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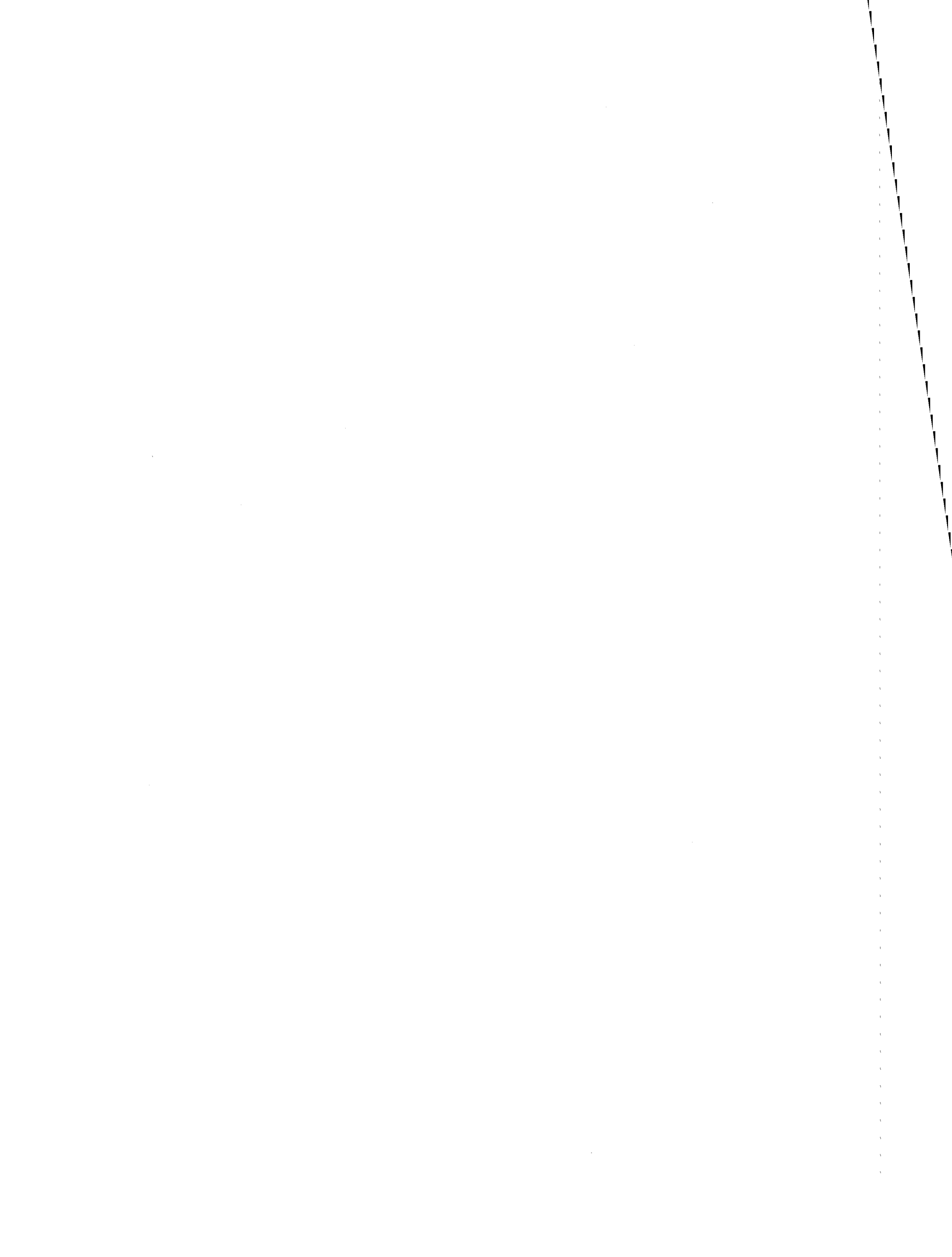
**Forestalling the Demise of Empirical
Economics: The Role of Microdata in
Labor Economics Research**

by

Frank Stafford

This is a preliminary paper. It is intended for private circulation and should not be quoted or referred to in publications without permission of the author. The revised paper will appear in the volume, Handbook of Labor Economics, (O. Ashenfelter and R. Layard, eds.) North-Holland, 1984. I would like to thank several people for helpful comments to date. Namely, Reuben Gronau, Bertil Holmlund, George Johnson, Gary Solon and Hal Varian. In addition, Hal Varian provided the winning margin in my first venture with microcomputers. All errors are my own responsibility.

January, 1984



In a recent letter to the editor of Science, Leontief (1982) has claimed that the American Economic Review and the economics profession more generally have come to be dominated by papers in which empirical work is either weak, trivial or totally absent and in which theory, simulation, and misplaced aggregation are central. The profession of economics is characterized as unconcerned about deterioration in the quality of data sources which could be used to revitalize useful empirical work. These are serious concerns if economics is to be successful as a scientific (i.e. empirically based) field rather than a branch of applied mathematics.

In contrast to Leontief's remarks which were directed toward the entire field of economics, in this paper it is shown that for the field of labor economics there has been a growth of new types of data, of econometric methods and practice tailored to hypothesis testing based on substantive and policy questions, and of papers with a theoretical section which is connected to the subsequent empirical work. These conclusions are based on analysis of the 759 full-length articles on labor economics subjects appearing in six major U.S. journals, and parallel analysis of several British and European journals is planned in the near future.

It is research based on microdata which sets labor economics apart from several other areas of economics in the extent to which theory and econometric method are used as part of a rather deliberate research program. As a recent study by Taeuber and Rockwell (1982) shows, there has been a dramatic growth in national data collection efforts in the late 1960's and the 1970's, and a large number of these datasets are appropriate for labor economics research because of efforts to relate data base design to questions implied by theoretical models. These data have had a disproportionate effect on research on the supply side of labor economics with much less new work being done on the demand side. Much of this supply side work has been stimulated by the advent of a small number of large scale sets of microdata, particularly panel data.

Was the greater availability of supply side data, in turn, the consequence of better theorizing and more policy interest in these topics? To illustrate, labor supply responses to variation in wage through time underly one of the key questions in macroeconomics: To what extent does variation in labor hours over the business cycle reflect optimizing behavior by households as they take advantage of temporary wage fluctuations to time their market work, with more hours during booms and less during recessions? To what extent is unemployment and nonparticipation in the labor market an implicit demand for leisure or a purposeful reduction in labor supply to canvass a wider set of prospective employers? Do social programs and tax laws accentuate the reduction in labor supply during economic contractions?

Although interesting labor supply questions can be listed readily, it is possible to identify just as many important demand side questions: How do inventory costs influence a firm's labor demand as product demand varies through the business cycle? Why do larger firms and certain industries pay higher wages and load their labor contract with a larger share of total compensation in the form of fringe benefits rather than direct wage payments? It is the claim of this paper that the greater range and quality of our knowledge and theorizing on particular topics does significantly stem from the advent of large scale micro level data sets. These data sets use individuals and households as the unit of observation and are important in explaining why, during the 1970's about two-thirds of labor articles in major U.S. journals were on the broad subjects of labor supply and wage determination. As the existing data are worked and then reworked a type of diminishing returns will likely set in despite more elaborate econometric and theoretical machinery with which to work the data lode. To forstall the trends observed by Leontief new forms of data and observation will be required.

The contrast between data available on the supply side of the labor market versus the demand side is striking. No national probability samples exist for industrialized countries at the establish-

ment level which can be used to characterize the microeconomic choice processes of firms in a fashion analogous to the way in which the choice process of households and individuals can be characterized. It is beyond the scope of this paper to review the demand side data and its prospects for future development, but I believe a vastly better job can be done and that it would have a research payoff at least as great as the labor supply data have had. Perhaps new data on the demand side collected with input from researchers in the areas of industrial organization and organizational behavior will be developed during the next decade.

In this paper we begin with a review of characteristics of papers published in major U.S. journals (1965-1983) in the field of labor economics as defined primarily by the chapter topics in the forthcoming volume, Handbook of Labor Economics (1984). This review demonstrates the changing character of the field in terms of topic, extent to which papers are exclusively theoretical, share of papers with a theoretical section which is meaningful and connects to the subsequent empirical endeavor, and type of data used for empirical work. Consonant with Leontief's findings we observe a growth of theoretical papers in terms of both number and share. However, it is also observed that this growth of theoretical papers does not appear to have crowded out good empirical work; if anything there seems to have been a parallel growth of both significant theoretical and empirical papers as the development of theory and data interact through time.

The second section of the paper turns to a more detailed discussion of the interaction between theory, data base development and policy issues. Topics highlighted in this discussion are earnings functions and intertemporal labor supply models, including retirement and unemployment.

The third section of the paper discusses some of the advantages and disadvantages of different kinds of microdata, including data from social experiments which were a popular and costly type of data gathered in the United States during the 1970's. The third

section indicates some data based pitfalls and the weakness arising from many of the statistical tests in what can be termed second generation work on several topics. These tests often suffer from very limited power to discriminate among alternative hypotheses, but in some cases this weakness could be overcome by additional data.

I The Changing Character of Labor Economics Research, 1965-83

To characterize the changes in labor economics research all articles appearing between 1965 and 1983 in six major U.S. journals¹ were coded by topic, whether exclusively theoretical, whether, if empirical, the paper had a meaningful theoretical section, whether the paper was based on time series data, whether based on some sort of aggregate data such as census tracts² or states³, whether the paper was based on panel, experimental, or micro cross-section data, whether the data source was the Current Population Survey (CPS),⁴ the Michigan Panel Study of Income Dynamics (PSID), the National Longitudinal Surveys (conducted for the U.S. Labor Department by the Census Bureau, the National Opinion Research Center and the Ohio State University's Center for Human Resource Research), data from the Census, the Survey of Economic Opportunity (SEO) or some other set of microdata (all other). The coding of topic corresponds closely to the chapters in the volume.⁵

¹ American Economic Review, Econometrica, Journal of Political Economy, Quarterly Journal of Economics, Review of Economics and Statistics, and International Economic Review. Notes, comments and shorter papers were excluded as were American Economic Association Proceedings.

² Census tracts, school districts, SMSA, city and county data were all coded as census tract data.

³ For research on countries outside the United States the coding was based on similar geographic areas. For example, prefectures of Japan were treated as states.

⁴ Many countries have a survey which is similar or identical to the CPS and research based on such data was also coded as "CPS".

⁵ An alternative coding structure would be in terms of type of model. To illustrate, papers based on Seater's (1977) model of search as well as the original paper have a theoretical structure which is virtually identical to several of the labor supply models reviewed by Yoram Weiss in the Handbook. Yet, these papers were coded in the search category rather than a category of dynamic micro models.

The total number of labor economics articles coded was 759, with 297 appearing between 1965 and 1974 and 462 appearing between 1975 and 1983. In Table 1 is presented the distribution of articles by subject for 1965-69, 1970-74, 1975-79 and 1980-83. Among broad topical areas, papers on labor supply and wage determination gained ground particularly between 1965-69 and the 1970's. The share of papers on labor demand and on institutional structures declined throughout the period, with the exception of a modest upturn in the most recent period, 1980-1983.

Some of the research trends appear to be the consequence of policy concerns. Retirement was not a subject which made an appearance in these journals until the late 1970's, when concern over funding of social security in the U.S. heightened interest in the topic. Similarly, the recent growth in papers devoted to labor market equilibrium, dynamic demand, and implicit contracts (included in the code of screening, signalling and contracting),⁶ can be ascribed to an interest in understanding the continued upward movement in the normal unemployment rate of most industrialized countries. Research on discrimination peaked in the 1970's at a time when government intervention for the purpose of affirmative action was the greatest but seems to have declined in most recent years as the flow of government initiatives in this area has dwindled.

Some topics seem to be largely stimulated by theoretical developments which are, in turn, at least partly stimulated by policy issues. Research on principal-agent and implicit contract models has grown recently, and this can be regarded as influencing models of retirement and unemployment. However, it can also be argued that this line of theoretical effort has, to some extent, been pushed along by policy related interest in retirement and

⁶ Again there are coding issues. Implicit contract models of retirement such as Lazear's paper (1979) were coded as having retirement as the subject rather than contracting as the subject.

Table 1 **Articles in Major U.S. Journals: Labor Economics Subject,**
by Year, 1965-83
 (Percentages in Parentheses)

	1965-69	1970-74	1975-79	1980-83
<u>Labor supply</u>				
Population size and structure	7	14	19	10
Household production	0	11	8	8
Labor supply of men	2	5	7	6
Labor supply of women	0	3	9	6
Labor supply of others and income support disincentives of UI, NIT, taxes or other	2	7	16	15
Retirement	0	1	4	1
Educational demand	3	11	9	2
Migration	13	9	14	4
All	27 (25.0)	61 (32.0)	86 (34.0)	52 (26.0)
<u>Labor demand</u>				
Basic labor demand	10	11	11	10
Adjustment and dynamic demand	6	4	6	10
Minimum wage	1	2	4	4
All	17 (15.5)	17 (9.0)	21 (8.0)	24 (12.0)
<u>Wage determination and earnings</u>				
Earnings functions	10	22	38	17
Theoretical lifetime earnings	2	5	4	6
Compensating wage differentials	2	4	5	9
Discrimination	4	17	14	7
Income inequality (other than human capital)	9	20	22	20
Occupational choice	1	2	3	0
All	28 (25.5)	70 (37.0)	86 (34.0)	59 (29.5)

	1965-69	1970-74	1975-79	1980-83
<u>Labor market equilibrium</u>				
<u>and friction</u>				
Specific training and turnover	1	4	3	5
Search	1	5	11	11
Unemployment structure	5	3	17	9
Cyclical movements	13	17	11	18
Screening, signalling and contracting	0	3	4	7
All	20 (18.0)	32 (17.0)	46 (18.0)	50 (25.0)
<u>Institutional structures</u>				
Trade unions, strikes, union wage effects	8	3	10	13
Stratification, segmentation	3	3	3	0
Public sector labor markets	3	4	1	3
All	14 (13.0)	10 (5.5)	14 (5.5)	16 (8.0)
Total	109 (100.0)	190 (100.0)	253 (100.0)	201 (100.0)

unemployment. A definite change in research on unemployment is a recent decline in papers on unemployment structure, and a replacement with papers devoted to establishing the idea of optimal or rational unemployment. Here theory has partly reshaped the way we think about a major policy issue.

Research on institutional structures declined in the 1970-79 period but has recently experienced modest growth during 1980-83. Rather than being outside the main framework of economic theory, this newer work has applied microtheory to the analysis of unions and has made use of the data and method developed in the broader field of labor economics, a subject to which we shall now turn.

One of the most pronounced changes in labor economics has been the growth of articles which are exclusively theoretical. Between 1965 and 1969 only about one-seventh of the papers appearing in major U.S. journals were exclusively theoretical as can be seen in Table 2. This share had approximately doubled by the 1980's: between 1980 and 1983 twenty-nine per cent of papers were exclusively theoretical.

The growing role of theory was not restricted to papers with an exclusively theoretical focus. Perhaps the most important change in the last twenty years has been the growth of empirical papers with a meaningful theoretical section. By this I mean papers in which there is some substantial theoretical framework which, at least in part, is an extension or reformulation of the existing standard theory of its day and which provides an interpretation the paper's subsequent empirical work. There are obviously different standards which one could apply, and it was not required that the theoretical section be so directly connected to the empirical work that it was necessarily parameterized by the author. On the other hand theoretical papers with a few stylized "facts" appended were not coded as "empirical with a meaningful theoretical section".

Table 2 Labor Economics Articles in Major U.S. Journals: Percentage Distribution by Type, Method and Data Source, by Year, 1965-83

	1965-69	1970-74	1975-79	1980-83	All
Theory only, All	14	19	23	29	22
Theory only, Significant	7	12	13	15	12
Empirical with a meaningful theoretical section	17	33	36	36	33
Micro data	11	27	45	46	36
Panel	1	6	21	18	14
Experiment	0	0	2	2	1
Cross-section	10	21	21	26	21
Micro data set					
PSID	0	0	6	7	4
NLS	0	3	10	6	6
CPS	0	1	5	6	3
SEO	0	4	4	0	2
Census (1-1000, 1-100 or other)	3	5	2	0	2
All other micro data sets	8	14	18	27	18
Time series	42	27	18	16	23
Census tract	3	2	4	3	3
State	7	6	3	3	4
Other aggregate cross-section	14	16	8	4	10
Secondary data analysis	14	3	3	4	5
Significant	37	59	63	51	55
N	106	191	257	205	759

Combining papers which are exclusively theoretical with those empirical papers having a substantial theoretical section, about two-thirds of the labor economics papers in major U.S. journals in 1980-83 were theoretically based. In contrast less than one-third of the labor economics papers during 1965-69 can be characterized as theoretically based.⁷ From these summary statistics it would appear that labor economics has conformed to the general pattern for all of economics reported by Leontief (1982) in his assessment of papers published in the American Economic Review.

A closer examination indicates a stable share of empirical papers in the range of 70 to 80 percent. The main decline in empirical work was in the reduced use of time series data⁸ and aggregate cross section data of various types. Secondary data analysis is defined as direct use of empirical results or tables published elsewhere, and this type of paper declined from 14 to 3 or 4 percent of all papers. As a group, the share of papers based on aggregate time series, aggregate cross-section, and secondary data analysis declined from 80 percent of all labor economics papers in 1965-69 to 30 percent in 1980-83.

The greatest attrition in terms of percentage point decline was in research using time series data. While 42 per cent of all labor economics papers were based on time series in the 1965-69 period, by the 1980-83 period this had fallen to only 16 per cent. The main growth in empirical papers has been in papers using microdata, particularly panel and micro cross-section data from surveys of households or individuals. In fact panel data were virtually out of the picture in 1965-69, but in the period between

⁷ The small number of papers with models simulated using hypothetical parameter values were included as theory only.

⁸ Many papers involve pooled aggregate cross section and time series. For example, state data through time. Where T (the number of time periods) greatly exceeded N (the size of the cross-section) or where the main results seemed to depend on time series variation, the paper was coded as based on time series.

1975 and 1983 they were utilized in approximately 20 per cent of the papers in the sample. A few of the papers based on panel data did not employ the panel features of the dataset. Instead, the dataset was analyzed as if it were cross-sectional. Specifically, 22 percent of the papers using panel data did not exploit panel features of the dataset.

Now let us turn to a more impressionistic assessment of the research. How significant are the articles based on different methods, approaches, and data? In coding each article's "significance" I tried to be eclectic and not impose my own research priorities.

An article was judged significant if it was empirical and improved our understanding of how labor markets work or the actions of behavioral units within labor markets. A theoretical article was judged in terms of its empirical potential even if the article itself pointed to no evidence. To give some feeling for my coding, articles on search ended up with a high per cent with a significance code value of 1 even though few empirical articles appeared until the late 1970's. Obviously, someone who feels that search models have not been very illuminating would have coded some of these articles differently. An effort was made to judge the paper's contribution at the date it was written rather than in light of subsequent knowledge.

What has emerged is a growing use of microdata and growth of empirical papers with a substantial theoretical section. Subject to the obvious limitations of my effort to code the significance of each paper, there was a growth in the share of such papers up until 1980. From there on the share of significant papers declined. See the second to last row of Table 2. This decline cannot be attributed to fewer significant theoretical papers as can be seen in row 2 of Table 2, nor can it be attributed to a decline in the share of empirical papers with a substantial or meaningful conceptual framework as can be seen in row 3 of Table 2. What has occurred in this author's interpretation is a decline in the number of illuminating papers based exclusively on empirical re-

sults. In particular, I judged that 33 per cent of papers were only empirical (not a theory paper and without a substantial theoretical section) and significant in 1975-79, whereas 21 per cent of papers were so categorized in 1980-83.⁹

A reason for this decline in significant papers with an exclusively empirical orientation could be termed the data lode phenomenon. When a new type of data becomes available for research use as did micro cross-section and panel data during the 1970's, there appears to be a set of interesting results which will be based simply on the data without any new conceptual framework for interpretation.¹⁰ As the data lode is worked sufficiently, diminishing returns set in to purely data based findings and perhaps eventually to innovations in or reformulations of theory.¹¹ This would imply that to counteract the pattern to which Leontief objects, labor economics would have to be rejuvenated by a succession of new databases. Of course, not all new data sources can be expected to have major impacts on research. In the case of data from social experiments, only two per cent of papers in recent years have been based on such data. See row 6 of Table 2.

⁹ To illustrate the role of data based findings consider the summary offered by Duncan and Morgan (1981): "Even the most basic, descriptive findings from the PSID are surprising because they contradict many of the stereotypes built up from many years of cross-sectional analyses. The economic environment that most people face is not stable but rather quite volatile. It creates large numbers of workers and families who are occasionally poor, on welfare or in certain sectors of the labor market, but it also produces fairly small numbers who are persistently in those states. Frequent changes in family composition play a role in much of this volatility."

¹⁰ The new data forms may give rise to complementary developments in statistical method, but it should be noted that here I have attempted to code substantive significance rather than methodological significance.

¹¹ John Pencavel's paper in this volume on labor supply of men seems to indicate that diminishing returns can set in early in this process. New results seem to be not much better than the pioneering work on male labor supply.

The attrition in studies based on time series data can also be ascribed to the data lode phenomenon. Widespread availability of lower cost computing capacity and the existence of a large stock of relatively unexploited time series in the 1950's and 1960's led to extensive analysis of the basic time series data. Although new data became available with the passage of time and through the construction of new series from historical records, the basic stock had been pretty well worked, with diminishing returns to re-working the data using different methods and interpretations.

An alternative explanation for the erosion of time series as the major data source is that these data as well as aggregate cross-section data were simply displaced by microdata, which permitted better inferences for a whole range of research subjects in labor economics. In this case we would expect microdata to occupy a long standing, dominant role in labor market research rather than simply going through a cycle of rising and then falling application as diminishing returns set in.

A clear feature of microdata use is the importance of a small number of data sets. As reported by Taeuber and Rockwell (1982), there are over a hundred large scale sets of microdata in the public domain in the United States, but about half of our sample's papers in 1975 to 1983 using microdata were written using just three data sources: the NLS, the PSID, and the CPS. The Survey of Economic Opportunity dataset collected in 1967 was quite widely used in the 1970's. In the later 1970's, of the papers using microdata, 56 per cent were based on just these four datasets. During the period 1975-83, 75 percent of the papers based on panel data utilized either the NLS or the PSID. While the share of papers based on microdata accounted for by the leading datasets was substantial, there was a considerable lag in the diffusion of their use. Major use of the PSID occurred about 5-10 years after the first year of data collection (1968). Publication of papers based on panel data occurred in overnight fashion with virtually none in the sample until 1974 and an abrupt switch to a high rate of utilization from then on. Other U.S. longitudinal studies, described in Borus (1982), include the National Longitudinal Study of the High School Class of 1972, the Longitudinal Retirement History Survey and the NBER-Thondike-Hagen study.

As noted above the data from the New Jersey-Pennsylvania, Gary, Seattle-Denver and Iowa-North Carolina income maintenance experiments have not been used a great deal. This is true even though the data, particularly those from the Seattle-Denver experiment extend over several years, include a wide array of variables and have income and wage variations which are probably much closer to being exogenous than the wage and income variations arising in a conventional set of microdata. Two explanations would appear to be that, first, the samples in the experiments are restricted to a particular (lower income) segment of the population and, second, that these data are no better for many research purposes than the previously available NLS and PSID data.¹²

Labor economics has been connected to many developments in econometrics as researchers endeavored to draw inferences from the newly available data sets over the last twenty years. Only 18 of the 759 labor economics papers were coded as primarily concerned with econometric method, although many more papers were state-of-the-art applications of existing econometric method. The growth of papers emphasizing and utilizing econometric innovations grew through time as did more sophisticated uses of the data, including matching variables from other data sources to different types of microdata for the particular purposes of the research topic in question. In all, 49 papers employed a significant use of special purpose matching to a micro data set. An illustration of this is work by Ehrenberg and Oaxaca (1976), who matched the varying unemployment system features of different states

¹² Another type of panel data is that from administrative records such as the Social Security Administration's Continuous Work History Sample (CWHS) and the U.S Labor Department's Continuous Wage and Benefit History (CWBH), which has longitudinal information on earnings, benefits received and some personal characteristics. As Ashenfelter and Solon (1982) note, a common drawback of administrative data is a restricted set of variables and restricted sampling to include only sub-groups of the population eligible for benefits or program participation. Many research purposes require comparisons between enrollees (or eligibles) and non-enrollees (or ineligibles).

to respondents in the NLS in order to evaluate the role of benefit levels on reemployment wage and duration of unemployment spell.

To summarize, micro level data for research, particularly on labor supply are now available in wide variety of social surveys, including panel surveys and surveys which have been at least partly designed for the purpose of estimating specific models. These data have been used quite extensively as can be seen from the growth in the use microdata from various sources including "all other". See Table 2. Recently there have been efforts devoted to compiling a set of data base descriptions and indexes to major social surveys. Readers interested in tracking down specific data bases can refer to these compilations. See Borus (1982). The recent Taeuber and Rockwell (1982) paper includes a time series of social surveys. Parallel to our findings on research uses of microdata it is clear that social surveys have been a growth industry. During the 1940's there are only four entries and in the 1950's this jumps to 8 entries, in the 1960's there are 32 entries and in the 1970's there are 34 entries. It should also be noted that several of the major data collection projects initiated in the 1960's were large scale panel designs in which reinterview data were collected in the 1970's.

The 1960's represented a decade during which widespread availability of low cost computing capacity occurred at the same time that there was an acceleration in the development of econometric methods. These forces also continued during the 1970's and this decade represented the further refinement and specialization of econometric method to problems of micro panel data and an enormous diffusion of micro data bases among a wide and diverse set of users in various academic settings. Thesis research in labor economics using this newly emerging technology grew at an accelerating rate in the 1970's and early 1980's.¹³

¹³ For a review of research based on the NLS see Thomas N. Daymont and Paul J. Andrisani (1983).

Main data sets such as the NLS and PSID became (by historical standards) very well documented for users despite the growing complexity of the file structures. In the PSID data base the complexity of the data was increased by virtue of the number of variables (over 5000 variables are in the public use data tapes) and, more importantly, by the design of parallel treatment of individuals and families. Specifically, the data are structured so that they can be used to characterize an individual's own economic history as he or she changes the connections to other individuals by splitting from or returning to a given family, and family records permit the user to define family income, family housing characteristics and other variables that can be defined for multi-person households. A unique feature of the PSID data incorporates new family units which have an original sample member giving rise to a growing sample.

An examination of the actual questionnaires used in social surveys of economic topics reveals that through time there has been considerably more complexity and sophistication in question wording and skip sequences. Studies to date show that financial compensation of respondents does not lead to obvious improvements in data quality in most circumstances as shown by Cannell (1978), and a great deal of specialized knowledge as to what types of topics and question sequences are feasible has been gained. Many data collection efforts employ standard question sequences such as those of the CPS and this permits ready comparisons across surveys.

II **The Interaction Between Theory and Data Base Development**

There is clearly an interaction between data collection and development of theory in labor economics research. There are relatively few empty economic boxes in labor economics compared to other applied fields such as industrial organization where much of the recent theoretical developments are regarded as valuable in their own right with relatively little attention given to empirical testing to date. This probably reflects the difficulty of collecting microdata on firms and organizations, a problem which has limited some kinds of demand side research in labor economics. Virtually none of the 759 papers reviewed in the previous section was based on microdata with individual firms or establishments as the unit of analysis.

In some instances theoretical models have clearly motivated data collection efforts. Prior to the advent of human capital models of lifetime earnings, most sets of microdata did not have much information on work histories of individuals. Early work on earnings functions was commonly based on years of potential labor market experience, defined in terms of age and years of formal schooling. Because the theory emphasized the importance of on-the-job training through various types of job market experience, new and on-going data collection efforts obtained extensive information on job market experience. Variables such as years of full time experience, years of part time experience, and years in military service became widely available in cross-sectional data. Panel data, in addition, allowed measurement of these variables by the researcher rather than from respondent recall.

The particular case of experience measurements for the estimation of earnings functions is a success story - so much so that it is now almost taken for granted. Yet, before experience variables were available for analysis it was claimed that labor earnings were heavily influenced simply by age and social norms about what should be paid to people of different ages. The evidence we have indicates that age has a role but one which can be interpret-

ed by length of remaining work horizon; people nearer retirement will have a shorter period in which to recover the costs of investment in skills and will for this reason invest less. In contrast various types of work experience have effects on earnings in line with what one would judge to be the learning content on each. See Willis, Chapter 12.

Differences between men and women in their work histories as measured by experience segments appear to account for perhaps 70 per cent or more of the wage differences between men and women. See Cain, Chapter 15 for a discussion. Experience-earnings profiles are clearly a case where data collection efforts were motivated by a conceptual framework. Moreover, the entire enterprise seems to have paid off, though some controversies remain. Does experience indicate production skills and actual output or does it also indicate such things as knowledge of how to effect organizational transitions and reorganizations? In the case of male-female earnings differences one of the controversies is whether or not differences by sex in accumulated work experience are the consequence of labor market discrimination.

One can identify cases where purely data based discoveries or puzzles have led to substantial theorizing and econometric work. Two illustrations from panel data are, first, the discovery of runs patterns in data on labor force participation of women and, second, the discovery that the duration of completed spells of unemployment is much shorter than as measured by duration from beginning of spell to survey date.

Interpretation of the apparent dependency of current labor force status on labor force status in preceding periods observed by Heckman and Willis (1977) led to efforts to determine whether this was because of fundamental effects of being in a given state or whether it was simply the consequence of differing, unobserved permanent propensities to participate.¹⁴ One feature of this

¹⁴ A more general econometric model of these issues has been set out. See Heckman (1981).

literature is that the econometric aspects of the problem seem to have absorbed most of the attention, and much of the work has continued in a rather atheoretical vein, with some connection to previously developed theories. Still, the econometric representation can be regarded as an important contribution which was initially motivated by regularities observed in the data.

The Current Population Survey involves reinterviews of the same households over a 12 month period. Using these data Kaitz (1970) discovered that by taking a sample of individuals who had completed a spell of unemployment the average duration of spell of unemployment in the United States was on the order of 4 to 5 weeks. This contrasts with the 8 weeks commonly observed during non-recessionary times (and 14-16 weeks common during recessionary times) when one measures unemployment duration by time from beginning of spell as reported by the respondent to date of survey. This puzzle can be resolved at the descriptive level by observing that the probability of leaving unemployment declines the longer the spell of unemployment. That is, the hazard function for leaving unemployment declines monotonically, but this squarely contradicts a main implication of search theoretic models which usually show that optimizing behavior in light of a perceived, stable distribution of potential wage offers will lead to a reservation wage which declines through time. If the wage offers are sampled randomly from this distribution the probability of accepting employment will rise through time, i.e., the hazard function for leaving unemployment should rise over time.¹⁵

¹⁵ Note that a constant hazard function, $\lambda(t)$, in the expression $\lambda(t) = \frac{f(t)}{1-F(t)}$ obtains in the case where $f(t)$ is an exponential density function. In a case of a constant hazard function spell to survey and spell to completion measures would coincide. If this case applied to mortality it would imply that an unbiased estimate of life expectancy could be obtained by asking a cross-section sample of individuals their age!

In the search literature the appeal of the theory is so strong that few students of the subject accept the apparent fact observed by Kaitz. Instead most people resolve the disparity by believing that there are unobserved individual differences in the level (and perhaps shape) of the hazard function, and that absent control of these differences one cannot identify the true structure to the time path of the probability of leaving unemployment for individuals. The data required to resolve this controversy would include panel data collected at monthly or perhaps weekly intervals for individuals during multiple spells of unemployment. Then one could identify person specific parameters of the hazard function. In this case new data collection would have been motivated by theory which was initially stimulated by descriptive empirical findings. This example illustrates the continuing interplay of theory/method and data collection. This seems to be a healthy feature of contemporary labor economics.¹⁶

A significant area which highlights the interrelation between theory and data is the broad area of intertemporal labor supply. The basic theory is simple and quite appealing: intertemporal utility maximization will require individuals to exploit information on variations in their wage through time with resulting substitution effects toward more work in periods when their wage is known to be high in relation to other periods. This simple theoretical framework was used to analyse unemployment and the effects of unemployment insurance, retirement, and the other life cycle labor supply decisions. Public policy is seen as the source of changes in the price of leisure at different points of time and as the source of income variation. Armed with this simple view, a variety of empirical efforts was mounted. In each of these areas the initial model has led to empirical research which has met

¹⁶ The additional work on unemployment spells has been very dependent on both new data sets and new interpretations. See, for example, Kiefer and Neumann (1981), Akerlof and Main (1981), Layard (1981), Pederson (1982) and Björklund (1983).

with anything from no success to reasonable success. In response to less than complete success, reformulations and extensions of the theory seem to be the order of the day. The two topics which will be reviewed here are unemployment and retirement.

A stylized fact which is regarded as consistent with the basic intertemporal labor supply model is the procyclical labor force participation rates and countercyclical unemployment rates for virtually all major demographic groups.¹⁷ In this view the unemployed are simply those who choose not to work during low wage periods, but because of a dispersion of offered wages may sample some jobs (i.e., "look for work") even though their reservation wage will exceed the typical wage offer they receive. Their reservation wage, we should remember, is in this view positively influenced by the prospect of higher anticipated wages in the future.

More recently these stylized facts have been subject to much greater scrutiny. If workers are to make a rational intertemporal choice they must have some basis for successfully forecasting future wage rates. If not they would be unable to decide whether the current period is one deserving extra work hours or fewer work hours. Work by Altonji and Ashenfelter (1980) addresses the following question: If we describe time series wage movements is it reasonable to suppose that workers can use past history to decide whether future wage rates will be higher or lower? Their findings, which should be regarded as somewhat preliminary, indicate that "rational forecasts of future real wage rates differ by a constant from current real wage rates, and there is very little variation in these deviations with which to explain unemployment".

¹⁷ Mincer was (one of) the original proponents of this type of interpretation of the cyclical labor force participation of married women. Recessions led to added women workers because of income declines in their families, but led to discouraged workers as they were unable to realize high wages during the temporary downturns.

Recent research devoted to estimating the elasticity of substitution between leisure in different time periods from time series data has found a small substitution elasticity or one of the "wrong" sign. This result also holds in some work using disaggregated data from the 1970 U.S. Census.¹⁸ Tests of the proposition that, in quarterly U.S. time series, people act as simple period by period utility maximizers can not be rejected against the alternative hypothesis that individuals act as multiperiod maximizers.¹⁹

Despite the apparent lack of support for the intertemporal labor-leisure model of unemployment, this is an area in which convincing empirical work has just begun. Time series tests are of limited value because there is not that much information there to discriminate among alternative hypotheses. Moreover, theoretical models used to date seem too restrictive. To illustrate, if businesses can carry inventory how do costs of inventory influence their incentives to stabilize output, employment, and wages? Micro level models that synthesize supply and demand factors and connect to empirical analysis are probably required to illuminate the basic issue. Recent work using microdata estimates the intertemporal substitution elasticity to be about .2.²⁰

Another approach to intertemporal labor supply research is based on a broader model which synthesizes labor supply and household portfolio choices. Here households up against a financial net worth constraint have high costs of downward adjustment for consumption commitments, such as repayment of debt for major durables. Expenditures associated with children such as food and schooling also involve substantial costs of downward adjustment.

¹⁸ Joseph G. Altonji (1982) and Kim B. Clark and Laurence H. Summers (1982).

¹⁹ See Varian (1984).

²⁰ Thomas E. McCurdy (1982) reports an estimate of .234 based on panel data and an estimate of .15 based on cross-sectional data.

In the presence of such consumption commitments short run wage declines can be shown to motivate short run market hours increases so as to maintain cash flow. The empirical work supports such a model for younger families, but for older families with positive net worth, hours of work rise during high wage periods and fall during low wage periods.²¹

The simplest labor supply models allow people to select their hours given a parametric wage. It can be argued that hours choice is, to a substantial extent, effected by job choice. However, efficient job choice is something which requires adjustment time, particularly in a world of firm-specific skills and attachment and search costs. If so, temporary wage fluctuations with a given employer can be replaced with an intertemporal, implicit contract in which hours vary and there is an earnings level over multiple periods sufficient to meet reservation utility, that level of utility attainable in an alternative sector where wage rates and hours are stable. Workers will be induced to accept hours variations and will do so at a modest wage premium if their hours restrictions are in the form of unemployment combined with unemployment compensation. This approach appears to receive empirical support in the recent work by Abowd and Ashenfelter (1981).

Another version of this type of approach is that of Feldstein (1976) who focuses on the role of unemployment insurance in lowering the cost of varying the number of employees rather than the hours per employee to effect a variation in worker hours when output price varies. His results in Feldstein (1978) suggest that about half of the temporary unemployment rate is the consequence of the presence of the unemployment insurance system.

Before fully embracing these sorts of results it should be remembered that the regular unemployment insurance system has in the United States, a tax rate which is substantially related, though

²¹ See Kenneth G. Dau Schmidt (1983).

with lags, to benefits previously paid to those laid off from the firm. In the context of the Feldstein model perfect experience rating fully eliminates the bias toward layoffs rather than variations in hours per employee. In the Abowd Ashenfelter approach since uncertainty has a direct role in the model there could still be net social benefits of a perfectly experience rated unemployment insurance system.²² Yet the system would lead to greater variations in work hours supplied (and demanded) through time. The important point here is that work extending the basic model has been dependent on newly available datasets, and additional data may help resolve the issue of the relative importance of some of the new features of models such as uncertainty and public policy variables.

Intertemporal labor supply models have also been the basis for recent analysis of retirement behavior. A widely observed phenomenon in industrial societies has been the growth of early retirement. The first microlevel analysis of this was by Morgan and Barfield (1969) who indicated that there appeared to be two groups of early retirees. One group planned to retire early and carried out the required work, earnings, and asset accumulation plan in the preretirement period. Another group retired early because of events which occurred (such as illness) for which they had not made provision. Part of the favorable financial status of the planners was their social security benefits.

From observing aggregate time series, the early 1970's were a time of increasing retirement of people age 62-64. In the U.S. this age group had been allowed to receive benefits. As the number of beneficiaries grew relative to the number of taxpayers questions arose over the incentive effects of Social Security. The initial microlevel analysis was largely atemporal and based on cross-section data. Persons eligible for benefits were seen as responding to these benefits in a myopic, single period fashion and

²² See the recent paper by Topel and Welch (1980).

worked less or not at all because of income effects arising from the basic guarantee and because of substitution effects embodied in the high benefit reduction rates as market earnings increased.

The second round literature was more intertemporal and emphasized social security wealth as an inducement to retire and as an inducement to less preretirement work hours and private savings. It was typically based on micro panel data. As additional work was developed in this intertemporal framework using micro panel data, several researchers discovered that added hours of market work in the preretirement period led to marginal discounted retirements benefits - adjusted for survival probabilities - which were often substantial: in many cases the social security system could act to increase preretirement hours.²³ If this actually happened the difference in net hourly wage between those who are just prior to age of eligibility and those who had just reached the age of eligibility could be substantial. In the context of the basic intertemporal labor supply or lifetime labor supply approach the system could affect the timing more than the total hours of work over the lifetime. Sharp differences in work hours between the nearly eligible and the recently eligible could give a greatly exaggerated picture of the lifetime labor supply effects. This issue has not been fully explored and there appear to be substantial data limitations on work of this sort in the near term.²⁴ In one study in which marginal social security wealth is related to retirement, no significant relation is found. Mitchell and Fields conclude that ... "retirement is affected ambiguously by social security eligibility, by current dollar benefits, by social security wealth and change in social security wealth."

²³ This has been observed in the work of Blinder, Gordon and Wise (1980). See, for example, Alan S. Blinder (1980, 1983).

²⁴ See Olivia S. Mitchell and Gary S. Fields (1983).

Most of the work in this area has been done without employing a full life cycle theoretical model with endogenous wages and a labor-leisure choice. While such models are not easy to work with, several have been developed and analyzed yielding the following qualitative insights: (i) It is common to find that an increase in financial wealth will lead to less market time during the life cycle,²⁵ including early retirement, (ii) More able individuals - those with a greater ability to learn and therefore a larger steady-state human capital stock will have (finite) life cycles characterized by a more accentuated earnings path, later retirement and greater life cycle savings during their earnings years.²⁶ Greater levels of both private pensions and Social Security benefits can be associated with such an earnings and retirement plan; as a result, without controls on ability it is entirely possible to observe a positive relation between pension wealth or Social Security Wealth (SSW), and later retirement.

Some studies report a positive relation between SSW and length of worklife.²⁷ The finding of a positive relation between pensions and retirement age is also consistent with the belief that pensions can be and are used to induce workers to stay with a firm and not leave after there have been substantial firm specific investments in human capital. See Chapter 6. Here retirement is one way in which an experienced worker can leave the firm.

²⁵ James J. Heckman (1980) provides a model which illustrates this point.

²⁶ See Harl Ryder, Frank Stafford and Paula Stephan (1976). See especially the discussion on p. 667-68. These topics are discussed by Yoram Weiss in Chapter 13.

²⁷ See Robert L. Clark and Thomas Johnson (1980) and Daniel S. Hamermesh (19). In a similar vein, Blinder (1983) reports a modest positive effect of private pensions on probability of market work for those age 58-60.

What are the implications of research to date on unemployment and retirement? It appears that the reformulated theories of behavior can be tested with an augmented set of variables in some of the main on-going data collection projects. Special supplements could be added to the CPS, and because of the continuing panel data collected in the PSID and NLS, new reinterviews could include variables specifically designed to test reformulated hypotheses. In fact, this feedback between testing, reformulation of theory, and new data requirements has characterized these three important data sets and probably accounts for much of their high utilization rate which we observed in section I.

Some of the variables suggested by the preceding discussion of retirement are indexes of market ability, characteristics of the pension plan, whether job skills are firm specific, tax treatment of social security benefits (which will in turn depend on other variables such as family structure), and measures of knowledge of the basis for retirement benefits in the public and private pension plans. Key variables suggested by the preceding discussion of unemployment are better wage measures, since changes in wage rates will be heavily influenced by measurement error in the wage itself. To this we should add measures of the household's financial wealth, measures of consumption commitments as indexed by expenditures in different categories and debt repayment.

III Advantages and Disadvantages of Different Types of Microdata and Some Data Based Pitfalls

If panel microdata have such an increasing role in empirical analysis why not devote resources to just a few good panel data sets and forget the rest? Much has been written on the virtues of panel data, but there are several drawbacks which would advise against the panel data only strategy. More traditional data such as micro cross-section and aggregate time series look attractive in many applications. In the U.S. during the late 1960's and throughout the 1970's, substantial resources were devoted to collecting and analyzing data from social experiments,²⁸ but as observed in section I, these data have received relatively little use in publications in major U.S. journals. Rethinking the collection of data for social experiments is important since, in principle, one can employ decision theory and cost-benefit criteria in determining a scale of evaluation. In this section it is suggested that an extension of this perspective can be useful in obtaining rough judgments about the process of collection of non-experimental data.

This section begins with two subsections on the advantages and disadvantages of cross-sectional microdata and panel microdata. The discussion then turns to social experiments and the possible role of international comparisons from standardized survey instruments such as the Current Population Survey.

²⁸ Greenberg and Halsey (1983) report that the cost of the four U.S. income maintenance experiments was over \$ 100 million.

Advantages and Disadvantages of Micro Cross-Sections

A major limitation of many studies based on aggregate time series is that the central endogenous and exogenous variables often all move together through time, and changes in the variables about a time trend is minor. Empirical results are often very different as a result of the inclusion or exclusion of a few observations and minor redefinitions of the variables via atheoretical changes of the lag structures. In contrast cross-sectional microdata are often characterized by many of the central variables being nearly independent of one another, including the dependent and independent variables!

In face of the low correlation among variables in microdata one is left with a quandry as to whether the real world is characterized by very great microlevel randomness in economic behavior or whether it is primarily measurement error which leads to the appearance of weak relationships.²⁹ For example, the topic of earnings risk has received limited illumination from microdata because one cannot tell how much true randomness there is versus measurement error. Some have rushed to infer that luck is a major determinant of lifetime earnings because of large unexplained variation in earnings based on microlevel earnings equations, but we know relatively little about measurement error in many of the key variables. Let us list the problem of measurement error as disadvantage one of cross-section microdata and label it DIC.

A second drawback in the use of cross-section data is that standard research practice in economics seems to be devoted to obscuring the homely nature of the actual questions used in the sur-

²⁹ A problem of this sort plagues microlevel research on the permanent income hypothesis where there are two sources of errors-in-variables: actual income fluctuation and survey errors. See, for example, the Holbrook and Stafford (1971) discussion (p. 14-15).

vey, which may be still a step (or several steps) removed from the proxy variable which is conjured up in the mind of the referee or reader of the published paper. Other social sciences have suffered from this problem, too. Presser (1983) found that "fewer than half of the (social science) articles reported anything about sampling method, response rate, the wording of even a single question, (or) year of the survey ... (which is) not markedly better than the much criticized mass media".

The economics articles reviewed by Presser were clearly the outlier group with only 3.9 per cent reporting the sampling method and 2.9 per cent reporting any question wording. This analysis was restricted to papers based "exclusively on articles reporting data the authors themselves collected or that were collected by other individuals independent of (data collecting) organizations". Therefore, the low percentages of economics papers discussing sampling method or question wording is not just the result of greater use in economics of standard data sets collected by someone other than the author. The relatively low professional rewards to work on such matters is indexed by the fact that only 1 of the 759 U.S. papers reviewed had data concerns as a central topic, and that was a relatively general discussion of the role of data from negative income tax experiments the gap between theoretical construct and the actual question or operationalization used in research was remarked on by Leontief (1982) and seems to apply to micro cross-section data as well. Let us label the problem of the disparity between the theoretical variable and the actual question or question sequence used to construct an operational index of the variable as D2C.

Very little work has been done to overcome these two disadvantages of micro cross-section data, but recently more studies have

begun to appear on such subjects,³⁰ though not in the journals reviewed in section I. In the case of market work the usual question is on how many hours were worked for pay during the last week or month, but this method seems to have problems of several sorts with people usually reporting more hours of market work than actually took place. Studies with beepers programmed to obtain a random sample of time use show that respondents tend to exceed the 24-hour time constraint in daily time allocation³¹ when asked to report directly for time spent in socially desirable activities. For people age 18-24 hours of work actually working, rather than on breaks socializing or participating in on-the-job training, are only about 68 per cent of hours reported in response to a direct question about market work.³²

If hours measurements have unknown validity and reliability this carries over to hourly wage rates which are often calculated as income per time period divided by hours worked per time period. It should be obvious that structural parameters are as likely to be biased as much or more for these reasons as for such reasons as selection bias, truncation bias, or simultaneous equation bias.³³ A favorable sign is that while detailed discussion of data

³⁰ See, for example, Mellow and Sider (1983) and Greenberg and Halsey (1983). These papers have shown not only the nature of data problems but their likely effects in drawing inferences about important research topics. The practice of using multiple indicators of variables measured with error often rests on the unwarranted premise of zero covariances among the errors.

³¹ See Robinson (1984). The beeper study estimates match quite closely the estimates from repeated application of 24-hour time diaries.

³² See Stafford and Duncan (1979).

³³ In a paper which attempts to address this, Borjas (1979) shows how what he terms division bias can alter the sign of the labor function.

problems was not prevalent in the articles I reviewed, there appears now to be more awareness of data problems and analysis limitations based purely on data quality than there was in empirical research ten years earlier. However, the broader problem requires more attention to working with observable and measurable variables in the development of theory as well as better empirical measures.

A third limitation of micro cross-section data is that there are inevitably important variables influencing any given behavior which are outside the scope of the hypothesis in question. This causes no problems if these variables can legitimately be added to the equation disturbances, but this is not defensible in most cases. To illustrate, suppose personal motivation differs across individuals, and one person is far more productive in the market than others of given education and background. Unobserved motivation variables will lead to higher potential wage rates and, if good working conditions are a normal good, people of given observed personal characteristics with higher wages can also have better working conditions - a result in apparent contradiction of hedonic labor market models of the sort discussed by Rosen in Chapter 14.³⁴ If so cross-section data will not permit identification of the parameters of interest because increasing the sample size increases the number of parameters one for one: each new observation implies another value of the unobservable "personal motivation" parameter. Further, ad hoc inclusion of variables to measure personality seems unattractive, and complication of the theoretical model to include personality variables may lead to a model which is too complex or outside the current competence of economists. Let us label the problem of unobserved personal differences as it applies to cross-section data as D3C.

³⁴ Brown (1978) and Smith (1977) summarize most of the empirical findings up until the last few years.

A fourth drawback of cross-section data is the limited potential to characterize market equilibrium and even individual level equilibrium.³⁵ The implicit or explicit framework in most studies using micro cross-section data is one of partial equilibrium with no ability to answer such questions as whether, for example, market wage rates will change in response to a government tax policy or whether an increase in those attaining a college education will drive down the returns to education and by how much.³⁶ For such questions aggregate data of various sorts are more widely used. Let us label the partial equilibrium nature of most work utilizing micro cross-section data as D4C.

A fifth drawback of microdata in the minds of many economists is the availability of large numbers of subjective or attitudinal variables. A common assumption of economic theory is that preferences, though unknown, are stable. Theories are developed so as to place only few general restrictions on the structure of preferences. Behavior will be altered in light of changes in the opportunity set, and, because the opportunity set is defined by "hard" economic variables, it is best to work with such facts rather than subjective data. Beliefs, preferences, attitudes, and the like are better left to other disciplines. Even theories which place heavy emphasis on expectations are worked out to deduce the consequences only for observed "economic" variables.

³⁵ An intriguing example of individual level equilibrium is micro cross-section estimates of the income elasticity of the demand for housing. The elasticity as estimated for a sample of recent movers is much higher than for all households in a paper by Morgan (1963). One interpretation is that recent movers are more likely to have aligned actual and desired housing stock. However, recent movers may have an underlying demand elasticity which differs from the entire population.

³⁶ See Johnson (1970) for analysis of this question. He utilized aggregate data.

A safer practice is probably to admit to limitations of attitudinal or perceptual variables but to avoid being doctrinaire. An illustration of this is in work on intertemporal labor supply. Wage variations are difficult to measure since wage levels are difficult to measure in the first place. Therefore, respondent reports of whether current wage is unusually high or low may be better than elaborate calculations of wage changes, and use of respondent reports of wage change was more successful in recent work by Dau-Schmidt (1983). The proliferation in the use of atheoretical attitude or preference variables can be noted as D5C.

Most surveys are based on some form of geographic or area sample in order to reduce interviewer travel costs. This means that the samples are not truly random samples of the population, and there are effects of sample design on statistics derived from the sample as noted in Kish (197). To illustrate, standard errors are understated and, while there are methods available to calculate the sampling influences, this is seldom done. The cost saving departures from pure random sampling are a limitation of many micro cross-section data, D6C. If the sample selection is done in a way so that probabilities of selection are not known, then, for models with an erroneous or incomplete specification, generalizing the results to a population of interest is not possible.

Inadequate sample size and lack of comparison group observations when analyzing special labor market groups such as blacks or unemployed is another disadvantage, D7C. In a usual cross-section only 4-10 percent are unemployed at a point in time. To remedy this it is common to design a sample of only the unemployed such as those covered and receiving benefits. However, this is a selected sample and excludes those not covered. A better but more expensive method is a screening survey applied to a

random sample with lower selection rates for those who are determined to be not unemployed in the screening section.³⁷

With all these problems why are so many papers in major journals based on cross-section surveys? A part of the answer is in the information cycle suggested in Section II: This is a relatively new form of economic data and computers provide for a period of low cost discovery which may dwindle through time. The use of microdata recalls the story of the drunk who lost his money on the dark side of the street but looked for it under the light because he could see better there. Perhaps we will keep looking at microdata because they illuminate some questions even if other questions seem more interesting. In a more positive vein, what attracts researchers to micro cross-section data?

Two main advantages of micro cross-section data are: The flexibility provided in subset selection for hypothesis testing, AIC, and the ability to measure a large number of variables for the same individual or household which could influence behavior of these decision making units, A2C. These two features are important because microeconomic models have been developed to interpret a wide array of individual behavior and because economic theory does not purport to have a comprehensive theory of all behaviors as they interact in the microeconomic process. Thus, for example, it becomes important to select women who are married of a certain age in studying labor supply rather than attempting a comprehensive theoretical and econometric model of labor supply (and other activities) in which adult, married females are just one case and in which, male teenagers are another and in which those nearing retirement are yet another. Normally, the medium range theoretical-econometric model will, for reasons of tractability, apply to one of these groups and one or two behaviors. As

³⁷ A claimed drawback of PSID data is the inclusion of observations from an earlier SEO sample of poor persons. This subsample is selected on the general outcome of low income and can bias certain estimates. Many researchers restrict their analysis to the random sample. This sample is in fact not random either since it is based on geographic sampling procedures as noted in D6C.

new issues arise and interest changes from one group (teenagers) to another (retirees) and from one behavior (labor supply) to another (savings) a good general-purpose, random, national probability sample can be deployed to analyze behavior without the need for time consuming developments of a special purpose questionnaire.³⁸

A parallel to the advantage of flexibility in subset selection applies to design of the survey instrument and coding categories of the variables. The basic variables should be gathered and coded in the most elemental level if costs are not prohibitive and respondents can actually report the data elements. This leads to advantages A3C, the possibility of variable redefinition from disaggregated variables. Again, examples are helpful. If we were gathering data for the single purpose of testing the hypothesis of the effect of transfer income of individuals on their time in market which appeared to suit our purposes and set out to collect these data in a survey. What we would discover in a pretest is that people cannot respond to a question which asks about transfer income but can report income received from various particular sources such as unemployment insurance, food stamps and so on. Further, market work time might include travel to work and exclude on-the-job leisure, and these may be easily coded from responses in a 24-hour time diary. For the purpose of the question at hand it may be useful to define transfer income as the sum of five or six income components and to define market work to include on-the-job training time but to exclude on-the-job breaks. The next user may have a critical need to include on-the-job leisure in market work since the issue might be how many hours the person is not available for home childcare. Similarly, an aggregation of transfer income is not helpful for the researcher

³⁸ This will be true if the right variables are measured as well. A common problem in survey design is anticipating possible future uses of the data. This sometimes leads to a desire to include every conceivable variable influencing microeconomic decisions. Budget constraints and limits on respondent patience limit this if nothing else does.

studying the effects of unemployment or the next trying to describe the distribution of food stamp receipts.

A limit to disaggregated variables in data archives is that some of the disaggregations may be the result of meaningless distinctions at the level of the respondent. In the United States respondents may not know whether they received regular Social Security benefits or Supplemental Security Income benefits even if it is of interest to researchers and policy analysts. On the user side a limit to disaggregation can simply be the cost of performing the necessary aggregation to define meaningful variables. If there are certain standard variable aggregations which are commonly used (e.g. all transfer income) they can be in the file but this does not argue for discarding the data on elemental measures from which they were constructed.

Computer power enters the discussion in several ways. In the last fifteen years it has become easier to store strings of variables in ways which lead to faster aggregation in the process of variable redefinition. An illustration of this is found in time diary coding. One can impose a prespecified grid of, say, 10 minute intervals (i. e. 144 fixed length segments per day) or let the respondent report a chronology of activities which will typically have somewhere from 15-50 entries per 24-hour day each of which will require a complementary variable to record the varying time length.³⁹ Fifteen years ago this variable entry chronology with detailed codes per entry would create a major, almost impossible, computing problem to create an aggregation across entries into, say, 100 codes for 2000 observations. Today this is only a moderately arduous task and researchers can specify their own variable definitions based on elemental variables. These same advances in computing power make subset selection a simpler task as well.

³⁹ The practice of variable length records is essential in other applications as in the PSID coding of information on varying numbers of individuals in a family unit.

The ability to use certain variables which can index the given data set to other data sets and match the data can be listed as advantage A4C. For example, information on which SMSA of residence can allow the addition of unemployment rate and wage variables for the SMSA as variables influencing individual behavior. This has become a rather frequent practice, as noted earlier.

Advantages and Disadvantages of Panel Data

Many of the advantages and disadvantages of panel data are implicit in the discussion of econometric methods designed for panel data.⁴⁰ We can refer to advantages and disadvantages of micro level panel data with the designation used from micro cross-sectional data, replacing the C with a P. Some of the advantages of panel data turn out to be a reduction in the disadvantage present in cross-section data.

D1P: Panel data, it is claimed, are more subject to measurement error than cross-section data. One is often using change measures derived from successive observations in time, and the apparent change can be dominated by different values of the errors in successive time periods. It is for this reason that in his chapter Lewis restricts his analysis of union wage effects to studies based on cross-section data. If one postulates serially correlated measurement error, as do Duncan and Holmlund (1983), then panel data have an advantage, so one cannot conclude that panel data universally suffer more (or less) from the problem of measurement error than do cross-section data

D2P: The disparity between theoretical variable and the actual question or question sequence applies to panel data as well as cross-sectional data. However, for actual change variables, such as change in assets or hours of market work one can derive these variables from simple repeated questions rather than from respondent recall. The same paucity of reports on sampling and questions describes panel data, for the most part, but since the variables defined by change measures seem to be regarded as more innovative, there tends to be more discussion of variable construction. This is just an impression I have from my review of journal articles.

⁴⁰ See The Econometrics of Panel Data, Institut National de la Statistique et des Etudes Economiques (1978).

D3P: Panel data have the problem of unobserved personal characteristics, but this is usually thought to be surmountable through statistical method. A substantial econometric literature has been developed to exploit the notion that if there are unchanging unobserved personal characteristics panel data can be used to limit their effects on estimation of other parameters. This work is illustrated by the papers by Chamberlain (1978) and Heckman (1981). In one important application, studies of compensating wage differentials seem to have had more success using panel data. Here success is defined in terms of result more in line with the a priori expectation of the theory as summarized in the chapter by Rosen.

A limitation of the methods applied to panel data is that the person-specific effects derived in models of heterogeneity and state dependence may not really be personal characteristics but rather persistent unobserved environmental variables such as job market characteristics, as could be the case in the analysis of youth unemployment by Ellwood (1981). Thus, unobserved variables which permanently influence behavior are still a problem though less so in panel data. Further, attention is often centered on movers or changers, who may differ from others.

D4P: Just as in micro cross-sections, market equilibrium is seldom characterized though models of adjustment to equilibrium by price taking individuals are possible.

D5P, D6P, D7P: Largely the same as for cross-section data. Panel data allow for a better opportunity observe rare events since individuals are studied over a longer time period.

D8P. Panel response rates fall through attrition and this can be a severe problem. If response rates on the initial interview are 70 percent and as high as 90 percent on each subsequent reinterview, a panel study of work history over ten years would have mere 27 percent of the original sample by the tenth year. Certainly one can cope with some of this problem by econometric meth-

ods, but a cost is that one has to specify a valid attrition process and even if the specification is correct it will typically preempt identification of other parameters of interest. A very serious problem occurs when there is no knowledge of the characteristics of initial non-respondents. This applies to both cross-section and panel data. There have been no major breakthroughs on the problem of getting a higher initial response rate.

D9P: Panels require unchanged question wording and questionnaire layout in successive waves of the panel. In implementing a panel study it is essential to have set question wording and questionnaire layout. Otherwise, changes in the values of the variables through time could arise simply because of changes in question wording. (This also applies to use of repeated cross-sections as in the measurement of unemployment from the CPS.) This point is obvious. As a practical matter there will always turn out to be problems with some questions which are discovered after one or more waves of panel data are collected. Should a better question replace the problem question midstream? The answer is not obvious because if there are several remaining waves one can get better questions and change measures over the remaining waves.

Also, numerous cross-sectional uses are made of data from panels. Why not just ask both the right and the wrong question sequences when a problem is discovered midstream? There are budget constraints and respondent irritation constraints. The point here for data users is that they should look at the actual question and question sequences used in different waves of a panel rather than assuming that there were no changes in wording or layout as the panel progressed.

Advantages of panel data include all of those for cross-section data and a few more. A1P, A2P, A3P, A4P: Same as for cross-section. Change variables derived from panel data greatly expand the set of variables available for analysis and in subset selection. Panels allow for greater opportunities to observe changes in prices and wages.

A5P: Dynamic models can be fit using data collected at different time points to define change rather than respondent recall measures of the values of variables at different time points or change therein. In studying savings behavior and adjustment of financial portfolios there is some evidence by Ferber (1976) that repeated measures of assets and change therein as calculated by the researcher provide better data than respondent recall of change in assets of various types. The details of unemployment spells and work history are difficult to recall, but simple reports collected weekly (for unemployment spells) or yearly (for work history) are probably quite accurate. Note that respondent attrition and annoyance with frequent reinterviews are practical considerations which could be dominant.

A6P: Panel designs allow several interview sessions in which to collect variables which are unchanging through time. It is unrealistic to have a personal interview which lasts more than about one hour unless the subject matter is very salient, personally interesting and non-threatening to the respondent. Questions asked by economists often fall on all three counts! Panel data, through the opportunity to reinterview, can be thought of as allowing a longer interview session.

A7P: Panels can be more cost effective. Reinterviews, particularly by telephone, are cheaper than initial sample interviews. Suppose one simply wants to estimate population means on certain variables which are subject to year-to-year or day-to-day variation. For a given research budget how many individuals should be included and how many times should each be reinterviewed? It can be shown, as in Kalton (1984) that cost-effective description can require the collection of reinterview data. Such data will permit an assessment of reliability which can be useful in various research application.

A8P: A large on-going panel can be used to evaluate the effects of policy changes. Do changes in the U.S. tax laws intended to reduce the marriage tax effect labor supply and marital stability? Data from on-going panels such as the NLS or PSID could be used to get an approximate answer to this question, even though panels were in place before the marriage tax was an issue of policy concern. Similar remarks hold for changes in retirement benefits which will likely occur in the U.S. Social Security system.

Have Social Experiments Been Useful in Labor Economics?

Social experiments conducted in the United States were based on microdata and, particularly, for the last of the four devoted to studying labor supply responses to income support, the Seattle-Denver Income Maintenance Experiment, the data structure was one of micro panel data extending over several years. The data from all social experiments were used in only about 2 percent of labor economics papers in our sample during the last ten years. What are the features of experiments that distinguish them from other sorts of microdata?

By postulating a specific, behavioral model and utilizing non-experimental (field) survey data, one can obtain an understanding of how an individual's labor market hours change in response to changes in after-tax wage rates and lump sum transfer payments. From such knowledge one could predict the labor market hours of households under alternative income support arrangements which differ in the extent to which they change after-tax wage rates and income guarantees. From analysis of field studies, notably large scale household surveys, labor economists have a consensus view that adult males have a labor supply which is relatively unresponsive to changes in income or wage rates while adult women have a labor supply which is quite responsive to changes in income or wage rates. See the chapters by Pencavel and by Heckman and Killingsworth. Given this prior research, a central issue is the role of experiments.

One possible role for experiments is to verify the impression from field studies and to assure policy makers, who are unaccustomed to the ways of academic research. Policy makers will take the experiment as clearer evidence since experiments do not require one to make a commitment to any particular structural or behavioral model. Policy makers, it is argued, can remain agnostic or uninformed about scholarly research and can use the experiment to answer the direct question of whether a particular income support system induces people to alter their hours of market work.

If we define the traditional labor supply model as one where a single person with a temporally stable objective function faces a temporally stable, exogenous wage rate with hours of work set totally on the supply side, then the share of the labor force for whom this applies is probably very small. The NIT induced labor supply responses predicted under alternative approaches such as those suggested by the work of Ashenfelter and Abowd (1981), Ham (1980), Heckman (1974), Phelps (1970), Feldstein (1976) and Deardorff and Stafford (1976) would differ from those predicted by the traditional model. Even where hours of work predictions are similar, some of these alternative approaches highlight periods in and out of employment.

If there is uncertainty as to which theoretical approach should be used, experiments look more attractive from the perspective of policy formulation. If the policy alternative is known in terms of both type (e.g., NIT versus wage subsidy) and magnitude (e.g., guarantee $G = \$5000$, and tax rate $t = .5$) and the experiment covers a random assignment of those in the various labor market circumstances, one can evaluate overall labor supply effects regardless of the true theory. Either a total absence of theory or an abundance of competing theories seems to strengthen the case for experiments! This is summarized in Table 3.

Table 3 **Conditions for Using Experiments (E) or Field Studies (F) for Policy Evaluation**

		Policy Alternative	
		Certain	Uncertain
		I	II
Theory	Known	F or E (nonexperimental use of data from experiments)	F or E (nonexperimental use of data from experiments)
		III	IV
	Unknown or many	E	Neither will help much

When the theory is "known" and the policy is certain (Case I) the choice of experiment versus field research should be determined largely by the cost of evaluation under the two methods and the extent to which one believes that variations in exogenous variables from these two data sources really are just that. Analysis of the experimental data often employs a structural model just as does the field model. That is, experimental data may be used to fit structural models in the well-known theory - uncertain policy case, because it is believed that only the experimental treatments are likely to represent exogenous variations in the same variables reported in field surveys (Case I and Case II). The use of experimental data to estimate structural models (non-experi-

mental use of data from experiments) characterizes much of the analysis from the experiments.⁴¹ If the real world generated observable variations in the exogenous wage and income variables then, on a cost basis, field studies would dominate. A good deal of the debate on whether experiments are "worth it" depends on one's belief in the ability of the real world versus the experiment to generate truly exogenous variation in critical variables.

What are some of the sources of policy uncertainty? Voucher and categoric aid programs are common and combine with the cash transfer system. Some of the former programs such as the Food Stamp Program are income conditioned and thereby influence the effective marginal tax rate on labor income. For this reason it is often suggested that these programs be "cashed out" and blended with a universal cash transfer system. However, various categoric programs such as those for medical problems are not so simply dealt with. These needs-based programs will likely continue, and the issue of how they interrelate with the cash part of the system has never been resolved. This leads to uneasiness about the desirability of a NIT and, in turn limits the payoff to a purely atheoretical use of the experimental data.

The results of the U.S. negative income tax experiments could be summarized by saying that they did not change people's beliefs about the mean of the subjective distribution of key labor supply parameters. The results have been in line with what has been learned from studies based on non-experimental data. In light of a small disparity one reaction might be that experiments were not worthwhile, but to answer this question one should think of these experiments in the framework of statistical decision theory. The first two ingredients in such an approach are:

⁴¹ See the papers reported in "The Seattle and Denver Income Maintenance Experiments", Journal of Human Resources, Fall 1980.

(1) listing the critical parameters about which we are uncertain and relating these parameters to (2) a loss function for policy decision variables. In the case of NIT let us assume that there are two critical labor supply parameters and two policy variables, G and t . How large a sample should be drawn given some known cost per sample point? We must first begin by defining a function that relates gains to selecting G (the guarantee) and t (the tax rate) conditional on values of the unknown parameters. This can be set out with a labor supply function and an indirect utility function for the NIT recipients as is done in Burtless-Hausman (1978). The labor supply function is given as

$$(1) \quad h = k(w(1 - t))^a(Y + G)^b$$

where h = hours of market work, w = wage, Y = non-labor income, and a and b are the critical labor supply parameters. Welfare of the recipients can be expressed as

$$(2) \quad V = V(w(1 - t), Y + G) = \frac{k(w(1 - t))^{1 + a}}{1 + a} + \frac{(Y + G)^{1 - b}}{1 - b}$$

where $V(\cdot)$ is the indirect utility function or maximum utility that can be obtained given $w(1 - t)$ and $Y + G$, for given values of a and b .

The "taxpaying" factors give a payment, P , of

$$(3) \quad P = (G - twh)n$$

to the n recipients.⁴²

⁴² This is obviously an oversimplification because who is a taxpayer and who is a recipient depends on whether $G - twh$ is positive or negative for a given individual. Here we assume that all n recipients have known, identical values of w and Y and have unknown but identical values of a and b .

Substitution of (1) into (3) provides an expression for the taxpayer costs. How does one translate this into a decision theory framework to address the question of the optimal scale of evaluation? First, suppose we knew a and b with certainty. What would be the optimal values of G and t ? Here it seems necessary to impose an arbitrary social welfare function. Following Orr (1976), suppose the taxpayer gets Z utils from the utility of the welfare recipients.

$$(4) \quad Z = Z(V)$$

where $Z \geq 0$. One reason for this would be altruism. Another could be that the taxpayer assigns some probability that chance will place him or his heirs in the recipient category. If a and b are known, the task is to choose G and t to maximize taxpayers' net utility.

$$(5) \quad B = Z(V(w(1 - t), Y + G; a, b)) - P(G, t; a, b)$$

The reason for a social experiment or survey is to provide better information about a and b . These are not really known but are given by a joint prior p.d.f. Given the joint prior p.d.f. there can be defined an expected value maximizing choice of G and t in (5). Perhaps, however, we can do better through evaluation.

A sample that costs c per observation can be drawn to carry out the evaluation. As we contemplate samples of differing sizes, we may expect to leave the mean of the joint p.d.f. on a and b unchanged but to reduce the posterior variance. The incremental gain in the maximum expected value of B as we contemplate incremental sample sizes can be compared to the marginal sampling cost, c ,⁴³ to determine an optimal sample size. In such an analysis the scale of the program (here, n) will be important and cost-benefit analysis, could justify large evaluation expenditure of the magnitude involved for the NIT experiments (\$ 100 million or so).

⁴³ The cost per observation also depends on a and b but we can ignore this here.

Actual implementation of the approach set out in (1) - (5) would require a computer simulation and would require some prior joint density function for a and b. Those who are skeptical of non-experimental labor market studies would want to use a diffuse prior while others would want to use a rather tightly drawn prior. Simulation results would show a range of optimal sample sizes depending on the prior density function. An important point of such an approach is that if the posterior mean values of a and b turn out to equal the prior means, this is not the basis for concluding that the experiments were not worth it. The expected post-experimental parameter precision will be greater and the expected value of the best policy can therefore be increased above its pre-experimental value.

Some aspects of the above discussion of the payoff to experiments in labor economics apply to the payoff from large-scale, non-experimental data sets (including time series). In principle, the application of econometric models to large scale data sets can inform us about structural parameters, and this information can be used for better policy making in the sense of accepting policy alternatives with smaller expected losses or in realizing that a lack of existing parameter precision implies large costs of uncertainty for specific policy choices. With experiments there is a greater focus on a single, specific policy option prior to developing the data set. Non-experimental data sets can inform a wide but unknown range of future private and public policy choices, making it impossible to write down an explicit function of the economic gains to additional data. There is also the problem noted above that the real world may be less likely to have truly exogenous variations in variables of interest.

From the numerous policy related topics which have been illuminated by labor economics research, one could probably rationalize the resources spent on data collection and analyses. There are usually papers which provide a useful summary of main findings and policy implications, such as the paper by Hamermesh and Grant (1979). The net payoff to additional data and analysis de-

depends on data quality (which influences the gain in parameter precision per sample point), cost of data and processing, and the change in loss functions conditional on added parameter precision. This says that labor economics should identify and work on feasible problems with major implications for the organization of society, and this seems to have occurred to a reasonable degree from the review of subjects in Section I.

In the context of decision theory there seems to be an important role for collection of identical datasets in several countries which differ in terms of policy. Political choices effected by chance factors, such as differences in median voter beliefs about alternative, discrete policy regimes, can be thought of as the basis for exogenous changes in major policy variables to which individual decision units respond. For example, Sweden, Japan, the U.S. and Canada are similar in many ways but have major differences in public policy variables such as tax treatment of married couples, deductability of interest on home mortgages and so on. If several countries collected identical sets of microdata, there would be more opportunities for policy analysis as well as estimation of structural parameters of general interest. Few papers based on data of this sort have yet appeared in the labor economics literature.

Limitations of Research Based on Micro Data

The evolution of most research areas in labor economics has given rise to reformulations of the theory and application of more specialized econometric models. Virtually all major areas have what can be termed a second generation or even third generation literature. A common pattern is that the basic conceptual model is extended in several dimensions and work is done emphasizing one or two particular dimensions per paper.

One can be skeptical about the prospects for a substantial synthesis of the various elements of the second generation work. This is not surprising since the data actually available and perhaps even potentially available do not contain enough information to abandon the maintained or restricted hypothesis testing approach to empirical work. Specifically, many of the second generation efforts achieve identification by testing much less than the joint hypothesis of all the interesting extensions of the basic model. This implies that the power of the tests on the restricted models is less than desired.

This dilemma of low power tests could possibly be resolved in future work by using two approaches. One approach would be to develop a more complete representation of the opportunity set. To illustrate, the issue of whether fixed costs of labor force participation or preferences account for the apparent discontinuity in labor supply response Cogan (1980) - wherein people work substantial numbers of hours not at all - could be resolved by actual measures of fixed time and money costs of market work rather than testing for the labor supply function parameter implications of fixed costs. Secondly, if we had better information to characterize directly the opportunity set we could employ non-parametric approaches to labor supply analysis as suggested by the recent work of Varian (1983). In that approach one obtains upper and lower bounds on preferences, and the presumption is that the range of these bounds is meaningful only if the opportunity sets facing different individuals can be represented. This non-paramet-

ric approach will preclude some of the controversies which now arise based on maintained hypotheses about the fact that there is a very limited set of restrictions one can place on preferences based on theory per se.

IV Conclusion

Theoretical and empirical research in labor economics has been broadened and accelerated by the advent of large scale microdata sets. The use of these sources has allowed us to know some things with much greater certainty - as illustrated by the work on labor supply responses to social insurance and income support programs such as unemployment insurance. On the other hand the better data have led to posing more ambitious research questions - such as "What is the response to wage variations through time?" In some cases research has led to a realization that we cannot characterize the world in a very simple way. An important illustration is that we do not now have a clear understanding of unemployment by simply characterizing the phenomenon as a special case of labor supply. Additional breakthroughs are required on the theoretical as well as empirical side.

Another consequence of better data has been an awareness of the fact that some conceptual models have limited prospects for detailed understanding. One such area is labor supply and demand synthesis. A prototype model is the hedonic labor market model. We know much less about such supply and demand synthesis models for two reasons. First, such models are more difficult to construct since one needs a demand side theory as well as a supply side theory and secondly, such a synthesis leads to much more limited prospects for identification. One only observes the market envelope, and this reduced form approach does not permit one to capture underlying supply and demand side parameters.

Research on labor market supply and demand synthesis models is limited by the absence of good demand side information on firms. As a result many of our stylized facts have a supply side bias - we think more, for example, of the worker's fixed employment costs than the firm's fixed employment costs. Analysis of the work incentive effects of unemployment insurance centers on labor supply responses rather than to variations in wage offered by employers as product demand varies. Clearly our knowledge

would be greatly improved by additional, microlevel demand side work which would fit into the substantial knowledge which has been gained on the supply side.⁴⁴

⁴⁴ See Walter Oi's recent paper (1983). He presents an analysis of the fact that within an industry the more highly capitalized firms achieve a higher rate of capital utilization, pay higher wage rates to workers with similar observed characteristics and have a larger share of compensation in the form of non-wage benefits. This can be thought of as consistent with a labor supply and demand synthesis or hedonic equilibrium. Here longer and more predictable hours of the higher wage workers are not a simple labor supply phenomenon.

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