assumptions that the significant other variables are unaffected by students'own career expectations. The path coefficients associated with the direct effects of significant others on the attainment variables are small; hence, the major effects of significant others on attainment must be indirect, operating through the career expectations. If career expectations affect the significant other variables rather than the reverse, however, then the total effect of significant others on attainments is small. Yet Sewell and associates conclude:

> Clearly, the variable we have called significant others' influence is an important factor. The present evidence appears to show that once formed, its effects are far-reaching. Also, besides being a powerful explanatory factor, significant others' influence should be amenable to manipulation. It thus, suggests itself as a point at which external agents might intervene to change educational and occupational attainment levels. (Sewell, Haller, and Portes 1969: 89.)

The possibility that the causal order specified by Sewell and associates may be inaccurate, is beginning to be noted in the literature (Williams 1976; Hout and Morgan 1975; and Duncan, Haller, and Portes 1968). Hout and Morgan (1975) offer a discussion of the causal order among all the commonly used career-decision-making variables, generally concurring with the conclusions stated here, that is, that two-directional effects cannot be ruled out for any of the important variables. Hout and Morgan proceed to estimate two-directional effects for several of the variable pairs, including parents' educational encouragement and progeny's educational plans. Based on cross-sectional data and two-stage-least squares, Hout and Morgan report that most of the effect between parental educational encouragement and progeny's educational expectations operates as Sewell and associates originally postulated--from parent to progeny. As these authors point out, however, the estimates depend on the assumption that the system is in aggregate equilibrium (i.e., no longer changing); this assumption cannot be checked with cross-sectional data.

Further, the application of two-stage-least squares used by

Hout and Morgan is not fully explicit in their article, but judging from their equations (eqs. 1-8, p. 368) they have violated the identification rule given in the econometric literature. Their equation (5), for example, shows the educational expectation of students as the dependent variable; the equation contains all four of the predetermined variables in the system (listed on p. 366 of the article) and three endogenous variables. The identification rule (order rule) for simultaneous equation systems such as presented by Hout and Morgan is that at least as many predetermined variables must be omitted from each equation as there are endogenous variables included (the current dependent variable not counted) (Goldberger 1964: 316). Since Hout and Morgan do not exclude any predetermined variables from the equation, and include three endogenous variables, it appears they have violated this rule. Without a complete mathematical statement of the procedures (missing in the article), however, one cannot be certain just what was done.

The static nature of the basic status attainment model and its failure to account for reciprocal effects may be remedied by writing the structural equations as simultaneous, differential equations. In particular, it appears reasonable to extend the linear character of the model by using linear differential equations. Such a system of equations can easily accommodate all possible two-directional effects among the career-decision-making variables and expresses a dynamic feature of the process in such a way that projections can be generated naturally from the theory (see Coleman 1968; Doreian and Hummon 1976; 1974; Hotchkiss 1977).

While the differential equations are well suited to handle the processes of making career decisions, they are not so appropriate for dealing with job changes after one enters the labor market. The differential equations require one to conceptualize continuous change over time, but occupational status remains fixed as long as a job is held, then may jump suddenly to a different value at the instant of job change. Thus, a different approach is required, perhaps one in which the time between job shifts is an important dependent variable (see, e.g., Sorensen 1977), or an approach using "catastrophe theory" (see, e.g., Zeeman 1977).

The preceding discussion has focused on the nature of the hypothesized relationships among broadly defined variables; attention now turns to conceptualization of one of the key categories of career-decision-making variables, the significant other variables.[3] One important issue concerning significant

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[3]Also, some discussion of the concept of occupational expectation is presented in the last chapter of this volume.

others is how to identify persons who are significant others for a particular ego (Haller, and Woelfel, with Fink 1968; Woelfel 1972; Woelfel and Haller 1971). Sewell and associates use a measure based on preselected categories of potential significant others, including parents, teachers, and peers. Referring to this approach, Woelfel writes:

> The problem with measures like this, of course, is that the results depend not only on how much influence significant others really account for but also on the degree to which the preselected panel of significant others is representative of the true significant others of the students involved (Woelfel 1972: 87).

The Wisconsin Significant Other Battery (WISOB) was created in part to rectify the problems associated with preselected lists of significant others. The WISOB asks each ego to identify his/her significant others within eight theoretical categories of significant others. The eight categories are created by completely crossing three dichotomous variables. The three variables are composed of the following pairs of classes: (1) educational vs. occupational significant others, (2) significant others who are models vs. those who are definers, and (3) significant others for self and significant others for object. The distinction between educational and occupational significant others requires no explication; it is based on the theoretical assumption that significant others may be attitude specific. Significant other models are those who influence one's attitudes by example, and definers are significant others who influence ego's attitudes through direct communication. The distinction between significant others for self and for object is based on a theoretical view of the manner in which attitudes are formed. According to the theory, attitudes consist of beliefs about relationships between oneself and objects outside the self. These beliefs are formed through use of classification categories, termed "filter categories" that may be idiosyncratic to each individual. Significant others influence attitudes by affecting the filter categories applied to oneself or to objects, whence arises the distinction between significant others for self and significant others for object.

The distinction between educational and occupational significant others has been applied in path models of career planning (e.g., Woelfel and Haller 1971; Kerckhoff 1971; Curry et al. 1976; Curry et al. 1978), but the other two dimensions have not been used very often. Most of the empirical work has dealt exclusively with SO definers and has combined SOs for self and SOs for object (see, however, Scritchfield 1976 for a study of SO models).

The concept of influence plays a pivotal role in significant other theory. Haller and associates write: "significant others are those who exercise major influence over individuals" (Haller and Woelfel, with Fink 1968: 12). Influence may be viewed as a special type of cause; if A influences B, then A, in part, causes B's attitudes or behaviors. (See Blais 1974 for a recent review and useful discussion of the relationships between power, influence and cause, also, see Simon 1957). Certainly, the relationship between influence and cause remains a moot issue, but it may, nevertheless, prove useful to consider some implications of treating influence as a special type of cause for the study of significant others.

Confining attention to linear systems, the effect of x on y generally is identified with the partial slope coefficient associated with x in the equation for which y is the dependent variable, thus suggesting that the amount of influence exercised by a significant other is indexed by a path coefficient. In the interest of conceptual clarity, then, the common practice of using the term "significant-other influence" to identify variables such as the level of occupational or educational expectations of significant others for ego seems inadvisable. More importantly, the WISOB methodology for identifying significant others might best be interpreted as a hypothesis-generating mechanism. If significant other influence is identified with a path coefficient, then the list of "significant others" obtained on the WISOB cannot be viewed as exhaustive nor can the fact that a person's name appears on the list be taken as clear evidence that the person is, in fact, a significant other. This conclusion agrees with informal observation. In general, we do not view individuals as infallible sources of information about the causes of their own behavior or attitudes; if significant others are defined as partial causes of attitudes and behavior, then it follows that people may be fallible in identifying their own significant others.

Viewing significant other influence as a special case of causal effect places excessive demands on data collection and analysis. With this definition, identification of SO definers for a particular individual requires an extensive time series of the complete sociometric matrix in which each individual fits. Measurements of attitudes and/or behaviors of interest are required from every person appearing in the matrix. Symbolic-interaction theory implies that people exercise reciprocal influence on each other. As Falk (1975) indicates: SO $\longrightarrow$ EGO $\longrightarrow$ SO. Thus, a method of analysis is needed that is appropriate for a time series of cross sections permitting all possible feedback loops. Establishing the influence of SO models is even more difficult because one can be a SO model without appearing in ego's sociometric matrix.

The difficulties associated with identification of significant others suggests that study of significant other influence may have to proceed without compiling an exhaustive list of significant others for each ego. The most viable alternative appears to be study of role categories whose "incumbents are likely to be significant others." This strategy places heavy demands on theory, for identifying the role categories must depend on theory. A more general strategy is to rely on theory to establish hypotheses that link significant others to descriptive variables that are relatively easy to measure. For example, the amount of influence exercised by an other may depend directly on the amount of interpersonal interaction between ego and other, thus suggesting a statistical interaction hypothesis which may include the product of SO expectation of ego and the amount of interaction between SO and ego. In fact, tests of theory predicting role categories and conditions leading to one person influencing another may yield more interesting results than empirical research assessing the overall impact of all significant others. After all, significant others exercise influence by definition.

Although defining significant-other influence as a particular instance of causation implies that the WISOB is not an infallible method for identifying SOs, the definition does not indicate that the lists of persons generated by administering the WISOB bears no correspondence to ego's significant others. In fact, there may be a close correspondence, though this ultimately is an empirical matter. The WISOB may provide a useful tool for generating hypotheses; studying the characteristics of those whom ego's list on the WISOB should produce hypotheses about characteristics of SOs that could be tested using path models.

The definition of significant others as those who exercise major influence over ego suggests a distinction between the terms significant other influence and interpersonal influence. Significant others are individuals who exercise major influence whereas interpersonal influence may be viewed as the total influence of aggregates of individuals of whom only a few are major influences. With this distinction it is immediately clear that school personnel, for example, may be important in shaping one's career goals even if no teacher or counselor is a significant other. Also, it may be useful to view the path coefficients associated with the variable used by Sewell and associates as indexing interpersonal influence, since their composite measure includes ego's perceptions of attitudes of fairly large aggregates of individuals such as teachers and peer friends.

There are two additional conceptual/measurement distinctions of importance: (1) the distinction between "perceived" and "objective" significant other variables, and (2) the distinction

between significant other encouragement and significant other expectation. Regarding the first distinction, significant others' attitudes and behavior toward ego have been measured by (a) asking ego to indicate his/her perceptions of those attitudes and behaviors, and (b) by asking significant others to indicate the attitudes and behaviors. With respect to the second distinction, at least two types of questions have been asked about significant others' attitudes and behaviors concerning ego's educational goals: (a) respondents have been asked how much encouragement to attend college significant others have given to ego, and (b) respondents have been asked to indicate the level of schooling that significant others expect ego to achieve. When these two dimensions are crossed, four types arise: perceived encouragement, objective encouragement, perceived expectation, and objective expectation--where perceived is used as a convenient shorthand for asking the questions of ego, and objective indicates that the questions are asked of the significant others. No studies have used the objective encouragement measurement, but the other three measurements have been used. The same variety of procedures have not been applied to occupational significant others, though analogous conceptual distinctions apply. As will be seen in the discussion of evidence, these procedures appear to affect empirical results.

Status Attainment Research

The purpose of this section is to review the evidence bearing on the theoretical perspective outlined in the preceding section. The strategy is to review selected empirical works in significant detail in order to provide the reader some insight into the strengths and weaknesses of research carried out to date. Following the detailed review, a brief overview of the variety of evidence is presented, the intent being to communicate a sense of the breadth of research that is germane to the status attainment viewpoint. The material is organized into four subsections. The first subsection identifies the main empirical implications of status attainment theory, including a brief explication of the concept of indirect effect in path analysis. Subsection two contains a detailed review of the Blau-Duncan findings. The third subsection summarizes findings from the Wisconsin data. Finally, the fourth subsection summarizes a variety of empirical research bearing on the status attainment model.

Empirical Implications

There appear to be three main types of observation that status-attainment theory leads one to expect. First, all the dependent variables in the model should be predicted with at least moderate accuracy. Secondly, the signs of the path

coefficients should be nonnegative. Finally, most or all of the effects of status origin (SES) and mental ability on educational or occupational status should be indirect. The first expectation requires little discussion; the point is that R-square values of modest to high magnitude should be observed when educational and occupational attainment, educational and occupational expectations, and educational and occupational significant-other variables are estimated from their respective antecedent variables.

The expected nonnegative sign of all the path coefficients is explicit in the literature (e.g., Sewell, Haller, and Portes 1969) and can be drawn from the context of the model. Certainly, one would not expect a negative relationship between parental status (SES) and any of the other variables in Figure 16; SES should exhibit a positive direct effect on academic performance and the significant-other variables. Its direct effect on educational and occupational expectations and attainments might be zero, but should not be negative. Similar reasoning applies to the effects of mental ability. The effect of academic performance on the level of significant others' educational and occupational expectations of ego should be positive and the direct effects of academic performance on the level of educational and occupational expectations and attainments might be zero but should not be negative. Similarly, the SO variables should manifest positive effects on the two expectation variables and non-negative effects on the two attainment variables. Finally, the two expectation variables should exhibit positive effects on the two attainment variables, and education should positively affect occupational status.

For those unfamiliar with the path analysis literature, some explication is required of the prediction that the effects of parental status and mental ability on attainment variables is indirect. Also, in view of our speculation that several of the important career-decision-making variables in the model manifest two-directional effects, it will be useful to explore the meaning of indirect effect for systems that contain feedback. It is found that the calculation of indirect effect must be altered somewhat when the system contains causal feedback, a fact that has been neglected in the literature.

The basic idea of indirect effect is nested in decomposing the bivariate correlation between x and y into parts--one part identified as the direct effect of x on y, one part termed the indirect effect of x on y, and one part termed a noncausal element of the correlation between x and y (Duncan 1966; Finney 1972; Alwin and Hauser 1975; Heise 1975). The decomposition has generally been developed for recursive systems. The main ideas are illustrated in Figure 17. Figure 17a shows a simple

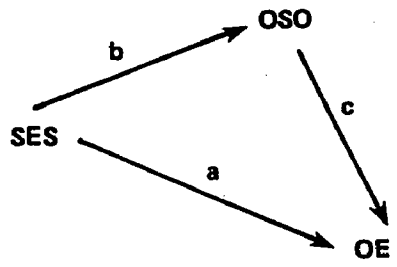

Fig. 17a

DE of SES on DE = a
IE of SES on DE = bc
TE of SES on DE = a + bc

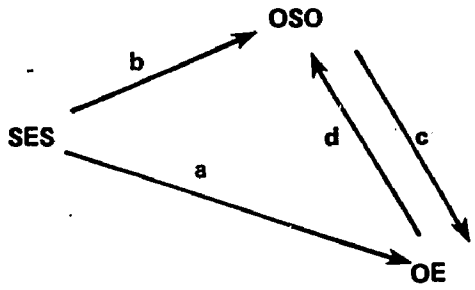

Fig. 17b

DE of SES on DE = a
IE of SES on OE = (bc + acd)/(1-cd)
TE of SES on OE = (a + bc)/(1-cd)

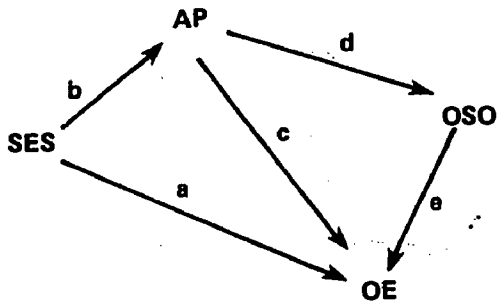

Fig. 17c

DE of AP on OE = c
IE of AP on OE = de
TE of AP on OE = c + de
NCP, AP and OE = ab

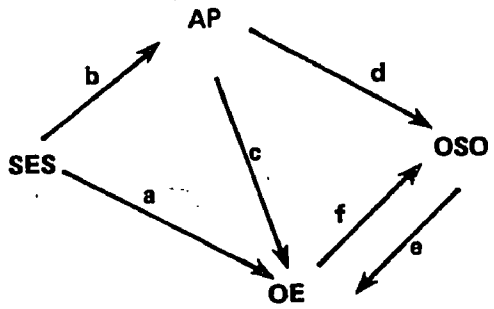

Fig. 17d

DE of AP on OE = c
IE of AP on OE = (de + cef)/(1-ef)
TE of AP on OE = (c + de)/(1-ef)
NCP, AP and OE = ab/(1-ef)

VARIABLES:

1. SES = parental status
2. AP = academic performance
3. OSO = occupational expectations of significant others for ego
4. OE = occupational expectation of ego for self

SYMBOLS:

1. DE = direct effect
2. IE = indirect effect
3. TE = total effect
4. NCP = noncausal part of a correlation
5. a, b, c, d, e, f = path coefficients

FIGURE 17. Illustrations of different types of effects in causal analysis.

recursive system--(i.e., a system in which the variables are given a unique causal order). Parental status (SES) affects occupational expectations of significant others for ego (OSO) and the occupational expectation of ego for self (OE). In turn, OSO affects OE; there are no reverse effects. The direct effect of parental status (SES) on occupational expectation (OE) is indexed by the path coefficient associated with the arrow pointing from SES to OE, this path coefficient being symbolized by the letter a. The indirect effect of SES on OE reflects the influence of SES on the significant other variable (OSO), symbolized by b, and the subsequent effect of OSO on OE, symbolized by c. The magnitude of that indirect effect is indexed by the product of the effect of SES on OSO with the effect of OSO on OE: indirect effect (IE) = bc. The total effect of parental status on occupational expectation is the sum of the direct and indirect effects: a + bc.

The model in Figure 17a presumes that significant others (SOs) affect ego but ego does not affect SO. It is difficult to make this assumption a priori, however, although the assumption generally is made in the literature (see, e.g., Woelfel and Haller 1971; or Hout and Morgan 1975 for exceptions). Heise (1975) inidicates that all paths that cannot be eliminated unambiguously on theoretical grounds should be retained and tested empirically. The model in Figure 17b, therefore, shows two-directional effects between the significant-other variable (OSO) and ego's own occupational expectation (OE). As shown in the figure, the "feedback" loop alters the calculation of indirect and total effects. For the recursive model in Figure 17a, IE = bc, and TE = a + bc, but for the reciprocal model in Figure 17b, IE = (bc + acd)/(1 - cd), and TE = (a + bc) /(1 -cd). Note that the term 1 - cd involves the feedback loop--c is the effect of OSO on OE, and d is the reverse effect. The numerator of the total effects for the reciprocal model matches the corresponding terms in the recursive model. Thus, calculations of the total effect for the reciprocal model can be viewed as requiring a correction factor to account for the causal feedback between significant others and ego. The correction factor accounts for the fact that the initial impact on OE of a change (difference) in SES recycles back to OSO, then back to OE, back to OSO, back to OE, and so on. Each step of the recycling is assumed smaller than the last step so that the effects of recycling converge to a constant (see Heise 1975: 62ff).

The influence of causal feedback on the indirect effect of SES on OE is slightly more complicated than its influence on the total effect. The indirect effect in the presence if feedback has the same correction factor (1-- cd) in the denomination as does the total effect. The numerator of the indirect effect in the presence of feedback contains the indirect effect for the

feedback system (bc) plus another term: acd. The term acd accounts for indirect effect which feeds back and forth between OSO and OE.

The second two path diagrams in Figure 17 illustrate these principles for four-variable models, one recursive (Figure 17c) and one reciprocal (Figure 17d). Observing the effects of academic performance (AP) on occupational expectation (OE), one sees that the correction for causal feedback in the four-variable system is quite analogous to the correction in the three-variable system. One divides the corresponding total effect in the recursive system by 1--ef, e being the effect of OSO on OE, and f referring to the reverse effect. The same correction factor (1--ef) appears in the denominator of the indirect effect, and the numerator contains, in addition to the indirect effect of the nonfeedback system, a term (cef) reflecting the indirect effect which feeds back and forth between OSO and OE. Although it is not shown in the figure, the analogous results occur for the effects of parental status (SES) on occupational expectation (OE).

Figures 17c and 17d also illustrate the idea that correlations may arise because both variables in the correlation are affected by a common antecedent variable; the portion of a correlation due to "causally prior" variable(s) is termed the noncausal part. Denoting the correlation between academic performance and occupational expectation (OE) by (r_{24}), the model in 17c implies the following decomposition:

r_{24} =	ab	+ a	+ de
correlation =	Noncausal part	+ direct effect	+ indirect effect

The noncausal part is due to the fact that both AP (x_2) and OE (x_4) are affected by a common antedecent--SES. A similar decomposition occurs in the reciprocal model (Figure 17d).[4]

The concept of indirect effect is central to status

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[4]It should be noted that the noncausal part shown here depends on the assumption that SES is uncorrelated with the disturbance for AP. In sociological discussions of path analysis, identification of indirect and total effects generally depends on decomposition of correlations. The same results can be achieved by creating independent definitions of the concepts indirect and total effects in terms of certain partial derivatives. The

attainment theory. As noted earlier, the field of investigation began with the pervasive observation that status mobility between father and son is limited, thus implying father's status is correlated with son's status. The common thread linking diverse empirical investigations of status attainment is the goal of interpreting the father-son relationship by identifying processes that intervene between father's and son's status--showing why the correlation arises. A key argument has been that parents' occupational values are related to parental status, parents become significant others for their children and thereby pass these occupational values on to their children in the form of level of the children's occupational expectation. The level of the children's occupational expectation, in turn, affects their occupational attainment. An analogous argument is advanced for educational attainment.

The concept of indirect effect in path analysis provides a basis for quantitative tests of this elementary theory. It is instructive to see how the principles of calculating indirect effects can be applied to the basic theory. Figure 18 abstracts some important principles from the preceding paragraph. With this model, the direct effect of parental status on one's occupational attainment is indexed by the single path coefficient symbolized by "a" in the figure. The combined indirect effects are be + bcd. The theory indicates that a should be small relative to be + bcd. The diagram also illustrates the idea that indirect effects can be broken into components. The term eb reflects the indirect effect of SES on occupational attainment (OA) flowing to the signigicant other variable (OSO) and then directly to OA, and the term bcd reflects a three step transmission, from SES to OSO to OE to OA.

The basic status attainment model given in Figure 16 also implies that the effect of academic performance on educational

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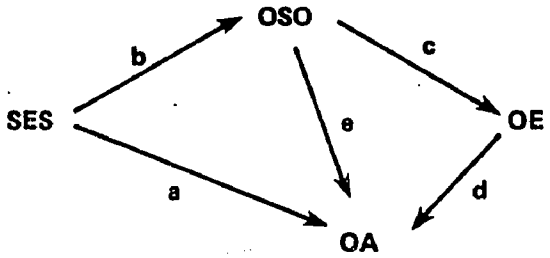
latter stratgegy seems preferable, because it offers a conceptual basis for defining effects by relative changes in y for a given change in x. All the results given in the text--both for recursive and reciprocal models--can be derived from definitions of direct, indirect, and total effects based on particular partial derivations. In addition, the definitions form the basis for generalization of the results presented in the text to cover a wide variety of linear and nonlinear models. For example, the first author of this report has derived a quite general expression for finding all the total and indirect effects of all exogeneous variables on all endogeneous variables in the standard econometric model of simultaneous systems.

and occupational expectations and attainments is indirect, and that the effect of the significant other variables on attainment operate indirectly through ego's own expectation. In addition, the effect of mental ability on attainment is indirect. In particular, academic performance should be an important intervening variable between mental ability and educational expectations and attainments. These predictions are part of the general theoretical viewpoint in status attainment research and have been explicitly stated (e.g., Sewell, Haller, and Portes 1969). However, no one expects them to hold precisely, and some empirical results have led to deemphasizing such predictions (e.g., Sewell, Haller, and Ohlendorf 1970).



SES = parental status
OSO = occupational expectations of SO for ego
OE = ego's own occupational expectation
OA = ego's occupational attainment
a, b, c, d, e = path coefficients

FIGURE 18. Simplified model of occupational attainment.

The Blau-Duncan Findings

The American Occupational Structure (Blau and Duncan 1967) not only develops conceptual and methodological innovations that have influenced strongly stratification research, but also presents empirical results based on a large, national sample of males. The data provide a firm basis for estimating the nature of status attainment in the United States at the time the sample was observed. This subsection describes the Blau-Duncan data and summarizes their findings relating to the basic path model.

A national sample survey entitled "Occupational Changes in a Generation" (OCG) forms the basis for the findings in Blau and

Duncan's research. The OCG is comprised of about 20,700 men who were twenty through sixty-four years old at the time of the survey in March of 1962. Only members of the noninstitutionalized U.S. population were surveyed. The sample represents about 83 percent of eligible persons contacted. The survey was administered by the U.S. Bureau of the Census during one of the regular Current Population Surveys (CPS) that the Bureau of the Census carries out periodically. Thus, the sampling design matches that used by the CPS. Most of the information regarding the respondents' own status characteristics (e.g., occupation, education, and income) was contained on the regular CPS schedule; information about the status characteristics of the respondents' father was obtained from respondents in a supplemental survey instrument that CPS interviewers left with respondents to complete and return by mail. Blau and Duncan carried out checks on the accuracy of the recall data and concluded that it is probably almost as reliable as data referring to respondents' own status characteristics (1967: 16), but they are quick to note that none of this type of data is error free.

The main variables included in the path analyses refer either to respondents' education or occupational status or to the educational or occupational status of the respondents' fathers. All of the occupational information is converted to Duncan SEI scores. Father's occupational status refers to fathers' occupation when the respondent was sixteen years old. Two occupational-status variables were collected for respondents, one referring to first job and one to the current job at the time of the survey. Education for fathers and sons is converted to numerical codes based on (but not equal to) the number of completed years of schooling. In addition, information was collected regarding income, family size, marital status, migration history, race, and national origin.

Findings relating to the basic path diagram (see Figure 13) are reviewed here; other analyses based on the OCG are summarized briefly in the last subsection. Recall that Blau and Duncan's basic path model contains five variables: father's education, father's occupational status when the son was sixteen years old, respondent's education, occupational status of the respondent's first job, and current (1962) occupational status of the respondent. The path diagram indicates no causal order between father's education and father's occupation but indicates these two variables affect all the son's status characteristics. The son's status variables are given the following causal order: education, first job, current job. There is some question about the accuracy of assuming education affects first job since the data do not indicate whether the first job occurred after

completion of education. Blau and Duncan suggest that the "appreciable minority" of respondents for whom the first job occurred prior to completion of education probably generates a downward bias in relationships between education and first job, and between first job and current job.

The statistical calculations needed to address the three main implications of the status attainment model are collected in Table 7 for males aged twenty to sixty-four. The table is formated to promote ready comparisons between bivariate correlations, direct effects, indirect effects, total effects, and noncausal parts of correlations. The table also presents R-square values. It is clear from the table that the Blau-Duncan data lend some support to the first two empirical implications of status attainment theory, namely that the effects should be nonnegative and that predictive accuracy should be moderate or high. Only one coefficient in the table is negative--the direct effect of father's education on respondent's current job status, but the magnitude of the coefficient is miniscule, -.014. The R-squares are of moderate strength, gauged against current social science data for which the individual is the unit of analysis. The fact that the R-squares uniformly increase from respondent's education to respondent's first job to respondent's current job is primarily due to the addition of predictor variables in successive equations. This is a common feature of recursive path models.

The correlational decompositions of most interest are those involving relationships between the two status-background variables (father's education and father's occupation), and the respondent's occupational statuses, (first job and current job). Regarding father's occupation and current job, the correlation is .405, and .08 (NCP) of this can be attributed to the correlation between father's occupation and father's education and to the effects of father's education on current job. The remaining value, .405 - .080 = .325, is the total effect of father's occupation on son's current job. The indirect effect (.205) is about 1.7 times larger than the direct effect (.120). The indirect effect operating through respondents' education is .145 (not shown in Table 7). Thus, the hypothesis that the effects of family status on one's own occupational status is indirect finds some support in these data. The indirect effect via education exceeds the direct effect, and the complete indirect effect is substantially larger than the direct effect.

The relationship between father's occupation and respondent's first job does not reveal strong support for the intervening-variable hypothesis. In this case the correlation is .417, of which .082 is a "noncausal part." The remaining total

Table 7

Data for Blau and Duncan's Basic Path Model, U.S. Males Aged 20-64 in 1962

	Independent Variable																					
	Father's Education (assumption 1)					Father's Education (assumption 2)				Father's Occupation					Respondent's Education					First Job Status			R^2
Dependent Variable	r	DE	IE	TE	NCP	r	DE	IE	TE	r	DE	IE	TE	NCP	r	DE	IE	TE	NCP	r	DE	NCP	
Respondent's Education	.453	.310		.310	.143	.453	.310	.143	.455	.438	.279		.279	.159									.26
First Job Status	.332	.026	.134	.160	.172	.332	.026	.306	.332	.417	.214	.121	.335	.082	.538	.433		.440	.098				.33
Second Job Status	.322	-.014	.168	.154	.168	.322	.014	.336	.322	.405	.120	.205	.325	.080	.596	.397	.122	.519	.077	.541	.282	.259	.43

SYMBOLS:
- r = bivariate correlation
- DE = direct effect, standardized partial regression coefficient calculated by OLS
- IE = indirect effect
- TE = total effect
- NCP = "noncausal part" of the correlation (r)
- R^2 = multiple coefficient of determination

NOTES:

1. Assumption 1 is that father's education has no effect on father's occupation
2. Assumption 2 is that father's education affects father's occupation
3. Calculations IE, TE, and NCP were carried out by the authors of this volume.
4. The direct effects reported in this table may be slightly different those in Figure 13. In order to insure numerical consistency, calculating IE, TE, and NCP, data for the complete regression equations were taken from the source

SOURCE: Blau and Duncan (1967: 169, table 5.1 and 174, table 5.2).

effect (.335) is predominantly direct (.214), the indirect effect via education (.121) being little more than half the direct effect. The relatively large direct effect of father's occupation on first job is responsible for a fair portion of the indirect effect of father's occupation on current job. The spirit of the intervening-variable hypothesis suggests that one might be inclined to eliminate this pathway from consideration when evaluating the basic theory. As noted in the previous paragraph, however, when the indirect effect of father's occupation on current job operating through first job is eliminated, the indirect effect through education still exceeds the direct effect. These observations suggest that Blau and Duncan may have been correct in speculating that respondents for whom the first job preceded completion of their education attenuated the correlation between education and the status of the first job.

The fact that the basic model stipulates no causal relation between father's education and father's occupation raises some ambiguity about the proper identification of indirect effects of father's education. No ambiguity arises, however, concerning indirect effects of father's occupation, since the status of father's occupation when the son was sixteen years old probably exercises no influence on the amount of schooling achieved by the father. The ambiguity regarding indirect effects of father's education is reflected in Table 7 by presentation of two decompositions for father's education. The column labeled "assumption 1" in the table attributes the entire correlation between father's education and father's occupational status to prior variables (e.g., grandparents' status, or father's mental ability); the column labeled "assumption 2" attributes the entire correlation to the effect of father's education on father's occupation. Neither assumption is entirely plausible, although assumption 2 is probably more nearly accurate than assumption 1. No matter which assumption is preferred, however, essentially all the total effect of father's education on first job or current job is indirect, but the magnitude of the indirect effect depends heavily on which assumption is preferred. For assumption 1 the indirect effects are .134 and .168 for first job and current job, respectively; whereas, for assumption 2, the corresponding values are .306 and .336. The indirect effects under assumption 2, then, are about double those under assumption 1. This exercise illustrates a general phenomenon in path analysis. Although estimates of path coefficients are often unaffected by unspecified causal relations, analysis of indirect effects (and "noncausal parts" of correlations) are rendered ambiguous by unspecified causal relations. This fact often has gone unrecognized in the literature.

To summarize the effects of father's education, the basic

intervening-variable hypothesis is strongly substantiated for respect to the influence of father's education on son's occupational statuses, irrespective of whether the correlation between father's education and his occupation is attributed to prior causes or to an effect of father's education on his occupation. However, the magnitude of the indirect effect (and, therefore, total effect) is strongly affected by the source of the correlation between father's education and his occupation.

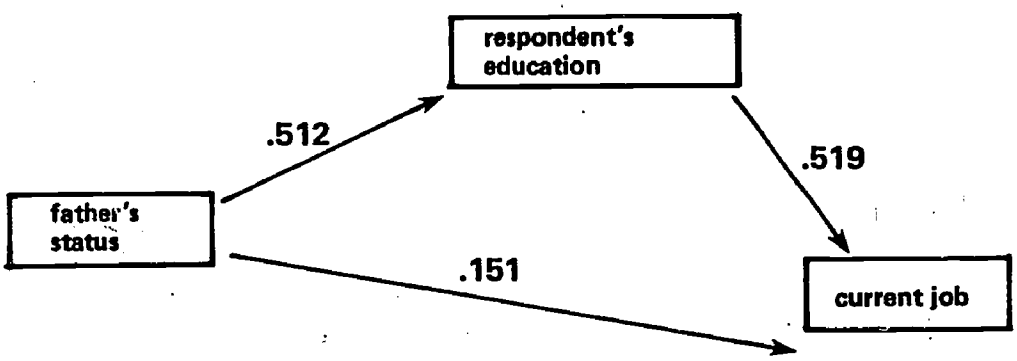
It is worth noting that only a small portion of the total effect of respondent's education on current job (.519) is indirect via first job (.122). This observation also lends some support to Blau and Duncan's view that respodent's listing first jobs prior to completion of their education may have deflated correlations of education with first job and current job with first job. This interpretation is reinforced by subsequent reanalysis of relationships involving first job reported by Duncan, Featherman, and Duncan. These authors write:

> The outcome of this work suggests the advisability of deleting first job from the basic model, to avoid conveying an over simplified impression of how this particular career contingency actually operates. This is not to suggest that it is an unimportant variable but rather to indicate that a separate treatment is advisable (Duncan, Featherman, and Duncan 1972: 206).
>
> Detailed cross-classification of data on educational attainment by age at first job suggests that many men interrupt schooling to enter the labor force in what they will later interpret to have been their 'first jobs.' It is, therefore, an oversimplification to think of schooling as unformily preceding first job (Duncan, Featherman, and Duncan 1972: 252).

Later analyses based on the OCG data have omitted first job from the basic model (e.g., Featherman and Hauser 1976; Hauser and Featherman 1977).

The data in Table 7 reveal substantial support for the intervening-variable hypothesis except for the small indirect effect of father's occupation on first job; however, in view of the ambiguities of the first job measurement, and in the interest of parsimony, a simplified model offers considerable heuristic value. Recall the fundamental idea of the intervening-variable model, quoted earlier from Duncan, Featherman, and Duncan (1972):

"family ——→ schooling ——→ job." In the Blau-Duncan model, two variables are classified as family background variables, father's education and father's occupation, and there are two job variables, occupational statuses of the son's first and current jobs. Including son's education, then, the Blau-Duncan model contains five variables. Although five variables is a relatively small number, the Blau-Duncan model is considerably more complicated than the basic theory; a simplified model therefore, is presented, calculated from Blau and Duncan's data. The simplified model closely resembles the family ——→ schooling ——→ job sequence. The model is calculated from the Blau-Duncan correlation matrix (1967: 169, Table 5.1); the results are shown in Figure 19.



NOTE: "Father's status" is the sum of father'd education and father's occupational status, both converted to standard scores prior to adding.

FIGURE 19. Simplified model of status attainment developed from Blau and Duncan.

For this parsimonious structuring of the theory, the main findings stand out in bold relief. The indirect effect of father's status ("family") on current job is .266 = .512(.519); whereas, the direct effect is .151. Only .077 of the correlation between education and current job is due to father's status (the correlation is .596; NCP = .596 - .519 = .077). In this simplified form, the data translate quite directly into a simple view of occupational stratification. Family background exercises a substantial effect on job-status achievement, but most of that effect occurs because family background influences the amount of schooling one completes which, in turn, affects job status.

Although Figure 19 displays considerably less information

than the full model, the parsimony of the model compensates in part for the information loss providing, of course, that the data displayed in the simplified model do not distort the findings of the larger model. The main source of possible distortion is the composite SES variable; it was constructed by summing the standard scores for father's education and father's occupation. In this particular data, the aggregate SES variable generates almost no distortion in the assessment of effects of family background on respondent's education; the square of the path from father's status to respondent's education is the same as the R-square using father's education and father's occupation as simultaneous predictors of respondent's education, to within limits of rounding. This result is not surprising since the path coefficients from father's education and father's occupation to respondent's education are nearly equal, and the summing procedure used to create "father's status," in effect, forces the two coefficients to be equal. Also, the direct effect of respondent's education on current job in the simplified model precisely matches the sum of the corresponding direct effect and indirect effect via first job in the full model, both values are .519. Moreover, the sum of the direct effects of father's education and occupation on current job and their indirect effects via first job in the full model is close to the direct effect of father's status in the reduced model (.187 for the former, .151 for the latter). Finally, one may note that the simplified model circumvents the problems of causal sequence regarding respondent's first job.

Having made these comments, it is important to add that replacement of the Blau-Duncan model with the simplified version shown in Figure 19 cannot be recommended as a general strategy. Figure 19 renders a convenient summary of the degree to which the intervening variable model is supported by data. In general, such an exercise must be carried out cautiously; simplified models must be compared to more elaborate models to assure that the simplification has not distorted important content in the data. The degree of simplification must pertain to the specific purposes of inquiry.

The main features of the Blau-Duncan model have been reviewed, but there remain some subsidiary issues that merit brief attention. First, by breaking the total sample into four age cohorts, Blau and Duncan present some evidence regarding time trends in stratification processes. Secondly, evidence regarding possible spurious effects in the basic path model is also contained in the Blau-Duncan volume. These two topics are considered briefly in the following paragraphs.

The four age cohorts studied by Blau and Duncan span ten-year age intervals: twenty-five to thirty-four, thirty-five to

forty-four, forty-five to fifty-four and fifty-five to sixty-four. Since father's education, father's occupation, respondent's education, and first job occur at approximately the same point in the life cycle of each cohort, the relationships among these variables can be viewed as approximations to data that might have been collected when each cohort was in the youngest age interval, twenty-five to thirty-four. The accuracy of the approximations depends mainly on accuracy of the recall data and differential mortality by variables contained in the model. No discernable trends appear in the relationships among these four variables across the four cohorts. This observation holds for the bivariate correlations and path coefficients.

On the other hand, current job does not occur at the same point in the life cycle for the four cohorts, and two marked differences among cohorts in relationships involving current job do appear in the data. First, the R-square values when current job is the dependent variable exhibit a monotonic decline from the youngest cohort to the oldest, ranging from .5 for the twenty-five to thirty-four group to .39 for the fifty-five to sixty-four group. The R-square differences are primarily due to a similar monotonic decline in the correlation between respondent's education and current job from the youngest to the oldest cohort; the correlations span from .657 for the youngest cohort to .576 for the oldest cohort.

Blau and Duncan attribute this monotonic decline to a time trend in the relationship between education and status of one's occupation rather than to the monotonic increase over cohorts in time between completing one's education and the time of measurement for current job. Two pieces of evidence are cited in favor of this interpretation. First, Blau and Duncan argue that if the change in correlations were due to the time interval between completion of education and current job, then the correlation between respondent's education and first job should exceed the correlation between respondent's education and current job, but this inequality does not hold in the OCG data. Blau and Duncan note, however, that the questionable sequencing of first job and education may account for the fact that respondent's education correlates more highly with current job than with first job. They therefore suggest the fact that father's education and occupation exhibit uniformly smaller correlations in all cohorts than do son's education and occupation is stronger evidence favoring the time-trend interpretation. One may doubt the validity of comparing the correlation between education and occupation for fathers to that for their sons, however. Both education and occupation of fathers were measured in the OCG data by querying the sons. Thus the measurements for fathers' education and occupation are subject to recall over an extended

time and may therefore contain larger errors; though this possibility runs counter to Blau and Duncan's tentative conclusion, it is plausible nevertheless.

To evaluate the possibility that there is more unreliability in the data for fathers than in the data for sons, the authors of the present volume carried out some further calculations. Equating the correlation between education and occupation of fathers to the same correlation for sons and using the standard correction for attenuation of a correlation due to measurement error allows an estimate of the relative unreliabilities for fathers and sons that would produce the observed results given that the error-free correlations were the same. For the total OCG sample, this calculation shows that the ratio of the geometric mean reliabilities for education and occupation of fathers to the same geometric mean for sons is .866. This does not seem like an unreasonable result. For example, if the geometric mean reliability of fathers' education and occupation were .80, then the corresponding value for sons would be .92; such numbers are entirely plausible. In fact, Hauser and Faterhman (1977: 294) report reliability estimates from OCG data for fathers' and sons' education and occupation implying the ratio of the geometric mean for fathers to the geometric mean for sons to be .782. This ratio generates a larger correlation between sons' education and occupation than the corresponding correlation for fathers. It, therefore, appears that the OCG data do not provide good evidence regarding the appropriate interpretation of cohort differences in the correlation between respondent's education and current job.

Using synthetic cohorts, Blau and Duncan also produce a highly interesting model incorporating simulated observations of a single cohort at ten-year intervals from age twenty-five through age sixty-four. These results show a marked age trend in the effect of past job on current job, implying that occupational mobility declines with age. There is ample theory to support this view, but convincing empirical support must await collection of real time-series data on a single cohort.

Finally, Blau and Duncan present some preliminary evidence that their basic model would remain essentially unchanged had a variety of additional variables been statistically controlled. The additional variables are: population size of one's residence in 1962, race, ethnic origin, migration, presence or absence of parents in the home when one was a youth, number of siblings in the family of origin, region, and marital status in 1962. A table is presented showing that bivariate correlations among the variables in the basic model are not affected strongly by controlling for these qualitative variables. The control

variables are entered into the calculations singly and in combinations of two or three. Later chapters of the volume analyze effects of these control variables on occupational attainment and educational achievement; brief summaries of some of these findings are contained in later pages of this chapter.

The Wisconsin Findings

Blau and Duncan opened a new vista in stratification research, but the limited number of variables contained in the OCG data prevented them from playing out the full implications of the theoretical/methodological viewpoint that they initiated (see, however, Duncan, Featherman, and Duncan 1972, to be referenced later in this chapter). Sewell and associates, drawing on longitudinal data collected from Wisconsin residents, have developed important expansions of the basic Blau-Duncan model. This subsection reviews empirical work based on the Wisconsin data. The seminal papers by Sewell, Haller, and Portes (1969) and Sewell, Haller, and Ohlendorf (1970) are reviewed first, and then extensions and modifications of the early work are summarized. The Wisconsin model is considerably more complicated than the Blau-Duncan model, but the early version of the Wisconsin model is somewhat less involved than later versions. By focusing on the early version of the model first, one gains substantial parsimony and creates a vantage point from which to view extensions.

The earliest papers presenting models of the status attainment processes published from the Wisconsin data treat educational attainment as the ultimate dependent variable and do not include a full complement of predictor variables (Sewell and Shah 1967; 1968). The first path model including occupational status attainment is presented in a paper by Sewell, Haller, and Portes (1969), but this paper soon was followed by an analysis of the same model for a more comprehensive set of population groups (Sewell, Haller, and Ohlendorf 1970). The following summary, therefore, draws mostly from the second paper.

Table 8 presents standardized path coefficients and bivariate correlations (in parentheses) reported by Sewell, Haller, and Ohlendorf for their total sample. The data are based on responses provided by a sample of 4,388 Wisconsin high school senior boys in 1957 for whom data were available from a mailed follow-up survey conducted in 1964-65. Data were received from 87.7 percent of the original respondents. The survey was conducted statewide; hence, it includes respondents from all residence categories ranging from farms to cities with populations exceeding 100,000. The family status variable (SES) is comprised of a factor weighted combination of the following

Table 8

The Wisconsin Status Attainment Model Based on Sewell's Data

Dependent Variables	Independent Variables: MA	SES	AP	SO	EE	OE	EA	R Squares
AP	.581	.026						.347
	(.589)	(.194)						
SO	.179	.246	.320					.318
	(.438)	(.359)	(.473)					
EE	.076	.168	.176	.434				.442
	(.418)	(.380)	(.459)	(.611)				
OE	.127	.163	.194	.359	--			.410
	(.445)	(.366)	(.470)	(.565)	(.771)			
EA	.080	.128	.172	.177	.350	.100		.598
	(.486)	(.417)	(.535)	(.609)	(.696)	(.632)		
OA	.031	.070	.035	.050	-.072	.150	.480	.405
	(.363)	(.331)	(.384)	(.438)	(.463)	(.482)	(.618)	

VARIABLES:

MA = mental ability (IQ)
SES = socioeconomic status index
AP = academic performance (school grades)
SO = significant-other composite variable
EE = student's educational expectation
OE = student's occupational expectation
EA = educational attainment
OA = occupational status attainment

NOTE: main entries are standardized path coefficients estimated by OLS and figures in parentheses are correlations.

variables: education of one's father, occupation of one's father, education of one's mother, respondent's perception (while in high school) of the economic status of the family, respondent's perception of parental financial support for attending college, and respondent's perception of the approximate amount of that support. Finally, the significant other variable (SO) is an unweighted sum of the students' report of the amount of encouragement to attend college received from his parents, the students' report of encouragement received from teachers, and the students' report of the college plans of his peers. Thus, the SO variable refers to educational communications of others but not to occupational communications.

The path coefficients are based on ordinary least squares (OLS) and a recursive system (i.e., it was assumed that each variable in the model has a unique "causal" position, possibly affecting all other variables with later positions in the order and possibly affected by all variables with earlier positions in the order). The variables are listed in the table in the order matching their assumed causal position; it is assumed that all variables may be affected only by other variables with smaller subscripts and may affect only variables with larger subscripts. There are two exceptions to these assumptions, however; no ordering is assumed between family status and mental ability--they are left as correlated givens. Additionally, Sewell and associates make no assumptions about the direction of effects between students' educational and occupational expectations. For OLS, standarized path coefficients are equal to standardized, partial regression coefficients with all variables affecting the dependent variable except one statistically controlled (Boudon 1965; Goldberger 1964). The table lists independent variables across columns and dependent variables across rows; each path coefficient is, therefore, a standardized partial regression coefficient with the dependent variable indicated by the row, the independent variable indicated by the column, and all other column variables to the left of the diagonal statistically controlled. R-square values are listed in the last column of the table for each dependent variable.

There are several important observations contained in the table. First, by far the largest "effect" on occupational status is educational attainment. This matches the Blau-Duncan findings. Secondly, educational expectation of youth has a much larger effect on educational attainment than does any other variable. Thirdly, the effect of the significant other variable dominates both educational and occupational expectations. Fourthly, the effects on expectations and attainment of the background variables are substantially smaller than their bivariate correlations with the same expectation and attainment

variables. All but one of the path coefficients are nonnegative, and the negative value is near zero (EE on OA). Finally, the R-square values are uniformly fairly high by survey research standards.

The Wisconsin data are in reasonable agreement with the main hypotheses drawn from status attainment theory. As noted, predictions are moderately accurate, and the paths are mostly nonnegative. Although a formal breakdown of total, direct, and indirect effects is not given, the pattern of relationships cited in the preceding paragraph provides partial support for the intervening-variable hypothesis. Abstracting from the data and hypothesis. Abstracting from the data and including only the most essential elements of the theory, the data approximate a simple chain: SES ⟶ significant others ⟶ expectations ⟶ educational attainment ⟶ occupational attainment. Of course, the data do not precisely fit this parsimonious view. For example, there is a modest direct effect from occupational expectation to occupational attainment. Also, SES, mental ability, and academic performance retain small direct effects on educational attainment, although their direct effects on occupational attainment are negligible.

It is useful to trace the manner in which the effects of SES on educational and occupational expectations operate through the significant other variable. For this exercise, it is assumed that the correlation between mental ability and SES is due to an effect of the latter on the former. This assumption is inconsistent with Figure 3 but does conform to later versions of the model (e.g., Hauser 1972; Sewell and Hauser 1975). The calculations are shown in Table 9. It is apparent that the significant other variable accounts for well over half of the indirect effects of SES on both educational and occupational expectations, and also accounts for 35 to 40 percent of the total effects. It is unfortunate that the Wisconsin data contain no measure of significant others' attitudes regarding ego's occupational plans. It is likely that the second line of Table 11 would more closely approximate the first had an occupational significant other variable been included.

Another important feature of the Wisconsin data is the fairly close association of educational and occupational expectations with educational and occupational attainments. Correlations where educational attainment is the dependent variable range above .60, and where occupational attainment is the dependent variable, above .45. The total effect of educational expectation on educational attainment equals the direct effect, .350, and the total effect of occupational expectation on occupational attainment is .198. Educational plans are apparently better

predictors of educational attainments than occupational plans are for occupational attainment.

These results are fairly impressive when one recalls that the information for educational and occupational plans was collected while respondents were still seniors in high school, and the attainment data were obtained about seven years later. Also, it should be emphasized that the total effects of the expectation variables on attainment would probably be substantially increased if the model were specified so that the SO variable, and the two expectation variables exercised reciprocal effects on each other, as recommended earlier in this chapter.

The broad outline of the model presented by Sewell, Haller, and Ohlendorf is easy to detect in later modifications. The chief differences between the initial Wisconsin model and later versions are: (a) separate family background variables are introduced in place of the SES index, (b) the significant other (SO) variable is disaggregated into its components, (c) filial income is added as a dependent variable, and (d) specification of the model is altered to permit SES to affect mental ability (see e.g., Sewell 1971; Hauser 1972; Sewell and Hauser 1972; Sewell and Hauser 1975).

An important volume by Sewell and Hauser (1975) presents an integrated statement of the current version of the model and points to plans for further development. After some exploratory analyses , Sewell and Hauser settle on four family SES variables: father's occupational status, father's education, mother's education, and average parental income over the years 1957 through 1960. The income data were obtained from income tax records. The composite SO variable used in earlier work is split into its separate parts--parental encouragement to attend college, teacher encouragement to attend college, and peer plans to attend college. The other variables are taken from earlier work, but earned income of respondents is added as a dependent variable. The income data were obtained through social security records and cover three years (1965-1967).

One of the important features of the Sewell-Hauser volume is the comparisons between the Wisconsin data and three national data sets, one of the national data sets being the OCG (the Blau-Duncan data). The main conclusion stemming from these comparisons is that, where data matches are possible, variations between the Wisconsin path models and the same models calculated from the other data are fairly minor. Sewell and Hauser choose to interpret this result as an indication that stratification processes are fairly stable under a variety of conditions rather than claiming that the state of Wisconsin is a microcosm of the

Table 9

The Role of Significant Others in Interpreting Effect of SES on Educational and Occupational Expectations

Dependent Variable	TE	DE	IE	IE via SO	Percent IE via SO	Percent TE via SO
EE	.380	.168	.212	.156	74%	41%
OE	.366	.163	.203	.129	64	35

VARIABLES:

SES = parental socioeconomic index

SO = significant other composite variable

SYMBOLS:

TE = total effect

DE = direct effect

IE = indirect effect

SOURCE: Calculated from Table 8

nation. This interpretation is reinforced by Hauser and Featherman (1977) who report little interaction in the OCG data when an analysis of covariance is applied to study simultaneously effects of city size and other variables in an expanded version of the Blau-Duncan model. The similarity of the results from different data sets is quite striking when one recognizes the differences between data sets in sampling and measurement. For example, the Wisconsin data are drawn from a single state, contain only one cohort, and exclude persons not graduating from high school; whereas, the OCG is a national sample, contains a wide span of cohorts, and includes persons not graduating from high school. In sum, it appears that the Wisconsin data may provide a good apporoximation to findings that might result if the same information were collected from a national sample.

With respect to educational and occupational attainments, the

main features of the initial Wisconsin model remain intact in the revision. Most of the effects of family background on education and occupation are mediated by social-psychological processes, significant others and career expectations. The significant-other variables interpret substantial portions of the relation-ships between background and educational and occupational expectations. Educational attainment remains the chief influence on occupational attainment.

In the disaggregated model, the total effects of the family background variables on educational attainment are approximately equal to each other; a similar observation holds for the total effects of background on occupational attainment and on mental ability. In contrast to the effects of background on educational and occupational attainment, only parental income exercises even modest influence on filial income. Over half the variance in educational attainment is attributed to measured variables, and the R-square for occupational attainment is .405 contrasting sharply with this is the finding that less than 10 percent of the variance in income is explained by the model. This anomalie may be due, in part, to the fact that (a) occupation and income information do not refer to the same dates, (b) the major occupational differences in income develop later in the life cycle than the point when the follow-up information was collected, or (c) major predictors of income are omitted from the model.

In contrast to total effects, the net effect of parental education and income on occupational attainment is not statistically significant, but father's occupation retains a small direct effect. This outcome closely matches the observations in the basic Blau-Duncan model. The main result of disaggregating the significant other index is that teacher's encouragement to attend college manifests substantially smaller effects on most subsequent variables than do parental encouragement to attend college and peer plans to attend college. The latter two significant-other variables exhibit nearly equal and substantial impact on career plans. In addition, tests for nonlinearity and interaction with quality of college attended reveal no substantial alterations in the model. On the other hand, the Wisconsin data are consistent with other reports that mental ability yields larger income returns as one's education increases.[5]

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[5]Becker (1964) points out that both education and ability are distributed approximately normally, and that their product therefore produces a skewed distribution similar to the observed income distribution.

Replications and Extensions

The preceding subsections summarize the basic results for the Blau-Duncan and Wisconsin models, but these summaries do not capture the volume and range of research that has been executed within the general framework of status-attainment theory. The following discussion references a variety of such research, summarizing additional findings about the mediating role of social psychological processes, tests for nonlinearity, sex and race comparisons, and other factors such as "career contingencies."

Drawing from a variety of data sources, numerous publications have examined the role of career expectations and significant others as intervening variables in status attainment (e.g., Woelfel and Haller 1971; Kerckhoff 1971; Kerckhoff and Huff 1974; Curry et al. 1976; Curry et al. 1978; Picou and Carter 1976; Porter 1974; Rehberg and Hotchkiss 1972; Williams 1972; 1975; Wilson and Portes 1975; Haller and Butterworth 1960; Duncan, Haller, and Portes 1968; Alexander and Eckland 1974; Alexander, Eckland, and Griffin 1975; Hout and Morgan 1975; Bordua 1960; Duncan, Featherman, and Duncan 1972). In the main, these analyses sustain the view proffered by Sewell and associates--that significant others form an important link between family background and career attainments by influencing the career expectations of youth. Measurement, sampling, and exact specification of the path models (or other analytic methods) vary among studies, however.

A study reported by Alexander, Eckland, and Griffin (1975) is of particular interest because it presents a close replication of the expanded Wisconsin Model as developed in Sewell and Hauser (1975). The replication is based on a national sample of nonfarm males from which information was collected when respondents were high school sophomores and again when respondents were thirteen years out of high school. Thus the sample contains the same cohort as the Wisconsin sample, but the first panel of information was collected two years earlier in the life cycle than it was in the Wisconsin sample, and the follow-up data were collected at a later stage than they were in the Wisconsin sample (thirteen years after high school vs. seven years). The later collection of follow-up data in the replication may be an advantage, however, since it allows a longer period for realization of the returns to education and occupation. All the variables in the expanded Wisconsin model (as reported in Sewell and Hauser 1975) are approximated in the replication. Family background variables include father's occupational status, father's education, mother's education, and an index of family consumer acquisitions serving as a proxy for family income. A measure of mental ability and self-reported school class standing are also included. The three significant other variables, peer

college plans, teacher's and parent's college encouragements, are also approximated. Educational and occupational expectations are indexed. The three adult attainment measures are education, occupation, and income.

Alexander, Eckland, and Griffin conclude their analysis in the following words:

> This paper has presented a replication of the Wisconsin model of socioeconomic achievement....The dynamics of socioeconomic achievement revealed in the two analyses are remarkably consistent. This holds, in the main, for most of the effects in the models and the patterns of mediated influence that they imply. This paper thus provides rather strong independent support for most of the Wisconsin conclusions regarding social psychological influences in the attainment process...(Alexander, Eckland, and Griffin 1975: 340-341).

Considering the difference between the Wisconsin measure of family income and the acquisition index in the replication, one of the most striking aspects of the data analyzed by Alexander and associates is the duplication of the Wisconsin finding that a measure of family economic standing is the only important family background variable that impacts on filial income. Also, the dominant effect of educational attainment on occupational status is replicated. The significant-other variables, especially peer plans and parental encouragement, generally mediate the relationships between parental status and filial educational and occupational plans. However, one important discrepancy between the Wisconsin findings and the replication must be noted. Educational expectation in the replication is not as important in predicting educational attainment as it is in the Wisconsin data. The authors of the replication attribute this to the fact that the replication data were first gathered when respondents were sophomores; whereas, the first panel in the Wisconsin data was collected when respondents were seniors. This explanation is certainly plausible, but must, of course, be checked empirically before it is convincing.

Not all scholars agree on the importance of significant others as intervening variables interpreting the relationships between status origin and status destination. In an examination of educational attainment, Wilson and Portes conclude:

> Whereas, past research emphasized effects of significant-other influences and aspirations, present results point to the importance of ability variables and socioeconomic background. Educational aspiration still shows a strong effect on educational attainment, but it fails to mediate the direct effects of ability and background variables on the latter. Significant-other influences do not have a

direct effect on attainment and emerge as a much weaker variable in the process (Wilson and Portes 1975: 357-359).

These conclusions are based on a national sample of boys collected as part of the Youth in Transition Project (Bachman 1970). The sample consists of 1620 respondents in the fourth follow-up, representing 71 percent of the original sample.

A plausible case can be made that the Wilson-Portes finding regarding significant-other influences is due, in part, to measurement procedures used to gather information about significant others. Wilson and Portes' significant-other variable is an equally weighted composite of student responses regarding encouragement to attend college received from one's father, mother, teacher, and friend. The response options relating to each significant other were the same and are listed below:

> encourages respondent to attend college and would feel bad if he did not
>
> encourages respondent to attend college, but would not care if he did not
>
> does not encourage respondent to attend college (Wilson and Portes 1975: 348).

According to the classification of status attainment theory, presented earlier in this text, the response options for the Wilson-Portes variable classify it as a "perceived-encouragement" measure.[6] In contrast, although Sewell and associates generally refer to their measure of parental attitudes as parental encouragement to attend college, careful reading of their questionnaire item indicates that their parental SO variable is close to a "perceived-expectation" variable. The exact wording of the Wisconsin item reads as follows:

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[6]Actually, the item is an incomplete crossing of all possibilities in an encouragement and expectation measure, but placement of the term encouragement first seems to emphasize the SO encouragement. Also, an accurate response to the first two options requires that one perceive significant others as exhorting him/her to attend college. Thus, since the response options are listed in descending order according to numerical code, a high score requires the SO to encourage college attendance.

My parents:

want me to go college

do not want me to go to college

do not care whether I go to college

will not let me go

(Sewell and Hauser 1975: 197).

Although the item does not contain the word expect, the meaning of the item would be changed to a moderate extent by replacing "want" with expect in the item alternatives; whereas, using encourage in place of "want" would produce a substantial change of meaning. There are many ways to communicate a desire or expectation without direct encouragement. For example, parents may routinely speak to their children about "when you go to college" rather than saying "if you go to college." Thus, subtle use of phraseology may communicate a desire or expectation to children without ever engaging in direct encouragement. Therefore, it appears that students might very well check the lowest response option in the Wilson-Portes variable and still believe that their significant others want or expect them to attend college.

The number of studies embodying the significant-other concept in status attainment research and the variety of measurement procedures used permit more than idle speculation about how the Wilson-Portes measure may have affected their findings. Table 10 presents a summary of correlations of educational and occupational expectations of youth with significant-other variables measured according to the four types--"perceived" encouragement, "perceived" expectation, and "objective" expectation, and "objective" encouragement were located. Except where indicated in the table, the results are for white males, since results are much more widely available for this group than for other groups. Bivariate correlations are reported instead of path coefficients because the set of independent variables varies from study to study, thus making comparisons between path coefficients difficult. The rows of the table identify significant-other expectations for ego and significant other encouragement variables, as labeled. The left-hand columns of the table identify educational expectations of ego and occupational expectations of ego. Sources of data are given to the right of the column entries.

The three data sets containing SO expectations for ego measured by asking significant others for information "objective"

Table 10

Summary of Results from Several Significant Other Studies for White Males

Significant Other Variable	Ego's Expectation Variable: education	Ego's Expectation Variable: occupation	Source of Data
Panel A: Perceived Encouragement Variables			
Parents' ed. enc.	.401	.235	Picou and Carter, 1976. (Louisiana data set for total sample, N = 1241.) Seniors
Teachers' ed. enc.	.263	.198	
Composite ed. enc. Variable	. 38	. 37	Wilson and Porter, 1975. (Youth in Transition National data set, N = 1620) Seniors
Parents' ed. enc.	. 36	—	Rehberg and Hotchkiss, 1972. (Data set from Southern Tier of Up-State New York, N = 1170 Freshmen
Parents' ed. enc.	.542	.370	Curry et. al., 1976. (Columbus, Ohio Sample, N = 131.) Sophomores.
Teachers' ed. enc.	.238	.162	
Composite SO variable	. 38	. 37	
Panel B: Perceived Expectation Variables			
Parents' ed. exp.	.522	—	Sewell and Hauser, 1975. (Wisconsin data set for total sample, N = 410.) Seniors
Mother's ed. exp.	.749	.530	Kerckhoff, 1971. (Fort Wayne, Indiana, data set, N = 410.) Seniors
Father's ed. exp.	.768	.530	
Mother's occ. exp.	.474	.293	
Father's occ. exp.	.451	.367	
Parents' ed. exp.	. 78	—	Williams, 1972. (Canadian sample, N = 90,000) Freshmen, sophomores.
Teacher's ed. exp.	. 69	—	
Composite SO variables	—	.362	Porter, 1974. (Project TALENT national data set, N = 14,891, 41% of the first survey.) Seniors.
Teacher's occ. exp.	—	. 60	Pugh, 1976. (Five Connecticut cities, N = 1728.) Seniors.
Panel C. Objective Expectation Variables			
Composite ed. exp.	. 66	. 55	Woelfel and Haller, 1971. (Small Wisconsin city, N = 100.) NOTE: These data are for male and female seniors.
Composite occ. exp.	. 59	. 64	
	Freshmen		
Mother's ed. exp.	.616	—	Kerckhoff and Huff, 1974. (Fort Wayne, Indiana, sample seniors, N = 26) Freshmen, N = 67.
Father's ed. exp.	.614	—	Intact families only.
	Seniors		
Mother's ed. exp.	.691	—	
Father's ed. exp.	.674		
Parents' ed. exp.	.766	.591	Curry, et al., 1976. (Columbus, Ohio sample, N = 131). Sophomores
Parents' occ. exp.	.608	.453	

NOTE: Ed. enc. = educational encouragement
Ed. exp. = educational expectation
Occ. exp. = occupational expectation

expectation show remarkably consistent, high correlations. (See the panel C in the table.) Also, in four of the five data sets containing ego's perceptions of SO expectations, the correlations are quite high, especially in the Canadian data reported by Williams (1972)--although substantial nonresponse may have biased these calculations. In contrast, the correlation involving perceived expectations in the TALENT data set (Porter 1974) is comparatively low (r = .362). The high attrition rate in the TALENT survey (59%) renders the data difficult to interpret, however. Results are mixed when the significant-other variables are measured by asking ego to report the amount of encouragement to attend college received from specified significant others. The Ohio data set (Curry et al. 1976) shows fairly high correlations, but the other two data sets show values ranging below .40.

In addition to the correlational results displayed in Table 10, Curry and associates (1976; 1978) carried out explicit comparisons of parallel path models of the formation of educational and occupational expectations, one containing perceived encouragement variables and perceived peer plans to attend college, and the other containing objective expectation measures. The clear result was that the objective expectation measures provide much more adequate interpretation of the relationships between status background and mental ability with educational and occupational expectations than do perceived encouragement measures.

There is still another difference between the measurement used by Wilson and Portes and procedures used in Wisconsin. The SO variable referring to students' peers in the Wisconsin data refers to ego's perception of the plans of his peers to attend college; thus, it is a measure reflecting the idea of significant-other "model" rather than significant other "definer." On the other hand, the Youth in Transition variable refers to encouragement to attend college received from peer friends and therefore, reflects the concept of significant other "definer."

Although the evidence is not definitive, it seems fair to conclude that Wilson and Portes may have reached different conclusions had their significant other variables referred to expectations (or desires) of significant others rather than to significant other encouragement. Final determination of the issue, however, must await further research.

In sum, information available to date remains too ambiguous to permit definite conclusions, but it does appear that significant-other data gathered from significant others, rather than from ego, yield higher relationships. Also, it seems likely

that asking questions about SO expectations is more satisfactory than asking questions about SO encouragement to attend college. Finally, high correlations between ego's expectations for self and significant others' expectations for ego have been observed consistently enough to generate reasonable hope that an important variable in the career-decision-making process has been identified.

The path modeling paradigm for studying status attainment presumes that linear functions capture the major systematic variance shared among the variables. This assumption has been tested on occasion. Gasson, Haller, and Sewell (1972) report extensive tests for statistical interaction, using the Wisconsin data; they found no substantial deviations from additive relationships. Wilson and Portes (1975) present eta coefficients and product moment correlations for every pair of variables in their report, finding no marked departures from linear associations. Also, as noted above, Sewell and Hauser (1975) find no interactions with quality of college attended and show no bivariate deviations from linearity worthy of note. On the other hand, Fisher, Lutterman, and Ellegard (1975) display some evidence that ability interacts with schooling in affecting income. Also, Alexander and Eckland (1975) report that parental status exercises a stronger influence on occupational attainment than ability for college dropouts; whereas, the opposite pattern holds for college graduates. For high school graduates not attending college, parental status and ability show approximately equal effects. The observed interactions, however, were of modest size. In sum, results to date suggest that no large distortions are introduced by assuming linearity, but further exploration of specific departures from linearity is warranted. In particular, simulation study of the effects of measurement error and failure to sample individuals falling in the extreme tails of the distributions of the status attainment variables might prove interesting.

In recent years a spate of empirical papers including comparisons of status attainment processes for females to processes for males have been published (e.g., Alexander and Eckland 1974; Chase 1975; Featherman and Hauser 1976; Glenn, Ross, and Tully 1974; Hout and Morgan 1975; McClendon 1976; Rehberg and Hotchkiss 1972; Suter and Miller 1973; Taylor and Glenn 1975; Treiman and Terrell 1975; Tyree and Treas 1974; Williams 1975; 1972). Three of these papers conclude that the process of educational and occupational attainment of women is similar to the process for men (Featherman and Hauser 1976; Treiman and Terrell 1975; and McClendon 1976). In contrast, Alexander and Eckland (1974) report that educational attainment of men depends more on measured mental ability than does the educational attainment of women; whereas, women's educational

attainment depends more on status background than does that of men--in spite of the higher academic achievement of women. Few studies support Alexander and Eckland's observation that status background is more closely related to attainment of women than of men, however. Featherman and Hauser (1976), Chase (1975), and Glenn, Ross, and Tully (1974) report just the opposite, and McClendon (1976), and Treiman and Terrell (1974) observe small differences between the sexes. Analyses of differential earnings by sex have shown universally that women earn less than men earn when education and occupation are taken into account (Suter and Miller 1973; Treiman and Terrell 1975; and Featherman and Hauser 1976). A few papers examine the mobility of women through marriage. Chase (1975) and Glenn, Ross, and Tully (1974) report women to be more mobile by marriage than men are through occupational status, but Tyree and Treas (1974) conclude that the two forms of mobility are of about equal magnitude. Taylor and Glenn (1976) conducted an interesting comparison between marriage mobility of women associated with physical attractiveness to that related to the women's education, finding education to be the dominant variable.

Of the few papers focusing on career planning of youth, most have concluded that the process for females is similar to that of males (Williams 1975; 1972; and Rehberg and Hotchkiss 1972). Although sex differences have been observed, they generally have not been large and are not easy to interpret theoretically. On the other hand, Hout and Morgan (1975) and Curry and associates (1978) display detailed sex-race comparisons, finding several interactions. Hout and Morgan report that parental encouragement to attend college has "significant" effect on students' educational expectations for all four sex-race groups, but that the effect is substantially stronger for black males than for any other group. On the other hand, black males were the only group for which peer's college plans showed essentially no effect on educational expectation. In contrast to the other subgroups, grade-point average of black males exercised a strong effect on educational expectation, but measured mental ability showed very little direct effect. Contrary to the pattern for educational expectation, the college plans of peers was associated with a substantial effect on occupational expectation of black males, but the strongest effect of peer plans was observed for black females. White females were the only group for which peer plans did not show a fairly strong effect on occupational expectation. Parental educational encouragement had a substantial effect on occupational expectation for both male subgroups, but was related weakly to occupational expectation for black and white females. Hout and Morgan suggest that this observation may be due to sex-role stereotyping of parents. While the interactions reported by Hout and Morgan provide potentially important empirical background, they do not readily lend themselves to a coherent theoretical interpretation. Also, the ambiguity

regarding use of the estimation method described earlier in this chapter may render some of the findings questionable.

Curry and associates (1978) compare the process of forming educational and occupational expectations of black and white females to the process for black and white males. The sample consists of urban youth in the sophomore year of high school. They report that development of educational expectations of females is fairly similar to the development for males, but that R-squares and path coefficients when occupational expectation is the dependent variable are considerably smaller for females than for males, particularly for whites. The report also lends support to the importance of significant others in transmitting parental status into educational and occupational expectations of both sexes. A measure of "home-career" expectation was administered to the high school youth and to their parents; the variable was designed to reflect the degree to which female respondents and their parents emphasize the importance of homemaker roles versus occupational roles. The measurements collected from the high school respondents ask about the respondent's home-career expectation for herself, and the parents were asked about their home-career expectation for their daughter. The findings of this study include: (a) significant others are about of equal importance in forming educational and occupational expectations of females as for males, (b) attitudes toward the homemaker role do not mediate the process of forming educational and occupational expectations of females, (c) females emphasizing occupational goals as opposed to homemaker goals do not approximate the models for males more closely than do other females, and (d) educational plans are more accurately predicted than occupational plans, and this difference is greater for females than for males.

It is a truism that educational, occupational and income attainments of blacks are lower than those attainments for whites. Much data support this view (Stolzenberg 1975; Porter 1974; Portes and Wilson 1976; Duncan, Featherman and Duncan 1968, Siegel 1965; and Thurow 1967). Racial differences in the processes by which attainments are generated are less well understood, however. Contrary to other results based on broad occupational categories or occupational status scores, Stolzenberg (1975), using detailed census occupational categories, found that income differences between blacks and whites are small within occupations (overall, racial differences in income were high), thus suggesting that job discrimination is one of the major factors accounting for black-white differences in income. The accuracy with which expectations and attainments can be estimated by a variety of independent variables, including family status, mental ability, and significant-other variables, has uniformly been much lower for blacks than for whites (Curry

et al. 1976; Curry et al. 1978; Portes 1974; Portes and Wilson 1976; Hout and Morgan 1975; Treiman and Terrell 1975).

Statistical interactions by race (i.e., coefficients associated with independent variables for a given dependent variable are different for blacks than for whites) have been consistently observed. Duncan, Featherman and Duncan (1968), Portes and Wilson (1976), Siegel (1965), and Porter (1974) report that background is not as closely associated with black attainments as it is with white attainments. Curry and associates (1976), on the other hand, report that family status of blacks is more important in a model of educational and occupational expectations than is family status of whites. Hout and Morgan (1975) report complicated statistical interactions for both race and sex. Portes and Wilson (1976) observed that significant-other variables are more important to career expectations and attainments for blacks than for whites. This observation tends to support Porter's (1974) argument that black attainment depends more on sponsorship than on competition. Treiman and Terrell provide a convenient summary: "...as usual, everything interacts with race." (Treiman and Terrell 1975: 198.)

This review reveals one of the flaws in the status attainment view of occupational choice. The viewpoint does not address societal factors such as the influence of variables like sex and racial prejudice on market demand..

A number of additional variables have been studied in conjunction with socioeconomic achievement. Thorough examination of issues raised by these studies would require more space than can be justified in this report, but brief mention of some additional work is in order. A large body of literature has arisen addressing possible effects of school differences on status attainment. An early study published by Sewell and Armer (1966) shows negligible effects of high schools in a Milwaukee sample after other standard variables such as SES are controlled. This paper stimulated a lively debate on the issue; several scholars take strong exception to the conclusions offered by Sewell and Armer (e.g., Turner 1966; Spady 1970; Smith 1972). In sum, however, no convincing evidence of substantial school effects not accounted for by combinations of other independent variables in status attainment research has appeared (see Hauser, Sewell, and Alwin 1976 for a review and extensive empirical investigation).

Some study of "career contingencies" has uncovered interesting results. Migration from place of residence at age sixteen shows that migrants achieve higher occupational status than nonmigrants from the farm after parental status is controlled (Blau and Duncan 1967; Duncan and Featherman, and

Duncan 1972). Also, keeping one's marriage intact may contribute to occupational success (Blau and Duncan 1967; Duncan, Featherman, and Duncan 1972). Fisher, Lutterman, and Ellegard (1975) report evidence that military service deflates earnings by a small amount over several years after leaving the service for high school graduates of nonfarm origin, but find no such pattern for college graduates or farm youth. Failure to control for SES of parents, however, may be responsible for the differences among high school graduates. The number of one's siblings tends to deflate educational and occupational attainment by a modest amount, and coming from a home with both parents present also has a small positive effect on occupational achievement (Duncan, Featherman, and Duncan 1972), but the latter effect is quite small in view of the strong claims of writers such as Moynihan. Additionally, pursuit of college preparatory curriculum in high school has sometimes been found to have some positive relationship with career expectation measures (Hauser, Sewell, and Alwin 1976; Rehberg and Rosenthal 1978). Finally, participation in extracurricular activities such as athletics and clubs may be positively related to career plans and attainments (Otto 1976; Rehberg 1969; Rehberg and Schafer 1968).

Summary and Commentary

This chapter summarizes status-attainment theory and research in sociology. From the vantage point of a broad theory of occupational choice, one of the central features of this work is that occupations are assigned prestige or socioeconomic scores that provide the fundamental organization of sociological work; status-scored occupations are major variables in all empirical research. Focus on occupational status sharply differentiates status-attainment research from other perspectives on occupational choice such as that offered by Holland or by microeconomic theory.

Status-attainment theory grew out of sociological work on occupational mobility. Mobility research typically analyzes frequency tables in which father's occupation is the independent variable and son's occupation is the dependent variable, occupations being grouped into a small number of ordered status categories. Blau and Duncan (1967) propose to study the process by which such relationships arise and developed the method of path analysis as a vehicle for exploring such mechanisms. The fundamental prediction of the theoretical perspective is that the relationship between filial occupational status and parental statuses such as father's occupational status can be interpreted by including intervening variables. Education of the son is the chief intervening variable introduced by Blau and Duncan, and

one's education does, indeed, account for a substantial portion of the total effect of parental status on filial occupational status.

The Wisconsin model adds more detailed substance to the basic Blau-Duncan idea by including significant others, ego's educational and occupational expectations, and school grades as intervening variables, and by adding a measure of mental ability. One of the main conclusions stemming from work with the Wisconsin model is that significant others are a critical link between family background and career achievements. High status families tend to generate environments in which youth are expected and/or encouraged to attend college and to seek high status jobs. Youth who are exposed to such significant-other expectations tend to form high career goals, and youth with high career goals tend to achieve high career outcomes. This is a highly simplified abstraction of the large volume of available data, however. At least one study based on a national sample downplays the importance of significant others in the status attainment process (Wilson and Portes 1975). While there is some question about the measurement of significant others' attitudes and behaviors used in the Wilson-Portes work, more research is needed before their findings can be interpreted unambiguously. In particular, more work comparing different measures of significant others is needed (see e.g., Curry et al. 1976; Curry et al. 1978; Hotchkiss and Scritchfield 1975; Kerckhoff and Huff 1974). In spite of the ambiguities, however, sufficiently high correlations between significant-other variables and ego's educational and occupational expectations have been reported in enough samples to suggest that significant others may be an important part of the process of status attainment.

The concept of socioeconomic life cycle is central to status attainment theory. Duncan and associates state the idea in the following terms:

> Implicit in the foregoing introductory remarks is a commitment to the strategy of looking at what happens to an individual over a substantial part of his lifetime--or, since our concern is really with populations of individuals, what happens to a cohort of men as they move through an appreciable part of their life cycles...as has been implied, we might think of at least three stages of the socioeconomic life cycle, conveniently labeled family, schooling, and job (Duncan, Featherman, and Duncan 1972: 5).

This approach requires an immense body of data. To fully play out all the implications, one needs complete time series on a number of cohorts following each cohort from early childhood to retirement. Information regarding mental ability, family status,

school grades, significant others, career expectations and many other factors must be collected during the preadult years, and information regarding job shifts, income, and education as well as significant others and career plans must be gathered throughout the adult period. Although substantial data have been collected already, nothing approaching complete life histories is currently available, nor is it likely to be available within the forseeable future. Further, time series of cross-sections are not generally available over several closely spaced intervals covering brief sections of the entire life cycle. For example, the OCG data refer to one time point in each of the stages identified by Duncan, Featherman, and Duncan, and the Wisconsin data include only one time point during the preadult years.

A full coverage of the dynamics of the process of status attainment and mobility requires numerous observations on the same individuals within each stage of the life cycle as well as between stages. Such data are extremely expensive and time consuming to collect; a complete life history for a single cohort, by definition, requires a lifetime to assemble. By the time the last panel of data is collected, many of the measurements would be obsolete. Consequently, it seems that the next important step in empirical investigation of the dynamics of the socioeconomic life cycle is to increase the number of data banks with two or three panels of data within the "family" years, "schooling" years, and "job" years. If these studies are carefully designed and executed, and appropriate attention is devoted to comparability between studies, then extant work connecting observations at different stages might be combined with the time series data within each stage. Assuming a stable process between cohorts, then minimum data for piecing together a model of the entire socioeconomic life cycle can be collected within a few years. It is possible that one might assemble enough information from current sources to construct preliminary estimates of a path model covering family, schooling, and early adult job changes. For example, Rehberg has collected information for three years during high school and two panels of very early post-high school experiences (Rehberg and Rosenthal 1978), and Johns Hopkins University has collected national data on job shifts using respondent recall methods (Sorenson 1975). Problems of data comparability in such a venture, however, would be formidable. To execute the work with sufficient care, substantial time and staff would be necessary.

In addition to heavy demands on data, the conception of status attainment as a dynamic process suggests the need to adopt a dynamic model. For career planning years, simultaneous linear differential equations may provide a good first approximation, in as much as attitudes may be conceptualized as changing continuously. Job changes, on the other hand, occur at discrete

intervals bringing sudden jumps in occupational status; thus, linear differential equations with status as a variable do not provide good conceptualization of the process (Hotchkiss 1977). Alternative models involving "psychological time" and probability of job shift need to be developed to handle such conceptual issues (see Sorensen 1975). To date, parental statuses have been assumed to be fixed throughout one's youth. This assumption obviously runs counter to fact. If parental status is permitted to shift during the career decision years, then straightforward application of differential equations no longer captures the essence of the theory. It seems clear that considerable empirical, methodological, and conceptual work remains before a thorough understanding of the socioeconomic life cycle is achieved.

In addition, measurement of key concepts in status-attainment theory is still ambiguous. First, we do not know how to interpret a teenager's response to questions concerning educational and occupational goals and expectations if the respondent is quite unsettled about appropriate expectations. It may be that moderate R-square values are achieved in total samples by combining some respondents who are clear about their career expectations, for whom predictions are quite accurate, with other respondents with little crystallization of expectations, for whom predictions are highly inaccurate. Further, it is a plausible hypothesis that questionnaire items assuming clear-cut career goals when, in fact, goals are unclear generate unnecessary inaccuracies in the responses. Status attainment research has paid very little attention to such matters, yet the plausibility of these hypotheses suggests that one cannot be confident in theory of career decision making until they have been explored. Secondly, more thorough exploration of the accuracy of retrospective data seems warranted. Evaluation of some extant analyses depends heavily on one's confidence in such data.

Finally, although substantial work has been carried out regarding status measurements of occupations, many questions remain. As noted in chapter 7, no clear definition of the fundamental unit, occupation, has been developed, and little attention has been devoted to the problem. Although some work has begun regarding appropriate dimensions of occupations (e.g., Hauser and Featherman 1977; Goldthorpe and Hope 1977; Grasmick 1976; Klatsky and Hodge 1971; Temme 1975; Blau and Duncan 1967), much work remains. For example, a few of these investigations have made ingenious use of canonical correlation analysis to derive empirical scores from mobility matrices that maximize the correlation between occupations at two time points, or between father's and son's occupation. The fact that the empirical scores correlate highly with status codes of occupations such as

the Duncan SEI or NORC prestige scores is interpreted as supporting the hypothesis that status is probably the most important dimension of occupational mobility. When second and third canonical variates are statistically significant, the results are interpreted as demonstrating the secondary importance of nonstatus dimensions in mobility. But such methodologies are generally applied to occupational groupings that have been categorized a priori to emphasize status content of occupations. It is, therefore, not surprising that the occupational scores derived from such procedures correlate highly with status codes. It is difficult to imagine how empirical analyses could be applied to mobility tables in order to derive post hoc scores for occupations without use of some a priori classification of jobs into relatively homogeneous groups, such as status groups. Thus, such procedures might best be viewed as scaling devices or tests of the ability of certain occupational classifications to capture occupational mobility rather than as devices to test whether occupational classifications other than those used in the mobility table may be important in occupational mobility.

Finally, although this chapter refers to theoretical viewpoints related to status attainment as status-attainment theory, the theory has not been thoroughly developed. Sorensen characterizes status-attainment work in the following terms:

> ...the dominant research strategy has been inductive, rather than deductive: the accumulation of empirical findings from cross-national and cross-temperal studies is believed to produce a pattern from which a sociological theory of attainment and mobility will emerge.
>
> This situation is in sharp contrast to the approach in economics to the study of one aspect of the attainment process--income attainment. Neoclassical economists have applied a powerful conceptual apparatus to income attainment in the form of human capital theory (Sorensen 1975: 965).

In broad terms, Sorensen's description is reasonably accurate, and the implication that status-attainment research might benefit from more careful, deductive theory building is appealing. In the paper just quoted, Sorensen develops an intriguing beginning for such an effort.

CHAPTER 5

ECONOMIC THEORY OF INDIVIDUAL LABOR SUPPLY DECISIONS

This chapter is divided into three sections. The first section discusses the broad framework of which microeconomic theory of individual labor supply decisions is a part and summarizes some key ideas in economic theory. The material in section one provides important background for section two. The second section summarizes several specific theories of individual occupational choices and related evidence. The final section summarizes the chapter and contains commentary about economic work.

Basic Ideas

The major goal of economic analysis of occupational choice is to predict the distribution of workers across labor markets. To some extent an occupation may be viewed as coextensive with a labor market, but with the usual definitions of occupation, the two concepts are not identical. The number of workers in each labor market occurs at the intersection of aggregate supply and demand curves.

A brief review of the structure of supply and demand curves is instructive on two counts. First, it reveals where economic theory of individual labor supply decisions (individual occupational choice) fits in the broader economic view of the labor market. Secondly, it emphasizes the importance of earnings in economic theory of labor supply. Figure 20 shows an aggregate labor supply and demand curve for a single labor market.

Note that both the demand and supply curve plot the price of labor (wages) against the number of workers. Although wage is the independent variable, according to custom it is plotted, nevertheless, on the vertical axis. The main ideas in the graph are: (a) the quantity of labor supplied rises as the wage rises, (b) the quantity of labor demanded by firms falls as wage rate increases, and (c) the number of workers and the wage for the given labor market are determined at the equlibrium point where the supply and demand curves cross.

The economic theory of individual labor supply decisions is related to this theory of aggregates in that the aggregate supply curve is determined by adding individual supply decisions. The work summarized in this volume, then, represents only a small part of the broad economic orientation to the study of the labor

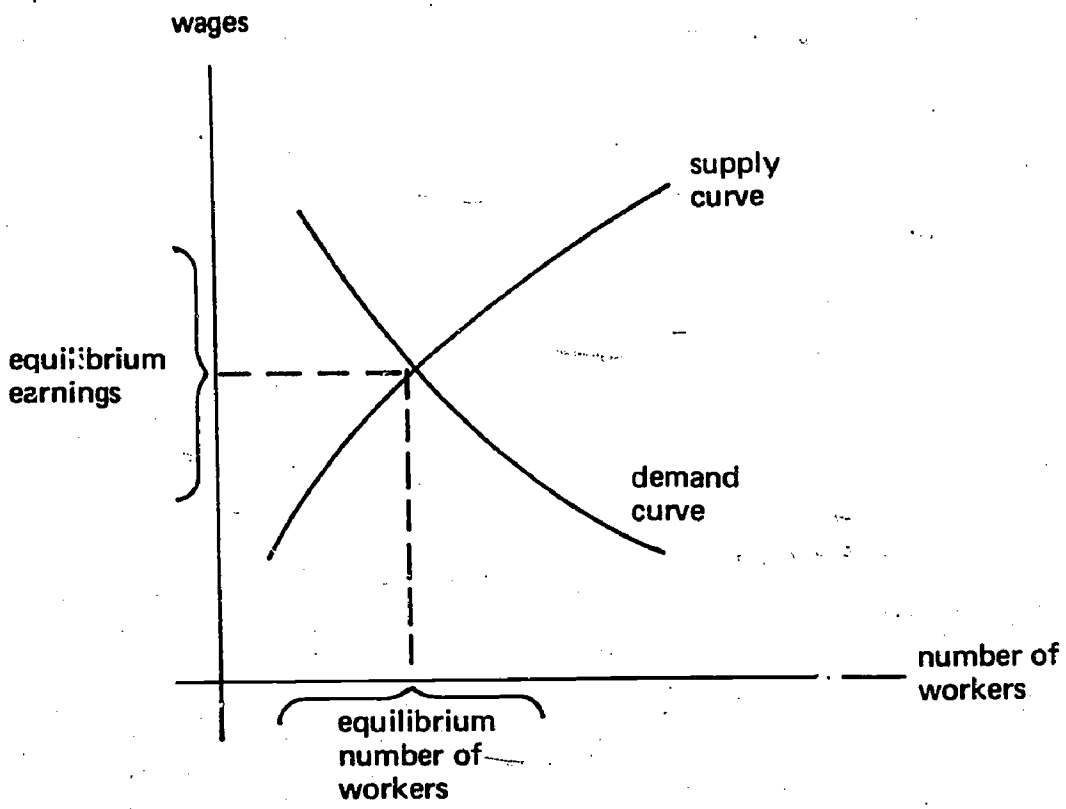

FIGURE 20. Aggregate labor supply and demand curves showing equilibrium at the intersection.

market--determination of the demand curve falls completely outside the scope of this chapter, and the chapter deals with individual supply decisions but is not concerned with the outcome of aggregating those decisions. This limitation in scope of the chapter is imposed because the focus of the volume is on how individuals make occupational decisions. The reader should recognize, however, that an important strength of economic theory is its treatment of the balancing forces of supply and demand decisions in the aggregate.

The aggregate labor supply curve reflects the fundamental idea in economic theory of occupational choice--that wage or (probably more accurately) earnings affect individuals' occupational choice. Although economists are careful to recognize nonpecuniary influences on occupational choice, the nonpecuniary variables normally are not specified.

The effect of nonpecuniary factors generally is represented in economic discussions by shifting the entire supply curve or demand curve. For example, a change in U.S. immigration laws permitting a sudden influx of foreign workers would move the supply curve to the right, reflecting the idea that more workers

would be available at any given wage. Similarly, the demand curve might be shifted to the left (in the short run) by introduction of new technology permitting workers to produce more. In the long run, workers may shift to other occupations bringing the supply down. Wages may then rise to reflect improved worker productivity brought about by the new technology.

Two complementary orientations to the study of individual occupational choice have emerged in economics; these are human capital theory and utility theory. The hypothesis that earnings exercise a major impact on occupational choice is manifest in different ways in human capital theory than in utility theory, however. In human capital theory it is hypothesized that individuals compare lifetime earnings in alternative education/occupation groups and select the "best" alternative--the best alternative is not necessarily the choice with the highest total lifetime income, however; the "present value" of that total at the time of decision depends on interest rates, personal time preference for income, and the particular sequence of each earning stream.

The remainder of this section is divided into two subsections. The first subsection summarizes the main theoretical viewpoint contained in applications of human-capital theory to occupational choice. Subsection two reviews the main ideas related to utility maximization and occupational choice.

Human Capital Theory

Although there are several variations on the main theme, in simplest form, human-capital theory of occupational choice embodies two postulates. First, the variety of occupational choices is limited by the amount of training in which one invests. Training is purchased as an investment in human capital. The cost of the investment consists of direct costs and foregone earnings. Direct costs include outlays for factors such as tuition, books, and supplies, and foregone earnings are defined as the difference between earnings during the investment (e.g., schooling) years and the earnings that could be made during the same period if the individual were to work full-time at the level for which he/she would be qualified without the extra investment. Secondly, it is hypothesized that individuals select occupations in a manner that maximizes the "present value" of their lifetime earnings. Generally, it is implicit that this selection is equivalent to maximizing the rate of return on one's human capital investment, although such equivalence is by no means a foregone conclusion.

The concepts of "present value" and "internal rate of return" play essential roles in the application of human-capital theory

to occupational choice.[1] Since understanding of the notion of internal rate of return depends on familiarity with the meaning of present value, a brief discussion of present value and its application to occupational choice theory is presented first. Then the internal rate of return is described.

Given the choice between receiving 100 dollars now and 100 dollars a year from now, even in the absence of inflation, almost everyone would prefer to have the money immediately. Similarly, most persons would prefer to receive the money one year from the present rather than two years in the future. These preferences hold, at least in part, because money received now can be "put to work" earning interest. Suppose that the interest rate accurately reflects the premium people must be paid to consume tomorrow instead of today. If the interest rate is equal to i, with compounding once per year, 100 dollars deposited today is worth $100(1 + i) a year from today; hence, the "present value" of 100 dollars received one year from now is $100(1 + i), since this is the amount required to be deposited today in order to obtain 100 dollars a year from now. In general, if one deposits 100 dollars t years before withdrawing the principal and accumulated interest, the total amount in the savings will be $100(1 + i)^t$. The present value of 100 dollars t years in the future is therefore $100(1 + i)^t$, because this amount of money deposited today will generate exactly 100 dollars t years from today.[2]

The idea of present value can be generalized to a stream of income received over successive years. For example, suppose one received 100 dollars today, 110 dollars one year from today and 105 dollars two years from now. If the interest rate is six percent, then the present value of this income stream is $100 + $110/1.06 + $105/$1.06^2$ = $297.22, which is less than the value of receiving all the money now (315 dollars). The present value, $297.22, dollars is the amount one would need today to generate an income stream of 100, 110, and 105 dollars over the next three years if the unspent portion each year were invested at six

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[1]The terms "present value," "discounted value," and "capital value" carry essentially the same meaning (see, e.g., Davidson, Smith, and Wiley 1962: 107-108). Also, the "internal rate of return" often is termed "the rate of return," "the yield," "the marginal efficiency of investment," or "the marginal efficiency of capital." (See Cohen and Cyert 1975: 322.)

[2]Development of the basic formula for calculating total return after t years of saving (compound interest formula) can be found in numerous sources, (e.g., Yamane 1968: 265; Cohen and Cyert 1975: 316).

percent interest. The general expression for present value with fixed interest rate and yearly compounding is:

$$(1) \qquad PV = \sum_{t=0}^{T} y_t/(1 + i)^t$$

Where: PV = present value of the income stream
y_t = income received in year t
T = number of years income is received
i = fixed yearly interest rate or discount rate
t = any year between time zero and time T, inclusive

Although a present value measure generally is considered superior to the internal rate of return for studying the monetary returns to investment (Wilkinson 1966; Cohen and Cyert 1975), the internal rate of return is an important concept in human-capital theory. This is because the internal rate of return provides a single index of the value of an investment which permits ready comparison of assets. The net return to investment in, say, education over one's working life may be considered as the present value of the earned income minus the costs of acquiring the education. The internal rate of return is defined as the discount rate (i in formula (1)) that will cause the net return to be zero.

The internal rate of return is one index of the desirability of an investment, provided certain conditions hold. For the moment it is assumed that the necessary conditions hold; they will be discussed presently. To appreciate how the internal rate of return serves as an index of the quality of an investment, consider an example of one who has completed high school and is contemplating the advisability of completing a four-year college degree. Suppose that without additional schooling, earnings in year t are denoted by x_t, and net earnings with four years of college in year t (earnings net of direct college costs) are given by y_t. Assume that during the four years of college and, possibly, for a few years thereafter, $x_t > y_t$, i.e., one can earn more with a high school diploma than with college study during the period of college education and, possibly, for a few years following completion of college. The sum of these foregone earnings plus direct college costs can be viewed as investment in human capital (recall that y^t, is net of direct college costs). After, say, m years, assume that earnings of the college graduate overtake and remain higher than those of the high school graduate, i.e., $y_t > x_t$ for $t > m$. These excess earnings of the college graduate may be interpreted as returns to the initial investment in college education.

The easiest way to interpret the internal rate of return is by analogy with a savings and spending plan. The direct costs

and foregone earnings associated with college education each year could be considered analogous to deposits in a savings account. The funds begin to accumulate interest when deposited. At the end of the m training years saving ceases and one begins to withdraw $Yt - x_t$ ($t > m$) dollars from savings each year. The amount remaining after each withdrawal, however, continues to accumulate interest. The schedule of withdrawal ends when the individual retirees--all "savings" are exhausted. Under certain conditions, it can be shown mathematically that the internal rate of return to educational investment is precisely that rate which would generate the savings/earnings stream just described. Apparently, then, the higher the internal rate of return, the more desirable the investment (ceteris paribus), for the internal rate of return can be interpreted as the rate of interest paid on one's educational investment.

Two conditions are needed to assure that the internal rate of return can be interpreted sensibly. First, the total return to the educational investment must exceed the cost of the investment, i.e.,

$$\sum_{t=1}^{m} (x_t - y_t) < \sum_{i=m+1}^{n} (y_t - x_t),$$

where n is the last year of work before retirement. Secondly, investment must be positive over the first years of the period, and returns must be positive over the remaining years [ie., $y_t - x_t \leq 0$ for $t \leq m$, and $y_t - x_t \geq 0$ for $t > m$] (Cohen and Cyert 1975: 325-326). If these two conditions hold, then there exists a unique real number that is the internal rate of return; however, if these conditions do not hold, then there may be more than one internal rate of return or there may be no real number satisfying the definition.

One of the main drawbacks of the internal rate of return is that there may exist more than one or none. When the age-earnings profiles of persons with two levels of education cross more than once, it is likely that there is more than one rate of return; in this circumstance which rate to use is not clear. A second ambiguity of the rate of return is that even when a unique rate exists, it may not lead to the same conclusions as a present value calculation on the same pair of earnings streams (Cohen and Cyert 1975: 327).

On the other hand, there is some ambiguity regarding use of present value calculations in human capital theory. Obviously, from formula (1), the present value of an earnings stream depends on the rate of interest used. In financial markets, interest rates are specified or can be estimated carefully, but economic theory indicating that educational and occupational choices of

individuals can be approximated by maximization of present values does not stipulate the level of interest to be used. Since comparisons between different occupational choices depend on the rate of interest, it frequently may be the case that numerous choices are consistent with present-value criteria--if the interest rate were chosen judiciously.

Utility Theory

The concepts of present value and internal rate of return are best suited for analyzing the effects of expected income on occupational choice, but these concepts are not as well suited for analyzing effects of nonmonetary aspects of occupational choice. Nonpecuniary traits of occupations can be studied by considering the concept of utility and the closely related concept of indifference curve. Utility may be defined as the degree of satisfaction derived from products, services, or activities. The important aspect of a utility function is that the values accurately order individual preferences between different combinations of goods, services, and/or activities (Ferguson and Gould 1975: 14ff). An indifference curve is defined to be the points on a graph showing all combinations of two (or more) activities that produce the same utility.

To show how indifference curves can be used to analyze individual decisions and to bring out the relationship between occupational choice and other economic decisions, an illustration involving the selection of quantities of two goods is presented first. Then the illustration is modified to apply to occupational choice.

Suppose a young girl is allowed to go to the corner grocery to buy herself a supply of sweets for the week. She likes a particular type of small candy bar that sells for a dime and nickle bubble-gum balls. Her allowance for the week is one dollar, all of which she intends to spend on the candy and bubble gum. If x is the number of bubble gum balls she buys and y is the number of candy bars, then her "budget constraint," that is, the total cost of purchase is

(2) $\$.05x + \$.10y = \$1.00.$

(That is, her total expenditure equals a dollar--the amount of her weekly income.) Her budget constraint is shown in Figure 21 as the negatively sloping straight line.

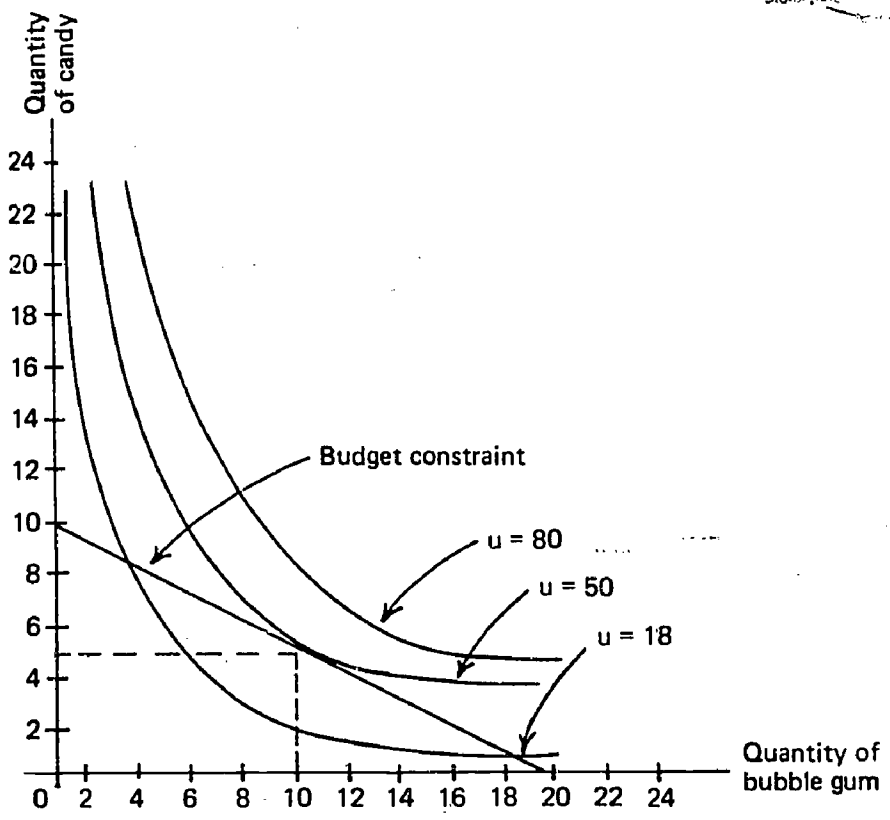

FIGURE 21. Illustration of indifference curves and budget constraint.

Three indifference curves also are represented on the graph in Figure 21 (calculated so that u = xy for convenience, where u is utility). The higher the curve, the higher the utility. Thus, the lowest curve has a utility (satisfaction) index of 18 all along the curve, the middle curve has a utility of 50, and the highest curve has an index of 80. The indifference curves should be interpreted according to the following examples. Referring to the lowest curve (u = 18), one sees that the little girl could purchase two bubble-gum balls and nine candy bars or eighteen bubble-gum balls and one candy bar with her dollar (the two points of intersection between the budget curve and the lowest indifference curve). But the utility from these purchases is only 18. The girl could also buy ten bubble-gum balls and five candy bars with her dollar, but in this case she is on a higher indifference curve--her utility is now 50. By observing the graph it is evident that no higher utility can be achieved since all higher indifference curves are above the budget line, i.e., cost more than one dollar (see the curve labeled u = 80, as an example). Therefore, the girl is likely to purchase ten bubble-gum balls and five candy bars. More generally, if the

indifference curves are concave upward, then it can be shown mathematically that the highest utility coincides with the point where one indifference curve is tangent to the budget line (see Henderson and Quandt 1958; or Ferguson and Gould 1975).[3]

To see the relevance of utility theory to occupational choice, assume that individuals are free to divide their time between work and leisure. Money income is "purchased" with work time and nonpecuniary income is associated with leisure time. This situation is not very realistic, at least in the short run, because there normally are severe restrictions on individuals' allocation of time between labor and leisure. In the long run, individuals may be able to exercise more control over work time by changing jobs or working more than one job. Nevertheless, the labor-leisure choice is a common application of utility theory and, as will be described later, utility theory can be extended to cover more realistic assumptions.

In the labor-leisure choice, x measures time spent at leisure (i.e., away from work), and y measures income. Utility is written as a function of income and leisure time, in analogy to consumer-choice theory. Total utility per time period is limited by the finite amount of time available. This limitation is graphed as a constraint function of the following form: $x + y/w = 24$, with time measured in hours, each time period being a single day, and w designating hourly wage rate. Solving for income gives $y = 24w - wx$; thus, the slope of the constraint line is $-w$, the negative of the hourly wage rate. Consequently, at the point where an indifference curve is tangent to the constraint line its slope is also $-w$. As discussed in the consumer-choice example, maximum satisfaction occurs at this point of tangency. This means that a rational choice occurs where income and leisure are substituted at a rate equal to the wage rate.

Specific Theories

In this section, several specific economic theories of

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[3]Showing indifference curves as concave upward makes good economic sense; it reflects the notion of diminishing marginal utility whereby the added utility of an item declines as one obtains more of it. This idea is consistent with the informal observation that people tend to become satiated with a good, service, or activity as they receive more of it. It should also be noted that the case involving two goods illustrated in the text can readily be generalized to cover N goods.

occupational choice are summarized, and the empirical support for each is assessed. The material draws on the concepts described in the preceding section. Some of the specific theories can be classified neatly as either human capital or utility theories, but others draw on both viewpoints. A subsection is devoted to each of the theories and is identified by the author's name.

Becker

Gary Becker probably is associated more closely with human-capital theory than is anyone else. In his seminal work entitled Human Capital (1964; 1975), however, he has little to say about occupational choice. In a series of published lectures on economic theory, on the other hand, Becker (1971) does address at some length the question of occupational choice. His theoretical work on occupational choice is embedded in a broad perspective on the supply of labor. This perspective encompasses three processes that, together, determine the quantity of labor supplied to each occupation. These are: (a) total population size in any economic system delimits the size of the labor force, (b) the choice between labor and leisure determines the number of person hours worked out of the total available in the population, and (c) occupational choices allocate total work time to different work activities. The descriptions of these processes are theoretical; Becker offers no systematic evidence bearing on the main propositions.

The discussion of determinants of population size centers on economic influences on family size. Becker presents a general discussion of economic factors that impact on birth rate and mortality; no discussion of migration is included. The basic concept is that the number of surviving children per family would be positively related to income if nonincome influences on family size were fixed. The main reason for the observed negative correlation between family size and income is a positive relation between income and the cost of child care, due in part to parental efforts to improve the quality of child care as income rises. The details of this analysis can be omitted for purposes at hand.

Becker's discussion of the labor-leisure choice is quite interesting because it elaborates the standard model, thereby improving the realism of the model. As in textbook economic models of choice between labor and leisure, Becker draws on consumer-choice theory, but it is Becker's own version of consumer-choice theory. The central idea in the modified consumer theory is that goods and services do not directly generate utility. Rather, market purchases are combined with consumption time to produce utility--a household production function is

posited for each household. The modification seems realistic, for examples spring readily to mind. To illustrate, food is purchased at the market and combined with meal preparation time to produce a "commodity"--in this case, a meal. Utility is obtained directly from the meal.

Stated in mathematical terms, the model is written in terms of commodities z_i, economic goods and services x_j, and consumption time t_k for different types of household production activities.

(3) $z_i = f_i (x_1, \ldots, x_j, t_1, \ldots, t_k)$ (household production function)

(4) $u = U(z_1, \ldots, z_I)$ (utility function)

subject to

(5) $\sum_j p_j x_j = c$ (income restraint)

(6) $\sum_k t_k + t_w = t$ (time constraint)

where

z_i = ith commodity, i = 1, ..., I
f_i = household production function for the ith commodity

x_j = jth market purchase (good or service) j = 1, ..., J
t_k = time spent in the Kth consumption activity, k = 1, ..., K
u = utility
U = utility function
p_j = maket price of the jth good or service
c = total money income
t_w = time at work
t = total time in period

Details of the mathematical analysis are omitted here for brevity. In summary, the time and income constraints [equations (5) and (6)] are condensed into a single constraint on the production of commodities. As with the usual income constraint, the sum of the products of shadow prices of the commodities with the quantity of each commodity is shown to be constrained by theoretical full income, i.e., the amount that would be earned at a constant wage were one to spend all time at work. Standard mathematical-economic results for constrainted optima apply to the restatement of the problem.

Becker's alteration of the basic theory accomplishes two things. First, it integrates time costs into the decision-making model. Secondly, it reduces reliance on tastes and increases the importance of income and prices; this is important from an economic perspective.

Application of the consumer model to labor-leisure choice is direct. Two results are immediate consequences of applying mathematical optimizing to the model: (a) cost in time and money of producing each commodity is minimized when goods and time are used in proportions so that the substitution of each good for time spent in each consumption activity equals the ratio of the price of the good to the wage rate; and (b) utility is maximum when commodities are substituted according to the ratio of their respective "shadow" prices. The "shadow" price contains the price of goods and time entering the production of each commodity. Since the amount of work time is limited by the quantity of consumption time, these conditions influence the allocation of time between work and consumption. For example, the model implies that an increase in unearned income without change in the wage will reduce the time spent at work while leaving unchanged the optimal proportions of goods and time used to produce commodities. Conversely, an increase in wage rate exactly offset by a decline in unearned income will increase the time allocated to work.

Becker's theory of occupational choice builds gradually from a simple model to a more realistic one. Initially, it is assumed that training and ability do not enter into occupational choice and that production technology does not restrict individuals' allocation of time between occupations. This simple view of the labor market implies that people split time between occupations until the wage differences for every pair of occupations is just offset by nonpecuniary satisfactions on the job. Two specific results of the model are at wide variance with observations: (a) the model implies that it is commonplace for people to be employed simultaneously at several jobs, and (b) the model also leads one to expect a negative reaction between wage rate and pleasantness of work. Both of these expectations are contradicted by fact.

Human-capital theory can account for these two discrepancies between the model of time allocation between jobs and observation. Specialization in training generates improved competency in one's occupation and, therefore, exherts upward pressure on the wage. Specialization of training also encourages occupational specialization. The improved competency due to training produces a positive relationship between training and rewards--both money income and nonpecuniary rewards. Thus,

Becker claims that when training is constant, the predicted negative relationship between pay and pleasantness of working environment will emerge. Once complete specialization of occupation is assumed, occupational choice is reduced to choosing the occupation with the highest present value of lifetime earnings stream (Becker 1971: 173-174).

Using a competitive model, the human-capital theory implies that equilibrium is achieved when training costs are exactly offset by income differentials requiring training and those requiring no training. This expectation probably does not match the facts, however, though clear evidence on this point is not available. To account for the probable positive association between level of training and the present value of lifetime earnings, Becker proposes ability and opportunity differences among individuals. In this context, ability is not defined in the psychological sense of facility for learning nor is it necessarily reflected by IQ scores. Rather, ability is defined in economic terms as a residual variable. According to Becker, ability means earnings capacity net of the influence of training. Ability and opportunity differences introduce variability into training costs. Those who can train for the least investment enter occupations requiring training, say occupation Z, before others do. As the wage in Z rises, people with higher training costs enter, and those with the lowest cost gain more returns on their investment than the cost of the investment; hence, their present values are positive.

According to the theory, opportunity and ability affect occupational choice in the following manner. Occupations are distributed by difficulty level defined by the cost of training necessary for entry. Persons with high ability and opportunity can acquire the necessary training for less than the present value of income differences; hence, persons with ability and opportunity enter occupations characterized by expensive training. Training requirements and wage of occupations are positively related. Consequently, persons with high opportunity and ability end up in high paying occupations requiring substantial training.

This economic theorizing has an interesting bearing on the status attainment "research program" developed by sociologists.[4] In this research program, Duncan's SEI (1961) has gradually become the most common--perhaps even the standard--

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[4]The term "research program" is taken from Mark Blaug (1976). Blaug's term refers to any broad area of research loosely connected by a few common orientations and hypotheses; it seems to describe more aptly status-attainment work than the usual term used by sociologists, viz, status attainment model.

measure of soicoeconomic status of occupations. In the present context, it is noteworthy that two empirical features of occupations define the Duncan SEI codes--education and income. As just reviewed, these are the very aspects of occupations that human-capital theory predicts will be positively associated with opportunities and ability.

If parental socioeconomic variables are accepted as surrogates for opportunities, as sociologists are wont to propose, and IQ measures are taken as indices of economic ability, then the status-attainment research is directly relevant to Becker's theoretical discussion. Indeed, a large empirical literature does show the predicted relationships (see the literature cited in the previous chapter). The major theoretical position rationalizing these findings, however, is quite different from the economic rationale proposed by Becker. According to status-attainment theory, bivariate correlations between occupational-status achievement (Duncan SEI) and background and the correlation between occupation and ability both are due to the influences of intervening social psychological processes (see e.g., Sewell and Hauser 1975; or Otto and Haller 1978). Specifically, variables such as the opinions of significant others and one's own career plans hold critical importance in occupational choices. These opinions and plans are, in turn, affected by background and ability. This theoretical orientation clearly implies that correlations between ability and occupation and between parental background ("opportunity") and occupation approach zero when social psychological variables are controlled statistically.

On the other hand, the economic rationale for the ability-occupation correlation and the opportunity-occupation correlation makes no such prediction and, further, would tend to be contradicted if the social psychological prediction were true. Much of the sociological work does show substantial reductions in partial relationships, as predicted by the social psychological model (see, however, Wilson and Portes 1975 for a contrary view with respect to educational attainment). In spite of the tendency among sociologists to accept the social psychological view, the evidence remains ambiguous. The predicted zero partial regression coefficients never are realized exactly and sometimes substantial nonzero partials arise. Also, significant others may be affected by economic events; thus, economic theory does not conflict necessarily with significant-other theory.

Numerous factors could account for such failures of data to conform to sociological theory--including the economic view that people choose the occupation that maximizes the present value of their lifetime earnings. Measurement and specification errors in status-attainment research must also be considered likely candidates for explaining observed results. For example, no one can

claim to measure occupational expectation without error; yet the social psychological prediction of vanishing partial coefficients requires such an assumption (Blalock 1964). Also, specification error may arise in numerous ways. First, most of the social psychological process variables probably exhibit two-way causal effects, yet empirical work has generally relied on "ordinary least squares" applied to cross-sectional data.[5] Secondly, no empirical work contains all important social psychological variables; omission of important social psychological factors easily could account for the low to moderate partial relationships observed between occupational status and "opportunity" and between occupational status and "ability" even after controlling for selected social psychological variables such as significant others' opinions and one's own career plans.

Lancaster

Kelvin Lancaster proposes a mathematically elegant model of consumer choices that he also applies to allocation of time between labor and leisure and to the selection of an occupation (Lancaster 1966; 1968). In one essential respect, Lancaster's model is similar to Becker's proposal, just reviewed. As does Becker, Lancaster assumes that utility is not derived directly from consumer goods and services. Rather, goods and services exhibit "characteristics" that directly yield utility. In Lancaster's consumer model, goods and services are one step removed from characteristics; goods and services are treated as inputs to "consumer activities" that, in turn, generate the characteristics. For consumers, the sequence is from goods to activities to characteristics. In applying the model to labor supply, the sequence is reversed. The activity of labor uses characteristics to produce goods and services.

Although the essential elements of the theory do not imply linear relations among the variables, Lancaster's presentation does introduce a linear model of most key relationships, for expository convenience. The utility function, however, is assumed to be strictly convex and, thus, is not linear. Consider, then, the following statement of the model.

(7) max. $u = f(z)$

(8) S.T. $Ay = x$

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[5]Several studies are longitudinal by virtue of combining one measurement point prior to high school graduation and one measurement after labor-market entry. This type of analysis design does not account for similartaneity of the social psychological process variables, however.

$$By = z \tag{9}$$

$$px \leq c \tag{10}$$

$$x, y, z \geq 0 \tag{11}$$

where

u = utility
f = the utility function, assumed to be convex
x = an n x 1 vector of quantities of goods and services
y = an m x 1 vector of levels of activities
z = an r x 1 vector of levels of characteristics
p = an 1 x n vector of prices
A = an n x m matrix with entries, a_{ij}, giving the quantity of good i necessary to produce a unit level of activity j
B = an r x m matrix with entires, b_{jk}, showing the production of characteristics through activities

The relations Ay = x and By = z are important connections in the theory. The former shows how activities y, depend on goods, x. It is assumed that each activity requires a positive or zero quantity of goods; hence, all entries in A are nonnegative. Similarly, it is assumed that the production of characteristics through activities exhibits positive relationships, so that $B \geq 0$.

In applying the model to individual labor-supply decisions some of the entries in the matrices A and B are permitted to be negative. The activity, labor, may use characteristics to produce goods, but labor may also produce characteristics; these two outcomes correspond respectively to negative and positive b_j. Permitting labor to produce characteristics reflects the widely held view that work is sometimes intrinsically pleasant. Also, negative coefficients in the A matrix correspond to labor activities.

The distinctive feature of the model is that it embraces private choices based on individual differences (as expressed in each individual's utility function) as well as "efficiency" choices that are common to everyone. On the other hand, the traditional ("neoclassical") model, described in the subsection entitled "Utility Theory" relies solely on differences among individual preferences. Introducing into the mathematical model the idea that utility is derived indirectly from goods via characteristics permits the constraint line to assume a positive slope; this is impossible in the traditional model.

A positive constraint line implies one can achieve at the same time more of two (or more) characteristics without violating

the resource limits. This situation violates a fundamental feature of a market. In a market, with constant income (resources) one must give up some quantity of one or more goods in order to increase the quantity of another good. To move along the positively inclined constraint line, however, one must exchange labor market activities for "leisure" (nonlabor market activities), or vice versa. Since the individual continues to gain both characteristics moving in one direction and to lose both moving in the other, movement continues in the direction of the gain until all time is devoted to market work or all time is devoted to nonmarket activities, depending on the location of the constraint line. The direction of movement depends on the wage. For very low wages, one might gain in all important characteristics by shunting market labor and farming one's own land for personal consumption. For very high wages, everyone enters the labor market. For wage levels between these two extremes, personal preferences govern labor-leisure allocation, as in the neoclassical model.

The same model can be expanded to analyze occupational choice, by adding a new activity corresponding to each occupation. To reflect current reality, Lancaster restricts each individual to a single occupation. Thus, according to the model, one allocates time between the chosen occupation and leisure. The main ideas are graphed in Figure 22. Leisure is symbolized by ℓ; allocating all of one's time to nonmarket activity yields twenty-five units of characteristic 1 ($z_1 = 25$) and five units of characteristic 2 ($z_2 = 5$). Similarly, work in occupation 1 is represented by the line labeled w_1, and spending all time at work in occupation 1 gives twenty-one units of the first charcteristic and eighteen units of second. In the same fashion, the activity line labeled w_2 is associated with work in the second occupation. The lines joining w_1 to and w_2 to represent respectively division of time between occupation 1 and leisure and between occupation 2 and leisure. For a person choosing occupation 2, for example, the closer he/she falls to w_2 on the line joining w_2 to , the larger the fraction of time spent at work. This idea can be given a numerical interpretation according to the following formula:

$$(12)\quad \text{Proportion of time spent in occ. 2} = 1 - \frac{\text{distance (TC)}}{\text{total distance of line AC}} = \frac{\text{distance (TA)}}{\text{total distance of line AC}}$$

where the letters refer to points on the graph in Figure 22. In the example used in Figure 22, the person with the indifference curve shown will devote 13/15 = .867 fraction of his/her time to work in occupation 2. This number is, of course, not very

realistic, but it does illustrate interpretation of the graph.[6]

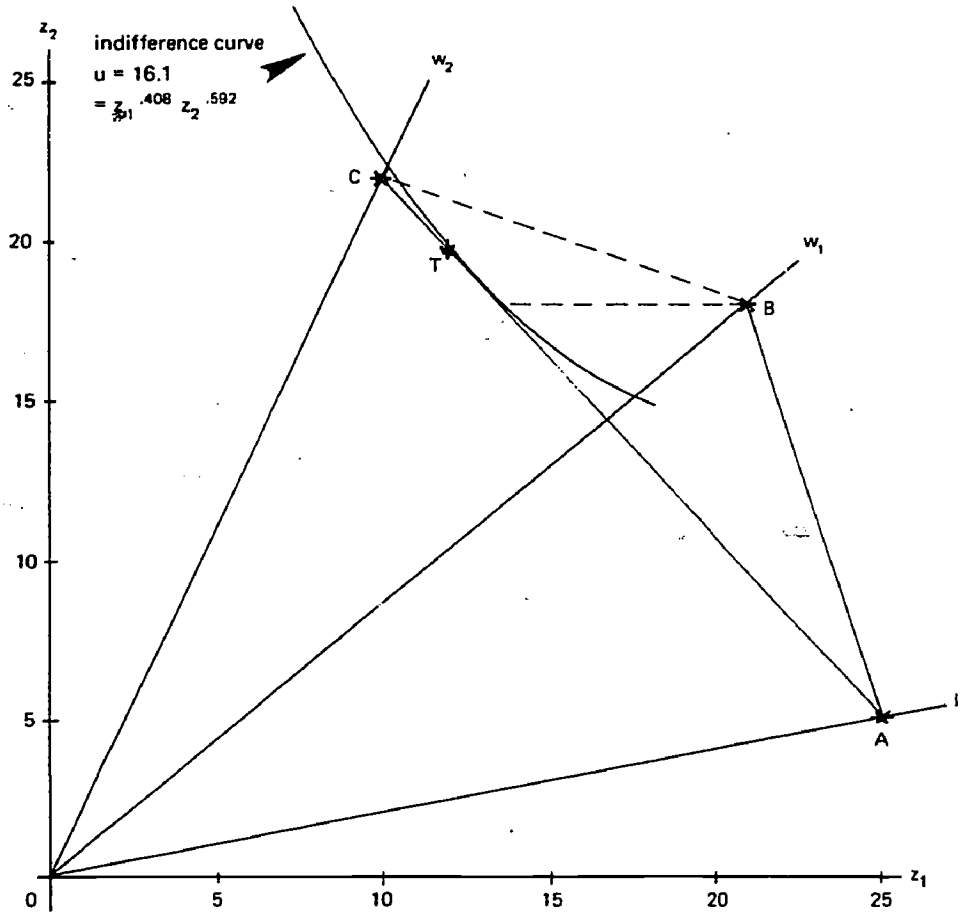

FIGURE 22. Lancaster's model of occupational choice.

Since, by assumption, no one works in more than one occupation, the dotted line joining w_1 to w_2 is not feasible. Those whose optimum choice might be to divide time between two occupations would be forced to devote full-time to one or the other occupation, at the expense of some loss of utility. The horizontal broken line marks a dividing line between choice of occupation 1 and occupation 2. Any person who would choose a

[6]Recall that maximum utility occurs at the point of tangency. Since it is assumed that workers choose occupations rationally, the choice occurs, by hypothesis, at the point of tangency.

small number of hours per time period in occupation 2 if occupation 1 were not available would, instead, choose to work long hours in occupation 1, because, by doing so he/she can move to a higher indifference curve (i.e., gain more total utility).

One of the major advantages of Lancaster's model of labor-leisure choice and occupational choice is the facility with which it handles nonincome rewards of jobs. To accomplish the same result with the neoclassical model of labor-leisure choice would require adding at least a third dimension, such as "pleasantness" of working conditions, to the standard labor-leisure graph. A new constraint on permissible exchanges of leisure time, income, and pleasant work would be required for each occupation, producing a new graph for each occupation. The parsimony of Lancaster's model is appealing by comparison. In addition, as illustrated in Figure 22, the model expresses the trade between income rewards and nonincome rewards of work and shows how the trade is realized in occupational choice. Further, the model shows how people may lose satisfaction by being forced through societal restraints to select only one occupation. On the other hand, the main discrepancy between the model and the current labor market is that the model permits allocation of time between work and leisure to be an individual choice when, in fact, the amount of time one may work on any job generally is restricted severely by employers. Also, the model fails to account for employees on fixed salaries.

The key assumption of Lancaster's work is that utility is derived indirectly from consumer goods and services and from occupations via characteristics associated with goods and services or with jobs. Lancaster emphasizes his belief that the characteristics can, in principle, be measured. This emphasis suggests a need for detailed empirical work to describe occupational characteristics and thus adds economic legitimacy to efforts by other social scientists to describe occupations. Examples include those proposed by Holland and by Roe, and the "data-people-things" measurements reported in the Dictionary of Occupational Titles.

Freeman

College-trained persons were studied empirically by Freeman (1971) to assess the validity of economic perspective about occupational choices. The main conclusion of the study is that allocation of college-trained people into employment is governed by economic factors (Freeman 1971: 227). Three broad policy implications are drawn: (a) policy goals may be achieved by economic incentives, (b) government intervention to maintain competitive markets is justified, and (c) the chief policy problem is to define goals rather than methods for achieving goals--

market mechanisms supply the methods.

The book (Freeman 1971) combines economic theory building about career choices with the empirical work analyzing those choices among college-trained persons. Three models are presented. The first model addresses primarily individual labor-supply decisions and, hence, is most closely related to the focus of this volume. Lancaster's model of individual supply decisions is adopted. The second model is a theory of aggregate supply incorporating a "cobweb" model and an "incomplete adjustment" model to account for lagged supply response to demand changes. This work emphasizes the cumulative effects of individual decisions on market supply. The final model describes the effect of universities on the aggregate supply of college graduates. Here, faculty is viewed as the chief input to university production of graduates. A simultaneoius equation model of allocation of personnel between academic and nonacademic employment is developed to reflect the belief that salaries and employment between these sectors are interdependent. The main purpose of these three models is to furnish direction for the empirical analysis rather than to propose a comprehensive theory.

Freeman's commentary regarding individual labor-supply decisions is immediately relevant to the topic of this volume. While the aggregate lagged-supply models and the model of the college-faculty labor market are interesting, they are not germane directly to individual choices; hence, the remaining discussion in this section is confined to Freeman's individual labor-supply model. Interested readers will find Freeman's work rewarding, however. In particular, the "cobweb" model and "incomplete adjustment" model are interesting efforts to account for two salient features of the market for college-trained persons--the lag time in training and the time interval required to disseminate information about changes in market conditions to prospective entrants in college.

In the human-capital perspective, occupational choice and the associated training decisions are a form of investment; however, investment in human capital exhibits some unique features. Freeman notes two. First, due to training time, finite life-span over which to recover investment, and lack of easy availability of loans for investment in human capital (because of prohibitions against liens on human work), occupational choice is an all or nothing decision. Other capital investments may be diversified. Secondly, one who sells his/her own labor has a strong interest in the conditions surrounding use of the labor. On the other hand, a seller of bricks, for example, has no interest in the use to which the bricks are put. Consequently, price does not have the same unique effect on labor supply that it has on supply of other economic commodities.

The basic idea in Freeman's discussion of individual occupational choice is that people maximize utility subject to ability constraints. Utility maximization depends heavily, though not entirely, on lifetime earnings, properly discounted. The ability constraints presented are analogous to income constraints in consumer theory.

The treatment of utility maximization adopts Lancaster's model largely intact. Freeman notes two important implications of the model. First, it shows how time preferences for leisure affect occupational choice. Secondly, the model implies that cross elasticities of labor supply will depend on similarities of characteristics of occupations--there being a positive association between degree of similarity and cross elasticity.[7]

The model of limitations imposed by ability links a unique set of ability requirements associated with each occupation to a "shadow" price on each ability that is common across all occupations.[8] The wage rate in each occupation is written as a simple function of ability requirements and the shadow prices, as follows:

$$(13) \quad w_i = \sum_j R_{ij} P_j A_j$$

where w_i = wage in occupation i, R_{ij} = requirement in occupation i for ability j, A_j = level of individual's ability j, and P_j = shadow price of ability j. Using this model Freeman proposes a graphical analysis of occupational choice in which a linear programming approach is used to illustrate how wages can be maximized subject to ability constraints.

Freeman notes that current career decisions are based on expectations regarding future characteristics of occupations; consequently, good theory must accommodate effects of expectations. The principal object of the expectation is a subjective estimate of lifetime earnings, properly discounted to a present value. Freeman hypothesizes that expected lifetime earnings are a function of three market variables: (a) current

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[7]Elasticity refers to the proportion change in supply (demand) in ratio with proportion change in wage (price). Cross elasticity means relative supply change in one occupation as dependent on wage change in another occupation. The concept of elasticity is very flexible, however, applying to topics such as consumer demand, busines supply, and migration, as well as to occupational choice.

[8]A shadow price is an ideal price of some commodity, that may or may not be the same as a money price.

average incomes in occupations, (b) trends in average incomes within occupations, and (c) nonwage factors such as unemployment. The discussion also incorporates the frequent assumption that people are averse to risk, and hence, prefer established occupations with stable histories.

The theoretical work developed by Freeman supplies a framework for the report of empirical results. Data are reported that are germane to each of the three topics of theorizing--individual labor-supply decisions, lagged-response models of aggregate supply of college-trained labor, and university responses to changes in demand for college graduates.

The bulk of the evidence offered in support of Freeman's economic view of individual occupational choice is drawn from a mailed survey to which Boston area college students responded (Freeman 1971). The survey data are supplemented with data from a variety of other sources such as census reports. The chief drawback of the survey data is the low return rate--25 percent. In an appendix, Freeman presents two types of information suggesting that the data do not contain inadmissable bias: (a) comparisons of subgroups within the sample exhibiting different return rates show little systematic variation across groups, (b) comparisons of selected variables for the exhibiting different return rates show little systematic variables for the Boston sample to carefully executed national samples reveal few differences. Nevertheless, as Freeman notes, his results must be interpreted cautiously.

The empirical analysis does not purport to contain a systematic test of the theoretical discussion of individual occupational choice. Instead, a variety of information is presented in support of the following general points: (a) college students generally make final occupational decisions in college; hence, they are flexible and thus able to respond to current and expected economic conditions, (b) college major and vocational choice are related closely, though not perfectly, (c) second occupational preferences are in fields related to first choices, (d) student income expectations reflect objective data about occupation-specific incomes, (e) student perceptions of chances for wealth in chosen fields are realistic, and (f) there are a substantial minority of students who are "marginal suppliers", that is, who are willing to shift occupatinal expectations in response to current economic trends. The marginal suppliers are important to the theories of aggregate supply.

The central thread running through these empirical generalizations is that college students respond to economnic variables when making career decisions, but the relationships observed in the data are not derived rigorously from the theory,

thus leaving a gap between the empirical analysis and Freeman's theoretical discussion of individual labor-supply decisions. A fair quantity of econometric analyses of aggregate data also lends some support to this viewpoint [see Freeman (1971) and Freeman (1976: 53) for a summary], but it must be emphasized that drawing conclusions regarding individual behavior from aggregate data is risky (Robinson 1950; Duncan, Cuzzart, and Duncan 1961; Schuessler 1971). The aggregate data analysis is more closely related to the aggregate theory presented by Freeman than the survey data are to the individual-level theory, however.

Annable and Fruitman

A paper by Annable and Fruitman (1976) proposes a model of occupational choice which draws on human capital theory and utility theory. The primary purpose of the paper, however, is to derive empirical estimates of an earnings function for persons employed in high-level jobs. The theory of occupational choice is incidental to this primary purpose; nevertheless, it is a well-developed, articulate statement of the economic point of view. Past work with earnings functions is criticized on two counts. First, selection of independent variables has not been based on theory. Secondly, important independent variables have been omitted, particularly job satisfaction. The paper addresses these two problems by proposing a theory of occupational choice that generates predictions for the empirical analysis in which earnings and job satisfaction are viewed as jointly dependent (i.e., exhibit two-directional effects).

The theoretical proposal incorporates four variables to predict occupational choice--"innate ability", access to resources for development of one's human capital, earned income, and nonpecuniary job satisfaction. One's resources--ability and human-capital investments--are conceptualized as a budget constraint, and earnings and job satisfaction are considered as two goods or services to be "purchased" with one's resources. Thus, utility depends on earnings and satisfaction according to standard assumptions about utility functions (e.g., indifference curves with negative slopes, nonintersecting indifference curves, etc.). Each job has an associated set of minimum ability and training requirements and associated rewards defined by earnings and satisfaction. The fundamental theory states that people maximize utility subject to their resource limitations; this means that each individual picks the job with the highest utility, subject to the proviso that job requirements are met.

In this theory, utility producing factors (earned income and job satisfaction) come together in packaged lots. Each "package" is an occupation. This model, with a slight modification, is closely related to the neoclassical consumer model illustrated

previously (Figure 21) by the case of a little girl selecting bubble gum and candy subject to a dollar per week allowance limit. If the bubble gum and candy came packaged together in predetermined combinations of quantities, the little girl would be forced to select the package costing one dollar or less that most closely approximated her optimum quantities of bubble gum and candy. Since workers cannot select earnings and job satisfaction separately but must, rather, pick a single occupation that presents a predetermined combination of earnings and satisfaction, the two cases are quite analogous.

Figure 23 shows a graph of this theory. Each point on the graph represents a job; its location indicates the level of earnings (x axis) and job satisfaction (y axis) associated with the job. The convex lines represent indifference curves, corresponding to constant utility. The "budget constraint" is discrete, not functional, because each individual selects the occupation on the highest indifference curve from among those occupations for which he/she qualifies.

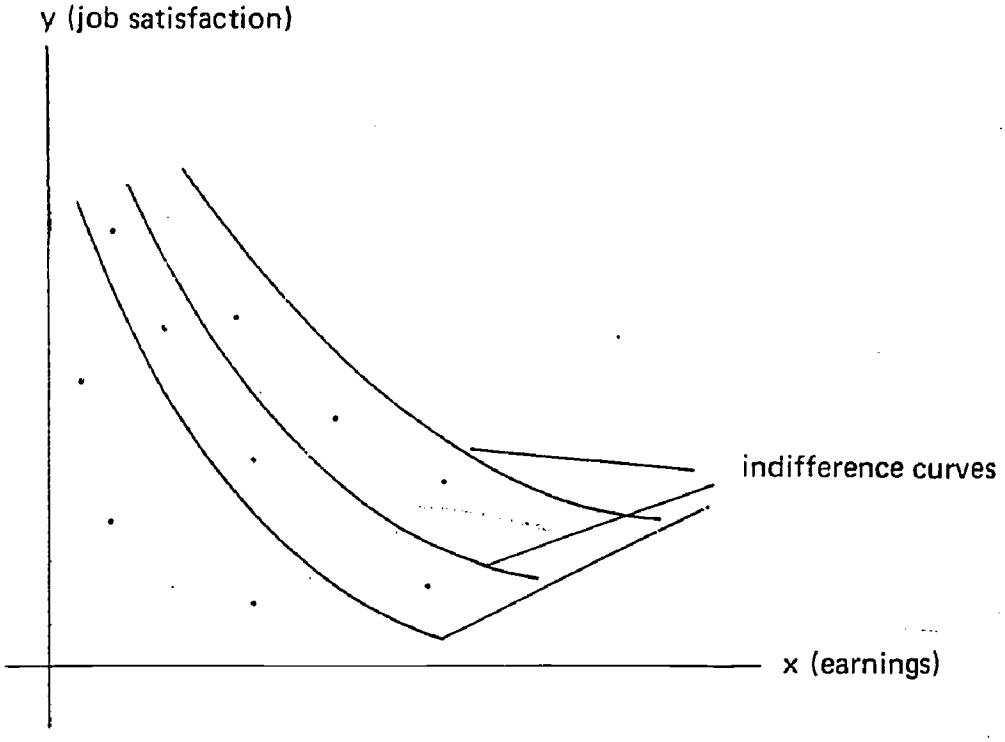

FIGURE 23. Graphic representation of Annable and Fruitman's theory of occupational choice.

Since it is assumed that indifference curves are negatively sloped, the relationship between utility producing variables is everywhere negative--Annable and Fruitman's theory of occupational choice, therefore, implies that earnings and job satisfaction are related by a negative function (i.e., $dy/dx < 0$. For their earnings function, consequently, Annable and Fruitman specify a negative sign for the regression weight indexing the effect of job satisfaction on earnings. On the other hand, drawing roughly on Maslow's theory of needs hierarchy Annable and Fruitman also postulate that earnings exercise a positive effect on job satisfaction; hence, earnings and income are jointly dependent, and two-stage least squares are applied to the data.[9]

Since occupational choice is not a variable in the data analysis, the empirical part of the study is related indirectly to the theory of occupational choice. Two results are, nevertheless, provocative enough to bear reporting. First, counter to expectation, the estimated effect of job satisfaction on earnings is positive and highly significant. This result tends to refute the time-honored economic viewpoint that job satisfaction and earnings can be traded for each other.[10] Lucas (1977), however, presents national data showing pleasantness of working conditions impact negatively on wages after other relevant factors such as age and education are controlled.

The second interesting result is that the percentage of variance explained in earnings jumped from 14 percent to 35 percent when a "disequilibrium" function containing region and occupation was compared to the "equilibrium" function containing only human-capital variables and job satisfaction. Here, the term disequilibrium is applied because regional and occupational differences in earnings that are not accounted for by economic forces should produce an economic disequilibrium that will tend to reduce regional and occupational earnings differences until equilibrium is achieved. Thus persistent earnings differences among regions and occupations that cannot be explained by human capital and satisfaction variables give indirect evidence of disequilibrium.

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[9]Two-stage least squares is a regression method for dealing with systems of variables in which two-directional effects are hypothesized. See Goldberger (1964) or Johnston (1963) for surveys of several statistical methods designed to handle such problems.

[10]This idea apparently originated with Adam Smith.

This result tends to support the segmented labor-market viewpoint--that two or more relatively isolated labor markets coexist--rather than the neoclassical view embodying human-capital theory and utility theory.

Before accepting these observations at face value, however, the data and analysis methodology must undergo close scrutiny. There are several features of the methodology that may account for the results. First, the sample is highly specialized, consisting of respondents to a survey of 1951, 1955, and 1959 graduates of the Sloan School of Management. While there is no obvious reason why this sample would be markedly different from a representative group, confidence in the results must await replication using a more representative sample. Secondly, the data are cross-sectional, thus, making estimation of two-directional effects difficult. Even with use of two-stage least squares, it is necessary to assume the variable system has reached equilibrium in order to achieve parameter estimates that are accurate up to a proportionality factor within each equation. Thirdly, the measure of job satisfaction does not reflect economic theory very well. In economic theory, nonpecuniary features of employment are supposed to balance earnings; a general measure of job satisfaction does not reflect this concept very well. Annable and Fruitman (1976: 1114) use a five-item index of "job satisfaction." One of the items seems to be way too general to reflect the idea of nonpecuniary income while the others are only roughly related to the concept.[11] Finally, "the disequilibrium

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[11]The five items are as follows:

A. If I had to change the kind of work I do, I would be very frustrated and unfulfilled.

B. I like to think about my work even when off the job.

C. My only interest in my job is to get enough money to do the things I want to do.

D. I wish I were in a completely different occupation.

E. My main satisfaction in life comes from the work I do.

Response alternatives consisted of five levels of agreement as in Lickert scaling. The items were averaged using equal weights (except for sign) to create the index. Item d seems particularly vague; indeed, income might easily be the main determinant of responses to this item. The other items probably reflect nonpecuniary job features somewhat better than item d, but no item is

equation for earnings adds occupation as a categorical variable predicting earnings. As a matter of experience, therefore, it is no surprise to find a "significant" improvement in predictive accuracy. Whether occupational differences in earnings should be interpreted as reflecting imperfect wage competition, however, is questionable. According to human-capital theorists such as Becker and Mincer, on-the-job training is an important part of human-capital accumulation; hence, earnings differences among occupations are not prima facie evidence of market disequilibrium, since quantity of on-the-job training might vary by occupation.

Benewitz and Zuker

An early paper by Benewitz and Zucker (1968) applies the theory of human capital to occupational choice. The paper does not contain systematic data. The critical postulate of theory is a link between occupation and training. Investment in one's human capital is conceptualized as a series of discrete investment the economic periods called an ordered chain. At each step, the individual decides whether to undertake the next period of training and, thereby, prepare for a higher paying job, or accept employment in an occupation for which prior training is sufficient. Each link in the investment chain has an associated internal rate of return.

Each individual has a subjective rate of return that equates the present value of an increment to future income to the amount of current income he/she is willing to forego to obtain the future increment. The initial assumption of the theory is that each individual maximizes the present value of earnings. If a person is up to the kth step in the investment sequence, it is necessary to decide whether to continue with the (k + 1)th step. After some elementary algebraic manipulation on a formula expressing the initial assumptions, it is found that the direction of change in present value of earnings due to the next

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carefully worded to exclude effects of earnings. For testing theory, it seems preferable to identify several specific job features such as security, degree of autonomy, etc., rather than general questions such as these. The index almost approximates a measure of utility more closely than it does a measure of nonpecuniary job features. Although economists disavow the need to produce a "cardinal" measure of utility, it would, nevertheless, be interesting to use an index similar to this index of "job satisfaction" as an indicator of utility and use earnings and nonpecuniary job characteristics as independent variables to estimate an empirical utility function.

set of investments depends on the relative size of the internal rate of return on the investment, r_k, and the individual's subjective rate of return on exchange of future for current income, r_i. If $r_k > r_i$ present value increases; if $r_k < r_i$, present value decreases. Consequently, each individual invests only until his/her subjective rate of exchange of future for current income matches the internal rate of return.

An interesting theorem is deduced from these results. If x_{k-1} and x_k represent respectively occupations resulting from $k - 1$ and k periods of investment, then in equilibrium $r_{k-1} > r_k$. The authors cite some informal observations to support this outcome, but the evidence is uneven.

Several qualifications to the theory are noted by the authors. First, the subjective rate r_i is assumed constant over time for a given individual, but the traditional assumption about diminishing marginal utility of income could violate this assumption in cases of large investment. Secondly, "consumption" elements in education (i.e., intrinsic value of learning), tastes for different types of work, and differential abilities across individuals all may affect results independently of present-value maximization. Finally, it is assumed that time discount rates, r_i, are independent of age, but, in fact, these rates are likely to increase with age.

The theory is a fairly pure statement of the human-capital point of view. The most serious shortcoming centers on the omission of nonpecuniary features of jobs, as noted by Benewitz and Zucker. Utility theory helps to meet this problem in human capital theory.

Lucas

The theories reviewed so far tend to overlook nonpecuniary influences on occupational choices or leave those influneces undifferentiated in a residual category labeled "nonpecuniary." In view of this, a recent paper by Robert Lucas (1977) holds particular interest. Lucas' statement of theory incorporates three classes of variables--wages, nonwage characteristics of jobs, and personal characteristics of individual. He points out that human-capital theory is preoccupied with wages and personal characteristics and tends to overlook nonwage characteristics of jobs.

Lucas' basic theory is very general. He stipulates that utility gained from one's job is a function of wage, nonwage job features, and personal characteristics. Maximizing the utility function generates a labor supply function for each individual. On the demand side, profits also are viewed as a function of wages, nonwage job features, and worker's personal

characteristics. Maximizing profit generates a set of equations determining the demand for labor in each occupation. Setting aggregate supply and demand equal, in turn, generates a reduced-form equation in which wages become a function of job characteristics and personal characteristics of workers. This general statement of the theory serves to rationalize specification of an equation for empirical work.

The functional form of Lucas' theoretical equations is not specified; thus, the precise link between the theory and data analysis is not worked out. The importance of Lucas' work is that it broadens the basis of economic theory by providing a conceptual structure for handling specific nonpecuniary variables in the determination of job choices. For example, Lucas argues that the degree to which individuals value different job features depends on ". . .some vector of measured personal characteristics of the worker. . ." (1977: 550). He gives two reasons:

(a) A presumption of dissatisfaction resulting from performing a task that involves the use of more, or less, of an ability than is possessed by the person.

(b) Tastes are..., at least partially, formed through environmental experiences, and some elements of the vector of personal characteristics may be viewed as factors that condition characteristics the probability of having certain experiences (Lucas 1977: 550).

The first of these reasons is reminiscent of trait-factor theory, but is general enough to accomodate Super's notion of implementing a self-concept. The second reason could incorporate environmental influences such as parental status and significant-other opinions. Lucas' work does not present a complete statement of the interplay between pecuniary and nonpecuniary influences on job choices, however.

The empirical work reported by Lucas is as interesting as the theory, in spite of the loose tie between the theory and the data. Two sources of data were merged for the analysis. Personal characteristics of workers were taken from the Survey of Economic Opportunity and job characteristics of each respondent's job descriptions in the Dictionary of Occupational Titles (DOT). The logarithm of hourly wages was the dependent variable. Schooling, age, race, and sex are the personal characteristics of workers, and six DOT descriptions of jobs were taken to represent nonpecuniary occupational characteristics. Besides confirming the positive effects of schooling on wages and patterns of age, race, and sex effects, observed in past research the data also show that nonpecuniary factors influence wages as Adam Smith suggested; viz, that poor working conditions are compensated for

by high wages, ceteris paribus, and vice versa. In fact, the bivariate relation between wage and attractive nonpecuniary job features is reported positive, but the sign reversed when human capital variables were controlled, thus contradicting findings reported by Annable and Fruitman discussed earlier in this chapter.

Summary and Conclusions

This chapter reviews economic theories of individual choices of occupations; it is divided into two substantive sections. The first section summarizes fundamental concepts in economics that enter into economic theorizing about occupational choices. The second section reviews several specific economic theories of occupational choice.

Two complementary ideas form the bases of economic theories of individual occupational choice; human capital theory and utility theory. Both use between-occupation income differences as an important determinant of occupational choice. According to human-capital theory, occupations are linked to training requirements. The training is expensive due to direct costs and foregone earnings, but there is a positive association between training requirements and pay rates of occupations. Thus, occupational choice can be treated as an investment decision. The process of selecting an occupation can, therefore, be seen as a matter of selecting that occupation yielding the highest rate of return on the investment. Utility theory incorporates earnings and nonpecuniary job characteristics as two determinants of the attractiveness or utility of each occupation. Occupational choice can then be handled as a problem of maximizing utility. The oldest application of utility theory, however, is to the allocation of time between labor and leisure on the assumption that workers are free to choose the number of hours worked, but this application can be extended to occupational choices in various ways, as illustrated in the section of the chapter entitled "Specific Theories."

Two important ideas are added to utility theory and human capital theory by the specific theories. First, the idea that economic ability and training opportunity affect occupational choices is proposed (Becker 1971; Freeman 1971; Annable and Fruitman 1976). Secondly, Becker (1971) and Lancaster (1966; 1968) propose that utility is derived indirectly from job characteristics or consumer commodities rather than directly from consumer commodities. Freeman (1971) also adopts this view, borrowing from Lancaster. Indirect utility permits Becker to derive the theoretical expectation that amount of time devoted to working is inversely related to amount of property income and positively related to wage rate; the latter result also follows

from the direct utility model. Lancaster uses the idea of indirect utility to show how a low wage, say in an agrarian economy, might lead to nearly 100 percent of the labor force farming for their own consumption rather than working for a wage in the market economy. In both cases, then, observations that appear anomalous when viewed through traditional theory are explicable by use of economic variables when the utility is considered to derive indirectly from consumer goods or from jobs.

When compared to other topics in economics, occupational choice has received relatively little attention. Theory developed primarily to handle investment and consumer decisions has been modified to fit occupational choice. It is not surprising, therefore, that economic theory of occupational choice is not fully developed and data bearing directly on the theory are scarce.

It is only in comparison with other economic theory, however, that economic theory of occupational choice is underdeveloped. When compared to noneconomic theory of occupational choice, the economic work fares much better. Economic theory-building tools have stimulated comparatively intensive derivation of consequences from a parsimonious set of initial assumptions. These consequences generally are not easy to test, however. For example, it is difficult to devise a direct test of the assumption that utility is maximized subject to ability and training limitations. Also, intensive work with income variables often has diverted attention from other variables such as self-concept, significant others' expectations, and occupational prestige. It seems likely that lumping all these specific variables into a single residual category labeled nonpecuniary variables unduly simplifies the theory.

Lucas' work is an exception to this characterization, of course, but it is only one paper and cannot, therefore, match the breadth of coverage contained in psychological and sociological writings. Contrariwise, sociologists and psychologists have ignored too long, economic motivation in occupational choices. What seems to be needed is an eclectic merging of several perspectives with a careful eye on striking a judicious balance between comprehensiveness and parsimony.

Although this volume is confined to a review of theories of individual choices of occupation, it is important to recognize that people are paired to occupations via an interplay between personal decisions (supply) and structural factors determining job availability (demand). One of the most important contributions of economic work is contained in analyses of the interplay between supply and demand. Those interested in a comprehensive theory of job allocation should refer to economic work on demand for labor as well as to economic theory of labor supply.

CHAPTER 6

DECISION-THEORY PERSPECTIVE

Decision theory is a branch of applied mathematics that is concerned with how individuals choose among alternative courses of action. It represents the process by constructing mathematical models in which the appropriate variables are represented, weighted by some coefficients, and combined according to algebraic rules to yield a decision criterion. One decision or another is then made according to the value of the decision criterion. A decision rule, which relates the values of the decision criteria to specific decisions, determines what decision will be made.

Decision theory traditionally has been concerned with two rather different applications. Prescriptive decision theory generates decision principles, or models, that are advocated as aids to decision making. The decision maker is urged to calculate a decision criterion utilizing some recommended principle and then to base his/her decision on the value of that criterion. Descriptive decision theory utilizes decision principle as models of how people actually make choices. The concern is with developing models that represent what happens when people make choices. The former is concerned, therefore, with how people ought to make choices, while the latter is concerned with how people do make choices.

There are some theories of occupational choice that are based, somewhat loosely, on descriptive mathematical decision theory. They are not direct applications, but rather are modifications designed to fit a different set of circumstances. Decision theory has developed almost entirely in very restrictive laboratory situations in which the subjects were allowed only a few simple choices. Predicting whether the next light to go on will be red or green, or deciding to bet one, two, or three tokens that the next light to go on will be red, are typical choice situations that these laboratory subjects encountered. Choosing an occupation, or making any real-life decision for that matter, is not nearly so simple a task. Modifications, therefore, seemed to be in order when applying a laboratory principle to the real world. This does, however, cause some theoretical difficulties, as we shall see later.

Some understanding of mathematical decision theory as it was originally developed in the laboratory provides a useful background for understanding its modification and adaptation to real-life situations. Related work is massive and complex; this report is not the proper forum for a complete exposition, but a

summary is provided. An excellent description of mathematical decision theory as it applies to human behavior can be found in Lee (1971). Chapter two is especially recommended as a brief overview.

Mathematical Decision Theory

Decision theory is sometimes called game theory, and the decision makers referred to as players. This should not be confused with psychological games as described by Eric Berne in his popular book, Games People Play (Berne 1964). The decision making, or game, situation is often represented by a game matrix. This is simply a row-by-column array in which the rows represent the possible decisions of one player, the columns represent the possible decisions of a second player, and the row-column intersections represent the consequences of each player choosing one of the options. The list of choices for each player are assumed to be mutually exclusive and exhaustive; that is, all possible choices are represented without overlap, so that each player must choose one and only one option. A game matrix is illustrated in Table 11.

Table 11

A Game Matrix

	b_1	b_2
a_1	o_{11}	o_{12}
a_2	o_{21}	o_{22}

In this illustration, the a's represent the possible choices for player A; the b's represent the possible choices for player B; the o's represent the possible outcomes, or consequences resulting from the joint occurrence of a decision by A and a decision by B. Player A is always considered to be an individual. Player B may be an individual, or may be interpreted as "nature." In the latter case, the b's are considered to represent possible conditions or states of nature, or the true state of affairs. This is the situation involving only one real decision maker, which is the aspect of game theory that has been applied to occupational choice. Two-person and n-person game theory has

been applied mainly to bargaining situations and entertainment-situations (Lee 1971), and has recently been applied to interpersonal-problem situations such as those encountered in family psychotherapy (Liebowitz and Black 1974).

To illustrate, let us suppose the above game matrix represents a real-life, one-person situation. I am driving home from work and wish to be home by six o'clock in order to watch the news on TV. I notice that the gas gauge reads "empty," which means that the tank is very close to being, though not quite, empty. The a's are the two possible choices I have:

a_1 - Try to make it home without buying gas.

a_2 - Stop at a service station and buy gas.

The b's represent the two possible states of nature:

b_1 - I have enough gas to get home.

b_2 - I do not have enough gas to get home.

The o's represent the four possible outcomes of this game:

o_{11} - I get home in time to watch the news. (I tried to make it home without buying gas and I had enough gas to get home.)

o_{12} - I run out of gas on the road and miss the news completely. (I tried to make it home wihtout buying gas and I did not have enough gas to get home.)

o_{21} - I get home, but needlessly miss the first ten minutes of the news. (I stopped to buy gas and I had enough gas to get home and need not have stopped.)

o_{22} - I get home, and of necessity miss the first ten minutes of the news. (I stopped to buy gas and it is a good thing I did because I did not have enough gas to get home.)

Notice that the o's are descriptions of what happens as a result of the joint occurrance of a decision on my part and a state of nature. They do not say what those consequences mean to me. If, instead of a description, a number is substituted which represents the value of each consequence to me, (v's are substituted for o's), the matrix is then referred to as a payoff matrix.

Games are said to occur under four conditions of play: certainty, rational competition, risk, and ignorance. The condition of certainty exists when Player A knows what Player B's choice will be, given any choice of Player A; that is, for each choice that Player A might make, there is one and only one choice that Player B can make. True conditions of certainty rarely occur in real-life decision-making situations. Usually, they are artificially created abstract situations, such as a pollster asking, "If anyone you wished could be president tomorrow, whom would you choose?" Some approximations to the condition of certainty do occur, and people seem to act as if the condition of certainty did exist. Ordering dinner in a restaurant is an example. People act as if what they order is what they'll get. Even here, however, there is some uncertainty. The restaurant may be out of something listed on the menu, or it may not be cooked properly, or it may not taste as good as expected. When the condition of certainty, or near certainty, does exist, it is almost always a one-person game. This condition is, however, of little interest in decision theory because the decision criterion is so simple as to be obvious.

The condition of rational competition is always an n-person game, since "nature" is presumed not to make deliberate decisions. Under this condition, Player B is assumed to be an individual who can, and will, make whatever decision is dictated by his/her self-interest. This condition would not normally apply to the occupational choice situation, where there is no individual antagonist. (It might apply to a job-choice situation, where an individual job hunter might "play against" an individual employer.)

The condition of risk exists when Player A knows, or has some notion of, the probabilities of occurance of each of the choices of Player B. This is the usual situation when Player B is "nature." Player A usually has some idea of the probabilities of the several "states of nature" given that he/she makes a particular choice. It is this condition that is assumed to exist for occupational choice and is of the greatest interest for this report.

The condition of ignorance exists when Player A knows that one of several states will occur after he/she makes a choice, but has no idea what the probabilities of those states are. This condition rarely exists in real-life decision-making situations unless the protagonist finds himself/herself in a totally novel situation with which he/she has had absolutely no experience. Except in contrived circumstances, this is not likely to occur and is of little interest in decision theory applied to human behavior.

The Expected Value Principle

Of the four conditions of play, the condition of risk (which usually assumes that Player B is "nature"), is by far the most prevalent in real-life decision-making situations, and is assumed to describe occupational choices (Vroom 1964). One of the most prominent, most studied, and most widely accepted decision principles for this conditon is the expected value principle. Actually, as we shall see shortly, this is a family of four very similar principles differing only in the definition of "value." The expected value principle states that a person will choose that option resulting in outcomes that will yield the maximum expected value. This is a kind of "getting the most for your money" principle. The expected value of a choice is defined as the algebraic sum of all the possible outcomes resulting from that choice weighted by the probability of that outcome (Lee 1971). Thus;

$$(1) \quad Ev_i = p_1 v_{i1} + p_2 v_{i2} + \ldots + p_n v_{in} = \sum_{j=1}^{n} p_j v_{ij}$$

where

Ev_i is the expected value of decision i
p_j is the probability that outcome j will occur, given decision i is made
v_{ij} is the value of outcome j

The probabilities may be either objective or subjective. The objective probability of an outcome is its actual probability of occurence; the subjective probability is that which the individual believes to be the probability, whether or not that estimate is accurate. The value of each outcome may also be either objective or subjective. Objective values are measured in concrete terms; for example, dollars received as the result of a particular decision. Subjective values are the psychological values of the payoffs to the individual--similar to the concept of utility as used in the economic literature. This leads to a four-fold definition of expectancy depending upon which of the two definitions of probability and which of the two definitions of value are used. This is shown in Table 12, which gives the names of each type of expected value.

In most real-life decision-making situations objective probabilities cannot be determined and most values are not measurable in concrete terms. What is the objective probability of my ultimately reaching a salary of $50,000 per year if I choose a certain occupation? What is the objective value of my enjoying my work? In this situation, the salary is an objective value, but objective probabilities and the value of enjoying work

Table 12

Classificiation of Expected Value

Probabilities	Payoffs: Objective	Payoffs: Subjective
Objective	Objective Expected Value (OEV)	Objective Expected Utilty (OEU)
Subjective	Subjective Expected Value (SEV)	Subjective Expected Utility (SEU)

are unknown. Only what the individual decision maker believes has meaning. One hopes, of course, that her/his beliefs are realistic approximations of objective probabilities and values, based on past experience, but there is no guarantee.

The Maximin Principle

The maximin principle is a very simple idea which has been widely advocated as a presciptive decision aid, but there is no reason to suppose that it might also represent individual decision-making processes. For any choice, there is one outcome with the smallest payoff (ties are also possible). The smallest payoff for one choice is larger than the smallest payoff for all other choices (again, ties are possible). The decision principle states that the option is chosen in which the minimum payoff is maximized. The principle is more complex when tied payoffs exist, but since these are unlikely to exist in real-life situations they will not be discussed here (Lee 1971). The simple maximin principle usually is not stated with mathematical notation, but could be as follows:

$$v_i = MIN(v_{ij})$$

where

v_i is the value of a choice
v_{ij} is the value of each outcome

The option with the largest v_i is chosen.

The maximin principle is said to be a more conservative criterion than the expected-value principle since it is likely to lead to choices of options that are not extremely bad, but not extremely good either. This will be illustrated in the next section of the application of decision theory to occupational choice.

Other Principles

Other decision principles have been advocated and have been studied in laboratory situations, but have not been applied to descriptive real-life situations. The Principle of Insufficient Reason and the Minimax Regret Principle are two examples (Lee 1971). The latter suffers from an interesting condition known as lack of independence from irrelevant alternatives. A person, given a choice of peas or carrots, chooses peas; however, upon learning that spinach is also available, decides he/she would rather have carrots. Common sense dictates that when new alternatives are introduced, the protagonist should not change his/her mind except to choose one of the new alternatives. Such principles have not been taken seriously.

Some newer decision models that have been proposed are Comb's Portfolio Theory, Tversky's Elimination by Aspects, and Hammond's Policy Capturing Model (Rosenweig and Porter 1977). These models have not been tested extensively, and have never been applied to occupational choice.

Vroom's Expectancy Model of Motivation

The earliest and most extensively studied decision-theory applied to occupational choice is that devised by Victor Vroom (Vroom 1964). The model appears to be a derivation of the subjective expected utility model of mathematical decision theory, although Vroom does not acknowledge this as its source. In fact, his only mention of decision theory is one sentence on page 19; "This formulation is similar to the notion in decision theory that people choose in a way that maximizes subjective expected utility" (Vroom 1964). It was not intended as a model of occupational choice per se, but as a more general model of motivation, one of whose applications was to the occupational choice problem. The discussion is divided into five subsections. The first describes the general model, the second reviews its application to occupational choice. The next two subsections discuss problems with the model, and the last discusses empirical evidence bearing on the model.

Vroom's General Model

Vroom's model involves two parts. The first defines what decision theory refers to as the value of an outcome; the second is a derivative of the expectancy principle itself.

Vroom defines the valence of an outcome as the person's strength of attraction to or repulsion from that outcome. A valence is said to be positive if the person prefers having the outcome to not having the outcome, negative if the person prefers not having the outcome to having the outcome, and zero if the person is indifferent to whether or not the outcome occurs. The value of an outcome is defined as the satisfaction that the outcome supplies when it is attained. Thus, Vroom distinguishes between the anticipated worth of an outcome (valence) and the realized worth of an outcome (value). Decision theory makes no such distinction; both are referred to as value. It is the valence, not the value, of an outcome which controls motivation, since decisions are made in anticipation of outcomes, not when the outcomes are realized.

The valence model is as follows:

$$(2)\quad V_j = f_j \left[\sum_{k=1}^{n} (V_k I_{jk})\right] \quad (j=1,\ldots,n);\ f_j' > 0$$

where

V_j is the valence of outcome j
V_k is the valence of outcome k
I_{jk} is the cognized instrumentality ($-1 \leq I_{jk} \geq 1$) of outcome j for attaining outcome k
I_{jj} 0
f_j' = the derivative of the function f with respect to the sum in brackets

Vroom states that the valence of any outcome j is a monotonically increasing function of the algebraic sum of the products of the valences of all other outcomes k and the persons conceptions of the instrumentality of outcome j for attaining these other outcomes (I_{jk}). In other words, each outcome of a choice is presumed to be instrumental in obtaining other outcomes. The perceived instrumentality of one outcome for obtaining another is said to range from -1.00 to +1.00. A value of +1.00 means that outcome j always produces outcome k; -1.00 means that outcome j always prevents outcome k; 0.0 means that outcome j has nothing to do with the occurrence of outcome k. Intermediate values refer to the relative effectiveness of outcome j for producing, or suppressing, outcome k. The valence of any outcome j, is thus

obtained by taking the valence of every other outcome k, multiplying by the respective instrumentality of outcome j for obtaining outcome k, summing those products, and then deriving the appropriate function of that quantity.

Two important points should be noted. The first is that the valence is not equal necessarily to the sum of the products; it is a positive monotonic function of the sum of the products. This function, however, is not defined by Vroom; it is merely some hypothetical function that is ignored in practice. The model is used as if the valence were equal to the sum of the products as a special case of the general formulation. The second point is that at first glance the model looks horrendous, since no limit is set on the value of k; that is, the number of outcomes is infinite. In any given situation, however, only a relatively limited number of outcomes will have nonzero instrumentalities. The rest will be eliminated from the equation for all practical purposes.

The statement that $I_{jj} = 0$ simply means that no outcome has any instrumentality for attaining itself. The final statement specifies that the first derivative of the function is greater than zero, which is the definition of a monontoically increasing function. As the sum of products increases, the valence increases, though not necessarily proportionately; that is, the function is not necessarily linear with unit slope.

The second part of Vroom's model is the equivalent of the decision-theory expectancy principle. Vroom defines force as a hypothetical construct having direction and magnitude which contributes to a determination of the choice a person makes. A field of such forces, each associated with a specific possible choice, determines the actual choice.

The force model is as follows:

$$(3)\quad F_i = f_i\left[\sum_{j=1} (E_{ij} V_j)\right] \quad (i = n+1, \ldots, M) \quad f_i' > 0$$

where

F_i is the force to perform act i
E_{ij} is the strength of expectency ($0 \geq E_{ij} \geq 1$) that act i will be followed by outcome j
V_j is the valence of outcome j
$i \cap j = \emptyset$ (null set)
f_i' = the derivative of the function with respect to the sum in the brackets

Vroom states that the force on a person to perform an act,

(i.e., make a choice), is a monotonically increasing function of the algebraic sum of the products of the valences of all outcomes and the strength of his/her expectancies that the act will be followed by the attainment of these outcomes. Again, note that the force is not equal to the sum of the products, but is a hypothetical and undefined function of that sum. Except for the specification of the function, this model is exactly analogous to the SEU (subjective expected utility) model in decision theory, with the components substituted as follows:

$$F_i = SEU = EV_i$$
$$E_{ij} = p_j$$
$$V_j = V_{ij}$$

Like the expected value principle, the SEU states that the force (expected value) is determined by taking the valence (subjective value) of each outcome, multiplying each of them by the respective expectancy (subjective probability), and summing those products. Unlike the expected value principle, Vroom's model stipulates a monotonic positive function of that sum, which is not defined and is ignored in practice. Just as the expected value principle supposes that a person chooses that option with highest expected value, so Vroom supposes that a person chooses that option with the greatest force. Vroom's model also ignores conditions, or states of nature. In a decision-theory game matrix, the probability that a particular condition j exists is also the probability that a particular outcome ij will occur given that decision i is made. In Vroom's model, the columns of the game matrix are ignored. Each row is simply a vector of outcomes with a probability associated with each.

The statement $i \cap j = \emptyset$ means that the intersection of the values of i and j equal the empty set. The final statement specifies that the first derivative of the function is greater than zero, which is the definition of a monotonically increasing function.

Application to Occupational Choice

As noted earlier, Vroom's model is a general model of choice. The application of the model to occupational choice is one of several applications discussed by Vroom (Vroom 1964). Three terms are defined which are used in further discussion. Occupational preference is that occupation with the largest positive valence. Occupational choice is that occupation with greatest positive force. Occupational attainment is that occupation of which the person is a member. Thus, a distinction is made between the occupation that a person would like, the occupation that he/she decides to pursue, and the occupation that he/she is successful in attaining.

The above definitions would seem to imply that Vroom regards occupational choice as a straight-forward application of his expectency model, but on page 55 he introduces another variable which is not part of the formal model: "Accordingly, we would view choices among occupations as the result not only of preferences among them but also of the subjective probability and expected costs of their attainment. Persons may not choose the most positively valent occupation if the subjective probability and expected costs of attaining it are very high" (Vroom 1964). Expected costs are not a part of the model and how they would function in the model is not explained. One could, of course, regard cost factors as outcomes with negative valence; and perhaps all that Vroom meant was that costs were a particularly important type of outcome, and did not intend to imply a third variable in the model. In any event, it seems best to make that assumption.

Thus, we see that occupational preference is determined by the valence equation, while occupational choice is determined by the force equation. Occupational attainment, however, is the result of the interaction of two sets of choices, one by the individual and the other by social institutions. A person may choose an occupation unilaterally, but he/she cannot attain that occupation unless the social forces that control that occupation also choose to allow him/her into it (Vroom 1964: 56).

Vroom discusses a variety of variables that he considers important determinates of occupational preference, choice, and attainment. These are based on his review of the literature rather than his own research. He sees three types of variables as being particularly important determinates of occupational preference. Motives, measured by verbal report and fantasy, seem to be weakly related to occupational preference. People prefer occupations with expected outcomes that are positively valent, but the relationship is not strong (a statement which would seem to contradict his valence model). Intelligence is roughly related to the intellectual requirements of the preferred occupation. The self-concept is related to occupational preference; that is, perceived similarity of the individual to the members or other features of an occupation is related to preference for that occupation. This idea could be incorporated into formula (2) by letting the valences of outcomes, V_k represent degree of correspondence between self-concept and outcomes (k) associated with the occupation (outcome i). Vroom's theory, then, could be viewed as a "skeleton" which can be "fleshed out" by substantive theorists such as Super.

As to variables affecting choice, independently of preference, Vroom mentions two, although the model does not allow for any such thing. Choice should be a function of preferences and probabilities, not preferences and other variables.

Nevertheless, Vroom mentions that motives are related to occupational choice. However, since the relevant studies did not control for preference, he feels that this relationship is measuring the same variance as those between motives and preferences. Abilities also tend to correlate with the requirements of the occupation chosen, but Vroom feels that this is probably an external selection factor.

Variables affecting occupational attainment are not clear, according to Vroom. Some differences in motives between members of different occupations have been found, but it is not clear whether these were determinants of attainment or the results of attainment. Ability patterns also discriminate among members of different occupations, but these may be training or institutional-selection factors.

Logical Problems with the Model

Before discussing the empirical evidence bearing on the model, it would be useful to discuss problems of internal logic and, in the next section, methodological problems. We will also illustrate how the model might apply to a real occupational-choice situation.

Before testing any new model, consideration should be given to logical features of the theory. Two aspects need to be considered: (a) Is the model free of logical contradictions within itself; that is, is it internally consistent? (b) Is it consistent with commonsense observation of the real world? Internal inconsistency in a model is generally fatal if it cannot be resolved by modification; apparent inconsistency with common sense observation is not necessarily fatal, since it may be common sense that is at fault. It did not make sense in the Middle Ages, (to anyone except Galileo), that the earth should travel around the sun, but that model was correct anyway. Failure to conform to commonsense does place a greater burden of proof upon the advocate of the model, however.

Internal consistency problems. There appear to be five possible problems of internal consistency. The first is related to the definition of valence. Recall that the valence of an outcome is determined by its presumed ability to obtain other high-valence outcomes. These other, or second-order, outcomes also have valences that are presumably determined in the same way; that is, by their ability to obtain still other, or third-order, outcomes of high valence. This same analysis can be applied to the third-order outcomes, which leads to fourth-order outcomes, which in turn lead to fifth-order outcomes, and so forth ad infinitum. However, if the valence of every outcome is determined solely by its ability to obtain other outcomes, the

process deteriorates into an infinite regression in which one never runs out of increasingly more remote outcomes. Not only is this a logical problem, it is also inconsistent with a well-established psychological phenomenon: the gradient of reinforcement. This principle states that the reinforcing effect, which is equivalent to valence, of an outcome decreases as the outcome becomes more remote (Dollard and Miller). It is difficult to understand how proximal outcomes could have higher valence than those of the more remote valences upon which they depend.

The problem can be easily resolved by postulating two kinds of valence: extrinsic and intrinsic. Extrinsic valence is that resulting from the ability of an outcome to obtain other outcomes, as the valence model states. Intrinsic valence is that which is inherent in the outcome; that is, the outcome is enjoyed, or is found repugnant, for its own sake. Money is an obvious example of an outcome with predominantly extrinsic valence. There is little that can be done with money except to buy commodities or obtain prestige and/or power with it. Listening to music would be an example of an outcome that has almost exclusively intrinsic valence. We usually listen to music because it is inherently enjoyable, not because it gets us another outcome. Some outcomes may have mixed valence. A steak may be eaten both because it is inherently enjoyable, and because it is known to provide essential proteins which lead to good health. The existence of both intrinsic and extrinsic reinforcing properties is also well established in psychology (Hunt 1960; Mowrer 1960). We can, therefore, postulate, that the valence of an outcome is partly the result of its ability to obtain other outcomes and partly the result of whatever inherent valence it has. This can be expressed mathematically by adding a term, V_j to Vroom's valence equation, where the new term represents the inherent valence of the outcome. The full equation would then read:

$$(4) \quad V_j = f_j \left[\sum_{k=1}^{n} (V_k I_{jk})\right] + V_j \quad (j = 1, \ldots, n)$$

This same result could be accomplished more parsimoniously by simply defining ($I_{jj} \equiv 1.0$ instead of ($I_{jj} \equiv 0.0$) as Vroom does.

A second problem is related to the mutual exclusivity of the outcomes. This should, perhaps, be called a potential problem because it depends upon how outcome is defined. Vroom does not explicitly define "outcome." By implication, it appears to mean "whatever happens as the result of a decision." This definition is simply too vague to address the issue, and the issue is important because one of the requirements of the expected value

principle in decision theory is that the outcomes be mutually exclusive. Suppose that one chooses a certain occupation, with, among others, three possible results: high pay, enjoyment of the work, and prestige. It should be obvious that these are not mutually exclusive occurrences, since one might get any one of them, any two of them, all three of them or none of them. These occurrences, therefore, do not qualify as outcomes in decision theory. One could, however, define all possible combinations of these occurrences as outcomes, and this set would be mutually exclusive. Let "a" represent high pay, "b" represent enjoyment of the work, and "c" represent prestige. Each of these occurrences can be defined as an event. Let the letter with a bar over it, "a," represents the "not" condition, or absence of, that event. The following combinations of events are possible:

$$(abc),\ (ab\bar{c}),\ (a\bar{b}c),\ (a\bar{b}\bar{c}),\ (\bar{a}bc),\ (\bar{a}b\bar{c}),\ (\bar{a}\bar{b}c),\ (\bar{a}\bar{b}\bar{c})$$

The three possible events generate eight possible combinations, one of which must occur and only one of which can occur. They are, therefore, mutually exclusive and exhausitive and can be taken as the outcomes to which the valence equation applies.

The above definition of outcomes leads to a third problem. Outcomes may be single events or combinations of events. In a sense, the multiple-event outcomes could be considered compound outcomes, since they consist of components that are, themselves, outcomes. Should not the valence of the compound outcomes be a function of the valences of the simple outcomes that constitute them? While this notion is intuitively appealing, some examples will illustrate that this is decidely not so. Let us suppose, to take an absurd but pungent example, that a certain set of choices can yield any combination of three events: ice cream, chocolate syrup, and pickles. Further, ice cream has strong positive valence (I like it), chocolate syrup has weak negative valence (eaten alone, it is too sweet), pickles have moderate positive valence (I like them somewhat). Obviously, the valence of combinations is not going to be a or multiplicative function of the valences of the components. Ice cream and chocolate syrup have stronger positive valence than ice cream alone, even though I have now combined it with a negatively valent substance; ice cream and pickles are strongly negatively valent, even though the two componenets are both positively valent, pickles and chocolate syrup are downright sickening, far more negatively valent than chocolate syrup alone; I will not even comment on the triple combination.

Fortunately, it is not necessary for the theory that the valences of compound outcomes be functions of the valences of the simple outcomes. One can assume that each compound outcome has a

valence that is partly inherent in that combination of simple outcomes and partly a result of what other outcomes that combination of simple outcomes has the ability to obtain. The valence equation says nothing about what constitutes an outcome, except that it is the result of some choice.

A fourth problem arises from the decision theory assumption that the outcomes are binary; that is, they can have only two values, occurs and does not occur. In real-life situations, outcomes are often continuous. Success, for example, would be an important outcome in considering occupational choice. However, one is not "successful" or "unsuccessful." There are degrees of success, with some persons being very successful, some moderately successful, some slightly successful, and some not at all successful. How, then, is a probability associated with a continuum? One possibility would be to consider several points along the continuum as separate outcomes, each with an associated probability. Thus, the individual would consider some subjective probability of his/her being very successful, another probability of his/her being moderately successful, and a third probability of his/her slightly successful. The probability of being unsuccessful need not be considered, since that is merely the absence of the other three outcomes. Whether individuals actually think in this manner, and if so, how many points on the continuum they consider, are matters for empirical determination. A generalization of the above idea is to associate a unique "probability element" with each point along the continuum, as is done in mathematical statistics by using the concept of density function. It is unlikely that individuals consciously use density functions in decision making, but such functions nevertheless may approximate behavior.

A third possibility for handling continua is one for which there is some support in the psychological literature. When faced with a decision regarding a continuum, individuals may adopt an implicit threshold which they consider as sufficient or satisifying (March and Simon 1958). In the case of success, the individual may have some notion of how much success is satisfactory to him/her. Anything at or above the threshold would be considered successful, anything below it would be considered unsuccessful.

This would have the effect of transforming the continuum into a binary scale by psychologically dividing it into two parts. As with the previous possibility, this must also be validated empirically.

The fifth problem stems from the fact that the expected value principle is intended to apply to the long run of decisions made

throughout one's lifetime, not to a once-in-a-lifetime decision, which usually characterizes choice of an occupation. Expected value, like any other probability or function of probability, is meaningful only as an average of a large number of occurences. It has no meaning in a single case. When we say that the probability of rain today is 30 percent we mean that on 30 percent of the days when conditions were like today it has rained. After the day is over, there is no probability associated with rain; either it did rain or it did not. Vroom's theory has been advocated as a general decision-making model and consequently does apply to the long run of decisions that individuals continuously make, of which career choice is only one. Viewed from this perspective, there is no problem. Yet, because of the importance of choosing an occupation, the infrequency with which it is done, and the considerable difficulty of reversing it, it should at least be considered whether individuals making such choices might not view the decision as unique, rather than just one more decision out of many, and perhaps use some principle other than expected value, such as maximim. This will be discussed further in the next subsection.

External consistency problems. Two aspects of external consistency need to be considered. The first is the question of whether the condition of risk required by the expected value principle exists in occupational choice. The condition of certainty obviously does not, since the individual could not possibly know for sure what all the outcomes would be if he/she chose a certain career. At the other extreme, the condition of ignorance can be presumed not to exist. By the time a person is ready to choose a career he/she has at least some knowledge about the various options and what the likely outcomes of each will be. On the basis of this knowledge and experience it is reasonable to assume that the individual has some subjective ideas about the probabilities of various consequences occurring. This is, of course, the condition of risk.

Let us turn now to the basic question of external consistency: in real-life choices, does it appear reasonable that the individual chooses as specified by the expectancy principle? To answer this question, examine the payoff matrix in Table 13 and see where one ends up as a result of using the principle.

In this matrix, V = valence, P = probability, and EV = expected value. Note the form of the matrix is not the same as in decision theory: the columns represent outcomes, not conditions. The occupation with the highest expected value, and consequently the greatest force, is electrician. This is the occupation that the expected-value principle predicts would be chosen. Does it seem to be a reasonable choice? Yes, it does.

TABLE 13
EXAMPLE OF A PAYOFF MATRIX

Outcomes

V=	10	8	6	1	
Occupations	High Income High Prestige	Low Income High Prestige	High Income Low Prestige	Low Income Low Prestige	EV
Electrician	P = .60 PxV = 6	P = .10 PxV = .8	P = .05 PxV = .3	P = .25 PxV = .25	7.35
Plumber	P = .10 PxV = 1.0	P = .40 PxV = 3.2	P = .45 PxV = 2.7	P = .45 PxV = .05	6.95
Janitor	P = .05 PxV = .5	P = .10 PxV = .8	P = .10 PxV = .6	P = .75 PxV = .75	2.65

The lady or gentleman in question has an excellent chance (.60) of getting a high valence job (10); but there is a price to be paid. The person runs a 25 percent risk of ending up with a really terrible job. Suppose the occupation of plumber had been chosen? From another perspective, that would also have been a reasonable choice. The person would have an excellent chance (.85) of getting a job with a reasonably high valence (6-8), even though there would not be much chance of getting the best job. However, there would also not be much chance of getting the really bad job. This would have been a more conservative choice than that of electrician: a high probability of obtaining a reasonably good outcome without running much risk of obtaining a very bad outcome, but also without much hope of obtaining a very good outcome. The choice of electrician, on the other hand, would provide a good chance of obtaining a very good outcome, but with some risk of obtaining a very bad outcome. Either choice would be reasonable, depending upon the person's propensity to take a risk.

The expected-value principle would have dictated the choice of electrician, but a variant of the maximin principle would have dictated the choice of plumber. The direct maximin principle, which says to choose the occupation with the largest minimum valence, is not applicable since all three occupations could result in the same four outcomes. The probabilities of the

outcomes do vary among the occupations, however. Consequently, one could choose the occupation with the lowest probability of obtaining the outcome with the lowest valence. The answer to the question of whether the expected value principle is reasonable must be yes, but not to the exclusion of other principles that are equally reasonable. Whether the expected value principle actually represents the way people make decisions remains an empirical question. Perhaps more importantly, even if valid, it may not be the only way in which people make decisions. In that case, it would be necessary to determine under what conditions and with what persons the principle is applicable.

Methodological Problems in Validating the Model

The first prerequisite for validating the model is a means of measuring the variables that enter into it. One would need a method of measuring the valences of outcomes, a method of measuring the perceived instrumentality of one outcome for obtaining others, and a method of measuring the perceived probabilities of outcomes occurring given that a certain choice is made. A measure of force is not necessary, since force is nothing more than a convenient name for the sum of products of the valences and probabilities, (or at least for the hypothetical function of that product). To say that a person chooses that option with the strongest force is just another way of saying that a person chooses that option with the highest sum of products. Choice is seen as a direct function of the sum of products, and no intervening hypothetical construct is required. Vroom suggests a variety of ways of measuring two of the three constructs, valence and expectancy. He does not discuss the measurement of instrumentalities.

Six possible means of measuring valence are suggested. The most direct is verbal report, using either Likert-type rating scales or pair-comparison methods. The former requires the subject to rate, on a number line, how well he/she would like or dislike an outcome; the latter requires the subject to state which outcome of a set of paired outcomes he/she prefers. Statistical techniques are then used to scale the set of outcomes along a preference continuum. The disadvantages of this technique are that it is possible for the subject to fake the ratings. The consequences of making a particular statement about an outcome may be more important than attaining the outcome; that is, there may be some gain to the subject for reporting that he/she likes a certain outcome even if he/she does not. A second suggestion is the use of fantasy measures, such as the Rorschach Test or the Thematic Apperception Test. However, the well-known lack of evidence for the validity of such projective tests renders this an unsuitable approach.

A third suggestion is the use of outcomes as reinforcements in experimental situations. While there is nothing theoretically wrong with this technique, it has severe practical limitations. It can only be used with relatively simple outcomes that an experimenter can control. Small amounts of money, for example, or M & M candies, might be used as reinforcers, but it would be impractical to manipulate "job satisfaction" or "opportunity to socialize with fellow employees," merely to measure their valence.

A fourth suggestion is inference from choices. If outcome x is chosen over outcome y, then outcome x is more valent than outcome y. This, however, is a tautological definition that equates choice and valence, and hence cannot be used to validate the proposition that choice is a function of valence. The measurement technique presupposes the validity of the model whose validity is yet to be established.

A fifth suggestion is the use of consumatory behavior in controlled situations. The amount or rate of consumption of an outcome is taken as a measure of its valence. This, idea also appears tautological in that consumption requires a choice that is taken to define valence. Also, it cannot be assumed that consumption is influenced by valences and no other variables. If a certain course of action earns 100 dollars the fact that I may not spend it immediately in no way implies that the money has low value for me.

A sixth suggestion is to use decision time to determine the difference in valence of two outcomes. If a choice between outcomes x and y is made quickly, then the difference in valence is presumed to be greater than if the choice is made over a longer period of time. This technique, at best, can only determine the relative valences of two outcomes, not the absolute valence of either; and, like suggestion four, this too, implies an inference from choice, which is tautological. Further, factors other than valence, such as reaction time, mood, and so forth, undoubtedly influence decision time.

It would seem, then, that there are only two viable methods of measuring valence. Verbal report, for all its shortcomings, is the only method suitable for measuring virtually any kind of outcome. The use of the reinforcement properties of outcomes avoids these shortcomings, and would be suitable for laboratory studies with limited numbers and kinds of outcomes.

Vroom mentions only two procedures for measuring expectencies, or probabilities: verbal report and inference from choice. These were discussed in the preceding paragraph.

Although Vroom does not discuss the measurement of instrumentalities, it is obvious that verbal report could also be used for this purpose. Questions could be asked of the form, "If x occurred, rate each of the following outcomes according to how useful you think x would be for obtaining it."

Another measurement problem of critical importance is that of properly scaling the scores obtained from the measurement techniques. Since the model involves a multiplicative component, ratio scales of measurement are necessary, since only with such scales can quantities be multiplied meaningfully. Most of the commonly used scaling techniques, however, generate interval scales. Likert (rating) scales, as well as the pair-comparison technique, are good examples. Most researchers in this field have tried to resolve the problem by providing "absolute zero anchors" for the arbitrary zero points on their scales (Schmidt 1973). For example, on a Likert scale ranging from -5 to +5 and used for measuring valence, the zero point might be anchored by the statement, "It makes no difference to me whether this outcome occurs or not." If the scale were used for assessing the subjective probability of an outcome, the zero anchor might read, "The outcome has absolutely no chance of occurring." As applied to measuring instrumentality, the anchor could read, "Outcome x neither helps to attain nor impedes the attainment of outcome y."

Schmidt (1973) addresses this issue at some length. He points out that such psychological anchoring techniques do not guarantee that the arbitrary zero point will coincide with the true zero point. It is generally assumed, however, that a zero point anchored in this way will be a sufficiently close approximation to the true absolute zero point that it can be used as if it were. (Ever since the Norton study on analysis of variance (Linquist 1956)), which demonstrated the robustness of that procedure, (that is, you can get away with violating psychometric assumptions as long as you are not violating them too badly), applied statisticians have been quick to assume the robustness of other procedures. Schmidt, however, demonstrates that the assumption of a rational zero point is not robust. He reports a number of linear transformations of the form x + k on expectancy and valence scales. This is a legitimate form of transformation for interval scales, preserving all the psychometric properties of that scale. He also notes observations of the effect on the correlation of the EV products with external-choice criteria. The correlations were found to fluctuate wildly, from -.76 to +.76. However, some of his transformations changed the means of the data quite drastically. The question of how far the arbitrary mean can be shifted from the true mean without appreciable changes in the correlations is not answered.

Another attempt at resolution of this problem has been to try to "argue out" of it. If the EV products do, in fact, correlate with appropriate external criteria, the argument goes, then this constitutes an empirically valid finding whether or not the sum of products is mathematically correct.

In fact, regression methods can be applied in a straightforward way to pick constants [k in the form (x + k)] that will maximize the correlation with a criterion and, thereby, diminish the problem pointed out by Schmidt. This argument would be valid if the purposes of the studies were empirical prediction of criteria. It does not follow, however, that such observed correlations demonstrate the validity of the multiplicative model when it is known that the multiplications performed have no mathematical meaning (Schmidt 1973). Schmidt suggests that complex scaling techniques (Thurstone and Jones 1957; Jones 1971; Krantz and Tversky 1971; Krantz et al. 1971) be used to generate true ratio scales. The Thurstone-Jones technique, however, does not guarantee that such a scale can be generated for all data, and the Krantz-Tversky technique has not been applied to correlational data, so that its effects on that type of data are unknown (Schmidt 1973).

To help resolve this problem a "Norton" study would be helpful. Using one of the techniques suggested by Schmidt, a ratio expectancy, valence, and instrumentality scales could be generated. These could then be compared with psychologically-anchored rating scales to determine the distribution of deviations of the anchored zero-points from the true zero points. Using transformations having magnitudes within the central 95 percent of the distribution, it could then be determined what effect such deviations from true zero have on the correlation between the sums of products and external criteria.

Assuming that some appropriate measures of expectancy, valence, and instrumentality can be devised, and that these can be scaled in some appropriate way, it then remains to determine what practical procedures would be needed to validate the model. Since two equations are involved, each needs to be validated separately. The valence equation states that the valence of an outcome is a function of the sum of products of the valences of all other outcomes and their respective instrumentalities (plus the intrinsic valence of the outcome, if the present authors' modification is accepted). It is obvious that "all other outcomes" are too many to measure, but a representative sample of the important outcomes in any given situation could be measured. Let us assume that the verbal-report technique is being used. Subjects could be given questionnaries measuring: (a) the valences of a set of zero-order outcomes (that is, on the left of the equal sign), (b) the valences of a set of first-order outcomes, and (c) the instrumentalities associated with the set

of outcomes. The sums of products could then be calculated. If the model is valid, it should be possible to find a transformation of the sums of products that will carry it into the valences of the zero-order outcomes.

The validation of the force equation would proceed in a similar manner. Measurement of valence and expectancies would be obtained for a list of outcomes that might follow a set of choices. The subjects would be asked which choices they would make. As above, the sums of products would be calculated and a transformation sought which would carry them into the "choice scores" obtained from the subjects.

Other Expectancy Models

Other expectancy models that have been considered are essentially minor deviations from Vroom's model, with applications in much more restricted settings. Galbraith and Cummings for example, postulate a combination of Vroom's valence and force models, which they refer to as the effort model (Gailbraith and Cummings 1967).

$$W = E\left(\sum_{j=1}^{n} I_{ij} V_j\right) .$$

where

W is the effort to perform a task
E is the expectancy that effort leads to performance
I_{ij} is the instrumentality of perforance T for attainment of an outcome j
V_j is the valence of outcome j.

Phillips (1964) proposes an additive model.

$$EVD = \Sigma(V_i - E_i),\ VI > E_i$$

where

EVD = is expected value deprivation
V_i is the value of an outcome i
E_i is the expectation of attaining outcome i

The option is chosen that has the smallest expected value deprivation; that is, the option which minimizes the average discrepancy between values and expectations of attaining those values. The model was used to predict preferences for various medical specialities. Guttman scales derived from questionnaires were used to measure the three components of the model. The

resultant data are presented in tabular form with no statistical analyses presented other than frequencies and percentages. Conclusions are drawn on the basis of inspection of the tables. Phillips concludes that the data are suportive of his model. The authors' are inclined to agree. Had correlations been calculated, they probably would have been nontrivial.

Evidence Bearing on the Theory

The expectancy principle is one of the most heavily studied models of choice, both in its formal decision-theory form (Lee 1971), and in its real-life form (Mitchell 1974). A very thorough review of the literature bearing on Vroom's expectancy model and its varients has been done by Mitchell (1974), while the literature on the expected value principle in decision theory has been reviewed by Slovic, Fischhoff, and Lichtenstein (1977) and by Lee (1971). The concern of this report, however, is expectancy theory as applied to occupational choice, and this section reviews the evidence primarily in that area.

Compared to the totality of research on the expectancy principle, there are very few studies bearing on its application to occupational choice. Four are worth looking at in some detail. The first is a study by Vroom (1966). One of the purposes of this study was to test the valence equation (but not the force equation), as a model of organizational preference. (The other purpose of the study had to do with post-decision dissonance.) Specifically, the following hypothesis was tested: "The attractiveness of an organization to a prospective member will be directly related to the extent to which he believes organizational membership to be instrumental to the attainment of his goals" (Vroom 1966). Forty-nine students enrolled for the degree of Master of Science in the Graduate School of Industrial Administration at the Carnegie Institute of Technology were the subjects in the study. The subjects had had an opportunity to explore and obtain information about organizations that they might consider working for, but had, as yet, received no employment offers nor made any employment choices. Each subject was given three questionnaires to measure occupational goals (first-order outcomes), the instrumentality of each organization for obtaining those goals, and the valence of each organization (zero-order outcomes).

The goals questionnaire contains the following list of occupational goals:

1. Chance to learn new things
2. Chance to benefit society

3. Freedom from pressures to conform both on and off the job
4. Opportunity for advancement
5. High prestige and social status
6. Chance to use special abilities
7. Freedom from supervision
8. Variety in work assignments
9. Chance to engage in satisfying leisure activities (recreational, cultural, etc.)
10. Friendly and congenial associates
11. Working as part of a team
12. High salary
13. A stable and secure future
14. Chance to exercise leadership
15. Chance to make a contribution to important decisions

Each goal was rated on a five-point scale of importance according to a 2,3,5,3,2, distribution; that is, the two most important were given a score of 1, the three next most important were given a score of 2, etc.

Each subject was asked to list the three organizations in which he/she was most interested. Each goal was then rated according to how instrumental each of the three organizations would be in attaining that goal. The same five-point scale and forced-choice distribution was used. Each subject then rank ordered the three organizations according to their overall attractiveness, rating each on an eleven point scale of attractiveness.

An index of the sum of products $\Sigma V_i I_{ij}$ was generated by obtaining the Pearson product-moment correlation coefficient between the valence ratings and the instrumentality ratings of the goals. The deviation-score form (that is, the raw scores minus the mean of each distribution) for the correlation coefficient is

$$r = \frac{\Sigma VI}{\sqrt{(\Sigma V^2)\ (\Sigma I^2)}}$$

The relationship between this function of the sum of products and the attractiveness ratings of the organizations is presented in a table. Vroom concludes, by inspection of the data, that a strong, positive relationship exists. The authors calculated the correlation coefficient between the two measures, which Vroom did not, and found that r = .98. This study, therefore, appears to provide considerable support for Vroom's valence equation.

Wanous (1972) also did a direct test of the valence equation, using occupational preference as the criterion. The subjects were 160 MBA candidates at the University of Minnesota School of Business Administration. Each student was asked which of the following occupations he/she most preferred to enter: production management, finance-accounting, sales, or personnel. This was the measure of the valence of the zero-order outcomes. Each student was also asked to rank the following six first-order outcomes in terms of importance to themselves: starting salary, salary after five years, job opportunities, how high one could go in the organization, and job security. These rankings were used as the measure of the valence of these factors. Thirdly, each student was asked to rank the five occupations on each of the six factors according to its instrumentality for attaining that factor. These rankings were the instrumentality measures obtained. The product of valence and instrumentality scores were calculated, and a derived measure (undefined in the article) obtained. The data are presented in a table showing the mean sum-of-products index for each occupation relative to the most preferred occupation. The rows of the table represent four groups of students, each preferring one of the four occupations. The columns of the table represent the four occupations as rated by the sum-of-products index. The basic questions asked are "How do students who prefer production management rate all four occupations on the valence and instrumentality of outcome factors?" "How do students who prefer finance-accounting..., etc?" Inspection of the data indicate that all four preference groups gave their occupation the highest sum of products (literally, the lowest index of the sum of products, since the derivation of the index apparently reversed the direction of the scale. A binomial test was done to show that the probability of this relationship occurring by chance was only .028. Thus, despite the ordinal level of measurement used and the unsophisticated statistical analysis, the results are supportive of Vroom's valence equation.

Sheard (1970) compared the predictability of the criterion by the sum of products with that of the sum of instrumentalities only. He used junior and senior undergraduates at Colorado State University as subjects. Each subject completed three rating scales to obtain measures of the valences of types of organizations (the criterion), the valences of work goals (outcomes), and the instrumentalities associated with the outcomes. The first questionnaire used asks each subject to rate the importance of each of twenty work goals. The ratings are made on a seven-point scale using a forced-choice Q-sort technique with a distribution of 1,2,4,5,4,2,1. This provided the valences of the outcomes. The second questionnaire used requires subjects to rate each of six types of organizations according to their preferences for them: federal government,

military service, large corporation, small business, state government, and educational institution. A pair-comparison technique was used in which the subjects had to choose the most preferred type from each pair of all possible pairs of the six types. The score for each type was the number of times it was preferred over the other member of the pair. The third scale used requires subjects to rate, on a seven-point Likert scale, each work goal within each organizational type, thus providing instrumentality ratings. No forced distribution was used in this case.

Sheard reports two sets of derived predictor scores. The first is the standard summation across goals of the goal-valences multiplied by the respective instrumentalities. The second set of scores is the summation across goals of the unweighted instrumentalities. Each of these scores was correlated with the preference ratings for the criteria. An intra-subject technique was used, which involves calculating correlation coefficients for each subject across the six organizational types and then averaging the correlations across subjects by using Fisher's Z transformation.

The range of correlation coefficients, (the subjects were divided into seven groups depending upon their major field of study, with each group being analyzed separately), for the full model is .78 to .82; for the attenuated model, summing instrumentalities only, the range of coefficients is .76 to .81. In six of seven cases, the correlation for the full model is higher than that for the attenuated model, but not significantly higher. In one case, the two coefficients are equal, and in one case, the correlation is higher for the attenuated model than for the full model, but not significantly so. The results, while supportive of the full valence model as stated by Vroom, are equally supportive of an alternative model in which the weighting by valences is omitted. This finding is not necessarily an invalidation of the full model. It is quite possible that in this particular situation valence ratings and instrumentality ratings are highly correlated; that is, for all six organizational types, the subjects perceive the more important goals as also the more attainable. However, Lawler, Kuleck, Rhode, and Sorensen (1975) found the same phenomenon when using the expectancy principle in another setting. It may be necessary to compare these two models under conditions where it is known that the valence and instrumentality ratings are not correlated, and to determine the conditions under which they are likely to be correlated.

Homstrom and Beach (1973) used an estimate of subjective expected utility (SEU) to predict preference for psychological occupations among senior undergraduate psychology majors. The

study was divided into two parts. Part I was used to generate occupational goals to be used in Part II. Five men and five women were interviewed about their views of their future careers as psychologists, and by means of a content analysis, eighteen occupational goals were selected: salary, advancement, novelty-variety, intellectual stimulation, credit-recognition, self-respect, personal growth, responsibility, peer contacts on the job, autonomy-independence, satisfaction of parental expectations, being a theoretician, being a scientist, interesting work, helping people, social relationships with professional peers, satisfaction derived from relationship to consumers, and contributing to society.

In Part II, fifteen men and fifteen women participated. Each subject completed a five-part questionnaire. The first two parts ask for demographic and academic data. Part III asks each subject to rank eight psychological occupations according to preference. The occupations were: teaching, research in an academic setting, research in a nonacademic setting, clinical practice in an academic setting, clinical practice in a community mental he lth center, private clinical practice, consulting, and administration. The ranked occupations were then arranged along a continuum with the least preferred being given a score of 0, the most preferred given a score of 100, and others distributed in between according to their preferability.

Part IV of the questionnaire asks subjects to rank the eighteen occupational goals according to their relative importance, which were then scaled in the same manner used in Part III. In Part V, each subject estimates the probability that each goal would be satisfied by each occupation. Thus, measures of the criterion valence, the valences of the goals, and the instrumentalities are obtained.

It should be noted that the subjects were asked for subjective probabilities that the goals would result from the occupations. The valence equation, however, calls for instrumentality estimates; the force equation, which is not at issue in this study since actual choices are not being measured, calls for probabilities. At first glance, it might appear that the authors have confused the two equations or have mistakenly used the incorrect component. The issue probably is more one of semantics than substance, however. It seems likely that the statements, "Outcome x will help me obtain outcome y," (instrumentality), and "Outcome y is likely to follow outcome x," (probability, or expectancy), have similar psychological meaning to people, and that instrumentalities could just as easily be interpreted as probabilities.

The authors combine the instrumentalities and valences, which

they refer to as probabilities and utilities, in an unusual way, given by the following equation:

$$SEU = \sum_{i=1}^{18} [P_i U_i + (1-P_i)(-U_i)]$$

They subtract from the usual sum of products another sum of products representing the disutility of the goals. There is no explanation as to why this is done, nor is there any reference to the technique.

Correlation coefficients were calculated between the SEUs and the occupational preferences, within each subject across the eight occupations. Twenty-three of the thirty coefficients were statistically significant, ranging from .59 to .98, with a mean of .83. The range of the seven nonsignificant coefficients was -.46 to .56, with a mean of .12 (The mean was calculated by the present authors; it was not reported in the article).

While these results, like the three previous studies, are generally supportive of the expectancy theory, an interesting phenomenon should be noted. The expectancy theory is stated as an intrasubject theory, yet it has usually been tested by correlating across subjects. Only the Sheard (1970) and the Holmstrom and Beach (1973) studies calculate the correlations within subjects, and only Holmstrom and Beach report the individual correlation coefficients. (Sheard reports group averages.) Inspection of these coefficients indicates that, although the mean is high, the range of individual differences is very large, from -.46 to .98. One possible, and very important explanation, might be that the expectancy principle is valid only for some people and/or only under some circumstances. It is reasonable to suppose, as was pointed out in the earlier illustration, that different people use different decision principles, or that the same people use different decision principles on different occasions.

The empirical evidence from studies of other real-life decision-making situations appears to support the expectancy principle, at least in a general sort of way (Mitchell 1974). Expectancies, instrumentalities, and valences do seem to combine in some way to predict preferences and choices, at least for some people under some conditions. It is not at all clear, however, for what people under what circumstances the principle holds; nor is it clear what the exact combination is. There is support for models that sum valences alone, sum instrumentalities alone, and sum discrepancies between valences and probabilities, as well as for the full Vroom model.

The evidence from laboratory studies of the expected value

principle in formal decision theory is much less supportive. A number of studies have attempted to demonstrate phenomena that are incompatible with the expected-value principle. Some have demonstrated that individuals differ in their preference for a gamble (Coombs and Pruitt 1960; Van der Meer 1963). Two options could have the same SEU, yet the specific EVs could vary widely in one case, and be quite consistent in the other; that is, one option could offer the opportunity for both large gains and large losses, while the other could offer moderate gains and losses. These two studies show that some individuals prefer the high variance gamble, while others prefer the small variance gamble. Meyer and Coombs (1968) identify a risk preference phenomenon. They found that preference for a gamble was determined by the difference between the gambles riskiness and the subjects ideal riskiness. This situation is similar to that discussed in the example in the "Logical Problems" section of this chapter. These findings do not invalidate the expectancy principle, but do indicate the need to consider additional variables in the choice equation. The variance preference phenomena has not been universally supported, however. Lichtenstein (1965) found that all his subjects preferred low-variance gambles, and Slovic and Lichtenstein (1968) found no variance preferences at all.

One of the assumptions of the expected-value principle is that the probabilities and the values are independent, yet quite a few studies have found that subjective probabilities increased with the values of the outcomes (Marks 1951; Irwin 1953; Crandall, Solomon, and Kellaway 1955; Pruitt and Hoge 1965; Slovic 1966; Irwin and Craae 1968). This correlation between the two variables supports the findings previously cited that summation of valences alone or instrumentalities alone are sometimes just as good predictors of preference as the summation of the products. Although some have interpreted this as a contradiction of the expectancy principle, (Lee 1971), that would not be the case unless it could be shown that the two variables are necessarily correlated for logical reasons (that is, they could not be uncorrelated), or that their empirical correlation is universal. If, however, they are only correlated under some conditions, then occurrences of those conditions constitute special cases in which summation of only one variable is necessary. Under these special conditions only, the two variables happen to be measuring the same variance. To determine whether this is the case, it would be necessary to find a high relationship between the sum of products and the criterion, and, simultaneously, a low relationship between the two predictors and between either predictor alone and the criterion. No study known to the present authors has yet attempted this. Slovic, Fischoff, and Lichtenstein (1977), in their review of the literature on behavioral decision theory, note that the expected-value principle has been both confirmed and disconfirmed, depending

upon the particular circumstances and subjects involved. They conclude that the evidence is ambiguous.

Commentary

Where, then, does the evidence leave the theory? Apparently in limbo. There is too much positive evidence, especially from field studies, to dismiss the expectancy theory. On the other hand, there are laboratory studies in which the expectancy principle did not work at all, worked to some extent, or worked very well, and there is much evidence that "it all depends," (Lee 1971; Slovic, Fischoff, and Lichtenstein 1977). Even in the field studies, there is some evidence that, even where the expectancy principle works, other (though related) principles work equally well. A probable explanation is that the principle is a fair approximation to human decision making, but it is not entirely adequate. Expectancies no doubt do contribute to the decision-making process, but there are probably other variables involved also. The imprecision of the model would tend to be masked in the global situations used in the field studies, but would show up more readily in the carefully controlled laboratory experiments. Some of the newer decision theories incorporate the expectancy principle into a more complex model. Coombs (1975) proposes portfolio theory, in which choice is determined by a compromise between maximization of expected value and optimization of risk. Other theories, such as the elimination-by-aspects model, (Tversky 1972), the contingent process model (Payne 1973), and various linear equation models (Slovic and Lichtenstein 1971), have incorporated expectancy and utility notions, at least by implication, into more complex information processing models. None of these, however, has been subjected to any extensive field study.

Strictly speaking, Vroom's expectancy theory has never been tested completely or adequately. Most studies have tested only parts of it, usually using rather crude measuring instruments under very loosely defined circumstances, and seldom using an intrasubject statistical analysis. It is tempting to agree with Mitchell (1974) who concludes that the theory should be thoroughly tested as stated before any further attempts are made to elaborate it or to replace it. There is too much evidence, however, from the laboratory studies and logical analysis indicating the theories imprecision to consider it a completely adequate model. Perhaps a useful strategy would be to test the theory to see if it is a useful approximation, and then to go on to developing a more adequate model.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

This chapter adopts the view that no authoritative synthesis of different approaches to occupational choices can be developed until more research is conducted. After a brief summary and commentary related to the theories reviewed in this volume, attention turns to suggestions of possible strategies for promoting integration of alternative approaches; this discussion focuses on conceptualization of the choice process, for it is here, we believe, that the most diligent work is needed.

Synopsis of the Five Approaches

Super's work is, by far, the most eclectic, but it does emphasize a distinctive point of view. The most important aspect of that point of view is the sensitizing hypothesis that occupational choice is a lifelong process and that associated vocational development is continuous. Discrete lifestages are superimposed on the continuous process, and the incongruity of discrete stages combined with a continuous process is not fully resolved. Vocational adjustment (satisfaction and success) is the main dependent variable; it is determined by congruity between one's self-concept and occupational choice (self-concept implementation) and by vocational maturity. None of the major concepts are specified in a manner such that operational procedures are easy to conceive. In fact, it is difficult to see how the efforts to measure vocational maturity will bear fruit; the concept is too complex and, perhaps, interwoven with ethnocentric values. Rather, a good strategy seems to be to explicate some of the implicit propositions that are embedded in the concept of maturity, and test these with causal models.

Super's theory might be characterized as a phenomenological balance theory, because it postulates that matching between personal concepts of self and of the external world determine outcomes. One of the main tasks required to apply Super's work to empirical investigations of occupational choice, then, is to carefully connect choice and satisfaction--in a dynamic model involving feedback loops: satisfaction $\Longleftrightarrow$ choice. As illustrated in chapter 2, this type of connection must be formulated with great care.

In comparison with Super, Holland presents a highly focused, empirically oriented, and the theory has received reasonable empirical support. Examination of the theory reveals numerous conceptual and operational points that need improvement.

The most pressing need is to conceive of the six Holland types as continuous dimensions and, at the same time, purify the factorial complexity of the six types (dimensions). More than anything else, this step could promote expansion of the empirical work beyond study of two-variable relationships and help to incorporate the emerging developmental view of the theory (Holland and Gottfriedson 1976) into empirical work. As a start in this direction, a model using Holland's variables but matching the logical structure of the status attainment model might be useful. A major complication in this regard is that occupations and occupational orientations must be described along the six Holland dimensions rather than just one (prestige) as in the status attainment model. Thus, hypotheses about the cause-and-effect relationships among the six Holland dimensions would have to be inserted into the model. The concepts of consistency and differentation offer intriguing ideas for attacking this problem.

One of the important aspects of Holland's work is the use of the same concepts to characterize people and environments, thus creating a natural congruency hypothesis. Congruency implies balance, reduction of dissonance; so does consistency. Hence, Holland may also be viewed as a balance theorist. He is not as much of a phenomenologist as Super, however; this characterization is implied by his use of external (to the individual) measures of environment and by the bridge Holland builds in assuming occupational stereotypes are reasonably accurate.

The organizing concept in the status attainment work is occupational status, and, more broadly, status in general. The meaning of occupational status is seldom examined with care, however, and conceptual discussions (e.g., Goldthorpe and Hope 1972) often go unnoticed in empirical work. The most common measure of occupational status (Duncan SEI) is a conceptual hybrid, combining income and educational aspects of occupation, but it manifests more construct validity than prestige measures that are conceptually more pleasing because they are, ostensibly, undimensional.

The basic principle in the status attainment-model is that parental status (including occupational status) is transmitted to children via intervening social psychological processes. This fundamental idea is translated into a system of (usually) recursive structural equations assuming linear effects. By comparison to Super or Holland, the theory is simplistic, but the empirical work is extensive and comparatively well conceived. The key hypotheses have been confirmed repeatedly on a wide variety of samples, several consisting of representative national

data. In spite of the relatively strong empirical base and multivariate approach, much work remains. Most of the models are specified incorrectly because they assume one-direction effects among-decision making variables that exhibit, in all probability reciprocal effects. Also, there is a pressing need to introduce a dynamic conception into the structural equations.

Economic theory related to occupational choice has been developed most intensively at the aggregate level, but the economic models do bring an important perspective to the study of individual occupational choices (supply decisions). The most obvious economic viewpoint is that income plays a dominant role in directing occupational choice, though the theory acknowledges other influences, they are seldom specified. A second important economic viewpoint is the maximizing principle. Nowhere is this idea so explicit as in the utility models. It is convenient to term this outlook as an incentive model and contrast it with a balance model. In simplistic terms, the incentive model says, ceteris paribus, "the more the better," and the balance model hypothesizes a minimum discrepancy between two (or more) variables. On the surface, these two ideas appear at variance but this appearance demands careful scruitiny.[1] Unlike the maximizing principle in utility theory, the balance principle is not stated clearly in technical terminology. It may be that the idea of the constraint function in utility theory can be seen to encompass balance theory. Whether or not this is the case, the concept of the constraint function is an important contribution of the economic work; it represents a simple, substantive concept expressed precisely in mathematical terms.

Human-capital theory is the second major contribution from economics. The theory brings with it the clever concept of present value, found nowhere else in the occupational-choice literature, and generates equations for estimating earnings that appear to do much better than the ad hoc linear models in the status-attainment work.

Empirical work associated with individual-level economic theory of occupational choice is scarce, though the related

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[1] If these two principles can be differentiated it would be interesting to study utility functions in which the major inputs are balance functions such as $(x - a)^2$, where x is some variable that is currently thought to generate utility and a is some finite goal level that the decision maker strives to achieve. Such a postulate would certainly destroy the convexity feature of the indifference surface, and thereby, have far-reaching ramifications for economic theory in general.

question of educational choice has received substantial attention. One of the reasons for lack of empirical work may be the difficulty of translating utility theory from consumer behavior into terms suitable for handling occupational choices. Consumer choices can be viewed as quantities--of goods and services--but occupational choice is not a quantity. The set of all occupations, properly defined to avoid overlap between occupations, can be viewed as a "nominal variable." Consequently, direct translation of utility theory (which is designed for studying choice of quantities) into occupational terms is not straightforward.

A second difficulty arises in connection with this. The constraint function in economic theory of consumer choices (and other decisions) is a linear form following naturally from the basic restraint on every household--you cannot spend more than you have--this implies that the sum of the product of quantities and prices equals income. Although there clearly are constraints on occupational choice, they are not so easily expresed in equation form. Also, in consumer choices, there is only one constraint, the income constraint, but in occupational choice there are numerous constraints. In principle, the mathematics of constrained optima can easily handle more than one constraint, but in order to do so, the constraints must be expressed as functions of the same variables that define the objective (utility) function. Such an expression is a difficult task because current thinking about occupational choices does not conform to this requirement. Utility generating aspects (rewards) of occupations are variables such as pay, prestige, feeling of community service, and interesting work. On the other hand, constraints include factors such as mental ability, physical stamina, prejudices, finger dexterity, training qualifications, and age. This list of rewards does not overlap at all with the list of constraints.

Of the approaches to occupational choice studied in this volume, decision theory is the least developed. The theory says nothing about the empirical substance of the problem, identifying no specific variables affecting occupational choice. Rather, it is a statement of process that assumes: (a) uncertain knowledge about the outcomes of alternative decisions, and (b) some type of maximizing behavior. Since the theory is silent on the manner in which the input valences (the V_k) not the (V_j) are affected by quantity, either an incentive model (the more the better) or a balance model (aim for a finite goal level) apply; the theory is general enough to accomodate both. From the point of view of utility theory, Vroom's function generating the valence for a given outcome might be viewed as an input; the function postulates a process for determining the shape of the utility function. The formula for force, on the other hand, is an

alternative to utility theory because it implies a method of making a choice, i.e., pick the option with the highest force. Occupational choice being among unordered categories, the Vroom model applies more directly than does utility theory.

An overview of the differences among the several approaches is shown in Table 14. Perhaps the most important part of the table is the first column. Inspection of the dependent variables reveals several differences. Super is interested in vocational adjustment (satisfaction and achievement), and in choice of occupation only as it impacts on adjustment. Holland categorizes occupations into six very broad types and predicts entry into one of these types (or subtypes). Status-attainment work predicts the status of the occupation that one chooses, not the specific occupation. Microeconomic theory of labor supply attempts to predict the labor market into which one enters; while labor markets and occupations are similar, they are not identical. Decision theory is not specific about the nature of the dependent variable but could handle any nominal variable.

Since the dependent variables vary among the different theorists, it is hardly surprising that the independent variables also differ. As shown in Table 14, Super emphasizes self-concept, personality traits, and vocational maturity; his intention is to predict vocational adjustment. Holland emphasizes personality type and environmental type as defined by the RIASEC scheme. It is more difficult to characterize sociological independent variables, because they cover a diverse range. The key concept, though, is to locate predictors of occupational prestige (status). Examples include father's occupational prestige, level of occupational prestige aspiration, occupational prestige that significant others expect the person to achieve, mental ability, school performance, educational attainment, and so forth. Economists emphasize income as a predictor of choice, and no specific independent variables are identified in decision theory.

The view of the process of occupational decision making also differs among the theories; these differences are a matter of emphasis and focus, however. Super emphasizes the continuity of choice over a life cycle and self-concept implementation. Status attainment theorists also adopt a life cycle viewpoint (see Blau and Duncan 1967; Duncan, Featherman and Duncan 1972; Hauser and Featherman 1977 as examples), and would not object to the idea that occupation and self-conception are closely related. Similarly, Holland has recently moved toward a life cycle approach and frequently notes the role of self-concept. Economic theory concentrates on the influences of economic factors on the process of choice. It incorporates a maximizing principle

Table 14

Comparison Matrix

Theoretical Perspectives	Dependent Variable(s)	Independent Variables	Statement of Process	Status of Evidence
Super	Vocational adjustment	Self-concept, personality traits, and "vocational maturity"	Occupational choice is an ongoing, continuous process involving self-concept implementation	A fairly large quantity of evidence exists but much of it is based on subjective methods, much work remains
Holland	Occupational choice categorized into one of Holland's six environmental types	Personality type is defined by Holland's typology	People interact in their environments to achieve a balance between their personalities and the environment	Much evidence has been assembled; relationships tend to be low to moderate and many important tests have not been carried out
Status Attainment Theory	Occupational choice scaled to reflect prestige	Parental status, IQ, academic performance, significant other attitudes, education	Although status attainment research claims to study process, the process is limited to describing variables intervening between "status origin" and "status destination"	The data are of uneven quality, but much data has been analyzed using relatively sophisticated statistical methods. A thorough test of a dynamic model has yet to be done
Economics of Labor Supply	Labor market	Income and "nonincome" utilities, "prices" or wages of alternative jobs	An individual-level utility maximization described by equations Investment in training process	Much evidence at the aggregate level has been collected, but little has been done to test the theory at the micro level
Decision Theory	Occupational choice as a nominal variable (Occupational choice would be viewed as a special case of choice in general)		Choice is a result of valences (preferences) and subjective probabilities that different outcomes occur. A maximizing principle is assumed	Evidence is sparse, and that which is available lends only indirect support

over the life cycle by using lifetime discounted earnings and multiple period optimizing of utility. Decision theory takes the broad concerns of the other work as given and tries to explain the detailed process of selecting between occupations.

The degree of empirical support for the different theories varies widely, as indicated in the last column of Table 14 and correponds closely to the ease with which major concepts can be operationalized.

Next Steps

This brief review, bolstered by the detailed analysis in preceding chapters, clearly reveals that some fundamental work must be completed before a comprehensive understanding of occupational choice processes is achieved. In this volume, certainly, we can do no more than suggest some possible attacks on the problem. The remainder of the chapter takes up some issues which, it seems, must be resolved before a useful synthesis of diverse theoretical viewpoints can be achieved and a thorough understanding of occupational-choice processes gained.

It seems clear that each of the five theoretical approaches offers some useful insights, but none is sufficient by itself. Earnings, prestige, and features of the occupational environment all affect occupational choice. To some extent, people try to maximize their utilities, and to some extent they try to balance conceptions of self with conceptions of environment. The difficulty arises in trying to integrate these viewpoints into a coherent theory. Progress toward integrating important ideas from the different perspectives is stymied by lack of agreement on conceptualization of the dependent variables. Holland wants to predict the "Holland type" of the occupation rather than the occupation itself, economists are interested in labor markets, and sociologists deal with the status of the occupation. Super's major dependent construct is not defined on occupations. It is little wonder that these approaches "talk past" each other; they are not studying the same thing, despite initial appearances. Given the discrepancy among dependent variables, integration of the several approaches cannot be accomplished by simply "borrowing" independent variables from one theory to apply to another theory. For example, it seems only marginally useful to use status level of occupational aspiration to predict entry into one of Holland's types. A conceptual apparatus that can accomodate the several viewpoints of the dependent variable is needed.

One of the most important conceptual tasks is to clarify the

meaning of the basic concept, occupation. Occupation apparently is considered to be a primitive term in much scientific work investigating occupational choice, since its meaning is frequently given little or no attention (e.g., Super 1957; Holland 1973; Haller and Miller 1971; Caplow 1954; Blau and Duncan 1967). Yet, much depends on the definition of occupation. For example, the accuracy of prestige ratings of occupations depends on the particular list of titles presented to respondents. Further, prestige ratings can be carried out directly only for those broad occupational categories with which most respondents are familiar. The strength of empirical relationships between occupation and variables such as income and education undoubtedly depends on operational procedures for separating one occupation from another. Something as simple as the number of defined occupations depends on operational criteria, and, in turn, influences the homogeneity of each occupation, thereby affecting the degree of association between occupation and other variables. Additionally, the criteria for differentiating occupations heavily influences theoretical work and empirical results. If occupations are grouped to maximize task homogeneity, the association between occupation and income, for example, will be less than if homogeneity of income were used to define distinctions between occupations.[2]

Among those who consider the meaning of occupation, definitions vary. For example, Slocum states:

> For our purposes, an occupation is defined basically as the kind of work an adult does on a regular basis. Usually it is an activity performed for wages, salary, commissions, or other forms of money income. An important exception to this attribute is the occupation of homemaker. Viewed in this way, it is clear that occupations are restricted to advanced and developing societies (Slocum, 1966: 4).

In contrast, Roe defines occupation in the following terms:

> In this book we shall use the word occupation...to mean whatever an adult spends most of his time doing (Roe 1956: 3).

Roe specifically contrasts her definition with more common conceptions in which occupation is defined by paid employment. Two sociologists offer definitions that emphasize the social consequences of paid employment. Hall states:

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[2]Temme (1975) defines occupation in a way that encompasses grouping of jobs by income.

> An occupation is the social role performed by adult members of society that directly and/or indirectly yields social and financial consequences and that constitutes a major focus in the life of an adult (Hall 1969: 5-6).

Similarly, Taylor writes,

> The sociological concept of occupation may be definded as a patterned set of human relations having to do with specific work experiences...ideology and identity are central to the sociological notion and experience of occupation.
>
> Integral components of the sociological concept of occupation include career status, prestige, mobility, images, clients, culture, structure, recruitment, remuneration, and control (Taylor 1968: 10).

All of these definitions encompass the common conception of occupation as referring to the type of paid employment in which one engages, but each definition also includes more than a specification of the types of paid employment. Further, these definitions are imprecise, thus inhibiting translation into operational terms. For example, Hall's definition indicates that an occupation must be "a major focus in the life of an adult." Determination of major focus is likely to be difficult. Taylor indicates that ideology and identity are central to the sociological meaning of occupation, but the reader is not informed about how to incorporate ideology and identity into operational measures of occupation. Further, the numerous concepts incorporated into the meaning of occupation by Taylor imply a multidimensionality in the definition that is probably best left as a matter for empirical investigation. That is, occupation, ideology, identity, and so on, are probably best defined as distinct concepts and their relationships examined empirically.

Shartle proposes a definition of occupation that is frequently cited; he defines occupation in terms of position and job, as follows:

> POSITION: a group of tasks performed by one person. There are always as many positions as there are workers in a plant or office.
>
> JOB: a group of similar positions in a single plant, business establishment, educational institution, or other organization. There may be one or many persons employed in the same job.
>
> OCCUPATION: a group of similar jobs found in several establishments (Shartle 1959: 23).

This definition of occupation differs from the previously cited definitions because it emphasizes the logical structure of the concept of occupation by defining it as a second level aggregation of elements. In so doing, Shartle indicates a general procedure for operationally defining separate occupations. The definition implies that one must begin by describing on-the-job tasks of every individual. On the other hand, the definition is not explicit as to whether the term occupation is to be reserved to apply to paid employment, although the strong implication appears to be that Shartle does intend paid employment to be the sole referent. More seriously, the definition is not specific at two critical points. Jobs are defined as groups of "similar" positions, and occupations are defined as groups of "similar" jobs, but the definition does not indicate how to determine similarity among positions and among jobs, except that similarity depends on tasks rather than other job characteristics.

Temme (1975) expands Shartle's definition by including job features other than tasks but, retains the basic logical feature of Shartle's conceptualization--that occupations are comprised of similar jobs:

> Thus, we define an occupation as that group of jobs with the same configuration of Routines, Requisites, and Rewards across employers. Thus, what constitutes a difference among occupations is a difference in any one or any combination of Routines, Requisites, and Rewards (Temme 1975: 153, captializations in the original).

Whether one follows Shartle and defines occupation by task similarity or follows Temme by using a more extensive list of occupation-defining variables, the same logical structure occurs. Occupations are defined by clusters of similar scale values on variables that are, in principal, continuous. (Although the concept of task is not continuous, application of the concept to define occupations probably would depend, at least implicitly, on a measure such as percentage of time spent in various tasks.) Two difficulties, therefore, arise. First, one must select the list of occupation-defining variables (Siegel 1971). Secondly, it is necessary to identify clusters of scale values on the selected variables to define occupations. Numerous empirical methods might be employed, such as a Q factor analysis, but such methods almost never achieve unique solutions that satisfy criteria on which everyone agrees.

These two problems have not been clearly resolved. As noted previously, many researchers leave occupation as an undefined, primitive term; this observation applies even in cases where empirical work depends heavily on the assignment of occupational titles to individuals (e.g.,Sewell, Haller, and Ohlendorf 1970;

Duncan, Featherman, and Duncan 1968; Wilson and Portes 1975; Sewell and Hauser 1975; Holland et al. 1971; Haller and Miller 1971). Several efforts to develop detailed operational definitions of individual occupations have been published by governmental agencies (U.S. Department of Labor 1977; 1978; Manpower and Immigration 1971; International Laborer Office 1968), but none solves these two basic problems satisfactorily. These publications typically list occupational titles and provide a verbal definition of each title. The definitions depend on criteria such as worker function or "work usually performed." The criteria used in generating the definitions generally are not well defined, however. For example, the introduction to the Canadian classification states:

> The basic principal of classification in the CCDO is that of the kind of work performed, but to clarify further the nature of the occupation, other factors were taken into account, such as materials or equipment used or produced, standards met, education or training required, worker environment, services rendered, and relationship to other workers (Manpower and Immigration 1971: xi).

Not only is the "type of work performed" left undefined, but several other criteria are used in unspecified degrees. These additional criteria (e.g., materials or equipment used) are not carefully defined either. Further, no discussion of the reliability in separating one job/occupation from another job/occupation is provided. One does not know whether independent judges would use the criteria to create the same breakdown of jobs and occupations. Ambiguities such as these are not peculiar to the Canadian classification. Similar problems are associated with other major occupational listings. For example, Siegel makes the following comment regarding the detailed occupations developed for the U.S. Census:

> Unfortunately, distinctions on the various dimensions of occupations are not uniformly made, and some of the resulting detailed occupational categories are internally heterogenous with respect to many of the qualities of both type (or task characteristics) and work situation (Siegel 1971: 153).

In summary, current definitions of occupation rely heavily on general usage, neglecting carefully specified, operational criteria. This characterization of the definitions will not be surprising to those familiar with the manner in which science develops. As Stinchcombe has written:

> In general, a science starts off with its variables defined by common sense, by the distinctions that people make in everyday life (Stinchcombe 1968: 41).

Stinchcombe goes on to point out one of the reasons why concepts/variables based on common experiences are usually inadequate for scientific investigation:

> One of the fundamental difficulties with applied research generally is that natural variables based on common usage that create administrative problems are not the same variables that have a unique set of causes (Stinchcombe 1968: 41).

One might add, even if the "natural variables" did have "unique causes" it would be difficult to discover those causes without accurate measurements.

The definition of occupation is important to the study of occupational choice, because the definition affects empirical relationships and theory. Yet, occupation has not been clearly defined in the professional literature. In particular, operational criteria for differentiating occupations are subjective and, undoubtedly, exhibit low reliability.

These observations do not necessarily imply that the same definition of occupation is equally appropriate for all investigations--two or more studies might, in theory, introduce clear definitions and reliable operational criteria while differing from each other in the content of occupational definitions. Although one might argue on other grounds that advantages of a single definition of occupation outweigh the disadvantages, such inference does not follow from the above discussion.

The definition of occupation certainly cannot be resolved in this volume, but some observations about strategies for attacking the problem are in order. The first question that must be addressed is: "What separates occupational from nonoccupational activity?" is one's occupation confined to paid employment, for example? A closely related issue is: "How does one distinguish one occupation from another?" The DOT defines tens of thousands of occupations; whereas, the three-digit detailed census codes establish only about 400 occupations. We need to know the consequences for occupational-choice theory and research of using one of these sets or the other.

It seems desirable for scientific work to conceive of an occupation as a point in a multidemensional space over the real number field. Using this conception, each occupation could be associated with a profile, the profile defining the location of the point. One of the appealing aspects of this strategy is that it encourages integration of important ideas about occupations derived from diverse theoretical perspectives. The profile, for

example, certainly would contain one score describing the prestige level of the occupation. Viewing occupations as points in multidimensional space, then, is a generalization of the standard sociological practice of assigning prestige scores to occupations thereby generating a one-dimensional space. Additional variables defining the profile might include variables to represent the degree to which the occupation corresponds to each of Holland's six types (generating six profile scores), average income, percent of incumbents who are female, public perceptions of the degree to which the occupation provides a community service, and degree of job autonomy. These variables are illustrative; they do not exhaust the possibilities. Lucas (1975) and Temme (1975) offer examples of this type of occupational description. Until occupations are accurately described on several dimensions such as those just listed, it will be difficult to see how fundamental questions concerning the motivational power of different occupational features can be addressed.[3]

Conceptualizing occupations as points in multidimensional space does not solve the fundamental question asked at the outset; that is "How does one distinguish one occupation from another?" Profile scores for each job, however, form the basis for empirical study to determine if job profiles cluster sufficiently to define clearly separable occupations. This idea gives the technical basis for operationalizing Shartle's

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[3]A conceptual paper written by Wise, Charner, and Randour (1976) presents a matrix to show how occupational features affect individual's career awareness. Wise and associates propose that personal knowledge, values, preferences, and self-concepts each relate to the three aspects of jobs identified by Temme (1975)--routines, requisities, and rewards (the three R's). Cross classifying the three R's with the four categories of personal beliefs (knowledge, values, preferences, self-concepts) creates a 3 x 4 matrix with 12 cells. The cell combining self-concept with rewards is omitted, however, leaving 11 categories defining aspects of career awareness. The basic idea here seems useful, but implementation of research based on the concepts depends on accurate description of the three categories of variables (the three R's) describing occupations. This example illustrates the importance of defining and describing occupations for every aspect of occupational theory.

definition of occupation. Given a numerical profile for each job, the distance separating members of each pair of jobs could be calculated using the standard Euclidian formula. These distances could then be entered into a matrix and some type of cluster analysis applied in order to group jobs that are close together. Such a task is a monumental undertaking, however, that could only be executed by a governmental agency. The work reported in the DOT illustrates the magnitude of the operations contemplated.

The results of the cluster analysis might create a set of clearly defined occupations, if the profiles on each job were rigorously assembled, and the patterns of profiles created clearly differentiated clusters. It is more likely, however, that occupational dividing lines would remain ambiguous. The strong real probability that this outcome would be realized suggests that current conceptualizations of occupational choice need some revision. Rather than view each occupation as a rigorously defined empirical category, it might be useful to consider occupation to be a culturally and individually defined category that has no clear delimitations. Part of the research problem then includes the question: "How are amorphous occupational categories used by individuals in determining the type of employment they choose?"

A second aspect of conceptualization that needs to be clarified relates to the term choice. In the narrowest sense, the term choice refers to the immediate act of selecting one or more options from several possibilities. More generally, choice may refer to an intention or to a past selection. When the objects of choice are occupations, choice may refer to expectation or aspiration regarding one's future occupation, or choice may refer to the current occupational attainment. When choice refers to occupational attainment, few complications arise, but when choice refers to occupational orientation, numerous subtleties of meaning occur. Distinctions among terms such as plan, expectation, intention, preference, and aspiration, are routinely drawn. It is with terms such as these that some clarification is needed. At present about all we know about the empirical relationships is that realistic expectations predict attainment better than other types of career orientations such as aspiration, preference, or plan. It is clear that many poeple have preferences as well as expectations, and probably both types of attitudes affect occupational attainments. The theories reviewed here do not address the questions involved in trying to integrate such concepts into a unified theory.

Super in particular emphasizes the obvious fact that occupational expectations leading to choice are a developmental process occurring continuously overtime. Although none of the

other viewpoints reviewed in this volume emphasize the continuity of occupational choice the way Super does; none would contradict this basic observation. One problem with Super's theory, however, is that while it recognizes the continuous flux of occupational plans, no technical apparatus is suggested for incorporating the theoretical idea into empirical, statistical work.

One of the most promising methods for expressing the hypothesis of continuity is differential equations. Using differential equations one can conceive of the dependent variable as a rate of change overtime. Thus, one expresses formal hypotheses about the behavior of the variable over continuous time. By integrating the differential equation the level of the dependent variable can be predicted to any point along a continuous time scale, thus overcoming Super's objection to regression methods which, he claimed, estimate a single choice rather than the sequence of choices compassing a career.

If simultaneous differential equations were used, several dependent variables can be made to depend reciprocally on each other in an onging process over time. The entire system can be projected to any point along a continuous-time scale, thus providing the basis for carrying out strong predictive tests of theory that have not been executed to date. For the first time, predictions based on theory could be made into the future prior to collecting data on the variables to be predicted. The ability of the simultaneous differential equation systems to handle two-way causal effects can also help to resolve some of the questions regarding direction of cause and effect that were raised in the chapter on status-attainment theory and research (see Coleman 1968; Doreian and Hummon 1976 for general reviews of differential equations in social research, and Hotchkiss 1978a for an application to status attainment theory).

Super's description of a continuous process entails more than the idea of continuity of change. He also describes crystallization of choice as a gradual process of narrowing down alternatives and firming up the confidence one has in a tentative choice. There seems little doubt that the idea of gradual reduction of uncertainty characterizes many, if not most, adolescents. A clear conceptual structure for adopting this important idea into formal and empirical analyses of occupational planning is not available currently (see, however, Hotchkiss 1978b for some work on this problem).

The idea that demand for labor affects occupational choice is fundamental to economic theory but this basic idea is scarcely noticed in most other theoretical viewpoints. Although this volume has not emphasized the manner in which supply and demand

for labor interact, due to delimitation of the scope of the effort, this aspect of occupational choice must be incorporated into any satisfactory theory. Defining occupation using a profile might contribute to integration of demand theory and theories from other viewpoints. One of the profile scores for each occupation could be unemployment rate; another could be percentage of the total labor force--or subgroup of the labor force--employed in the occupation. With such a definition, one could compare the effects of incentives such as occupational prestige or income to the effects of demand variables.

In studies of job shifts during adult years, concepts such as expectation and aspiration need to be included. The basic concepts of continuous changes in differential equations do not apply to study of job shifts, because job shifts occur abruptly rather than continuously; on the other hand, differential equations do apply to changing expectations. Therefore, a fundamental problem arises: How can an accurate model be constructed to describe continuous change in expectations and abrupt changes associated with job shift? The mathematical work on "catastrophy theory" offers a potential tool that is worth exploring (see Zeemans 1977; Jiobu and Lundgren 1978). Catastrophe theory is designed to describe behavior in which variables change continuously over time until a threshold configuration occurs, at which time a sudden shift in a dependent variable occurs. This idea appears applicable to the relationship between job shift, occupational expectation and characteristics of one's current occupation.

This discussion of next steps in occupational choice theory and research has intentionally avoided calling for any grandiose attempt to integrate existing work into a comprehensive theory. In the authors' view such an effort is premature. As implied in the above discussion, substantial conceptual work is needed to translate important yet imprecise ideas into precise terms that can be used in research. Several recommendations for attacking this problem are discussed above. As the conceptual work proceeds, empirical work should also accumulate using newly formed concepts. One can expect a comprehensive theory to emerge gradually out of such long-term work rather than in a single stroke.[4]

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[4]It is interesting, however, that catastrophy theory might be used to describe the apparently sudden achievement of a theoretical breakthrough that, in fact, builds on a large volume of slowly accumulated findings.

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