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## **HOUSEHOLD MARKET AND NON-MARKET ACTIVITIES**

Research program and proposal

by

Gunnar Eliasson  
Anders Klevmarcken



THE INDUSTRIAL INSTITUTE FOR  
ECONOMIC AND SOCIAL RESEARCH, STOCKHOLM

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## FOREWORD

Research and knowledge on several important problems related to the household sector in Sweden have long been held back because of a serious lack of statistical data of sufficient quality. For instance, information on the relationship between the household and production sectors and the determinants of saving and labor supply is simply lacking. Much of what is needed already exists in the United States.

To remedy this situation the Institute has taken the initiative to prepare a large research project. Provided that sufficient external funds are made available, the proposed project is to be undertaken together with Professor Anders Klevmarken at the Department of Statistics at the University of Gothenburg. Professor Klevmarken is spending the current academic year at the Survey Research Center, Institute of Social Research (ISR) at the University of Michigan, where much research in this area has been initiated.

The basic idea of the project is to merge data on individual household time-use, Use of subsidized public services, private consumption expenditures, and saving into one survey. In this respect the proposed investigation will be a pioneering study in econometrics. Costs for the field work of a study of this kind will necessarily be very large and far beyond the resources of the Institute. The benefits of a project like this will largely accrue to the research community at large. By engaging in the preparatory work of this study the Institute wants to emphasize the view that more research should be devoted to improving methods of measurement in economics, if necessary at the expense of other areas.

This report contains a summary presentation of what has been done in this and adjacent areas, what methodological experience that exists and what this tells us about the optimal design of such a survey. Cost estimates and notes on the managerial organization of the project are appended.

We believe that this preparatory work is of sufficient general interest to be published in the IUI research report series.

Stockholm in February 1981

Gunnar Eliasson

## 1. INTRODUCTION AND OBJECTIVES

Empirical studies of market and non-market activities of households in Sweden have mainly been based on aggregate time-series or single cross-sections. Because of data limitations, cross-sectional studies have typically been restricted to one aspect of household behavior at a time. Examples are the personal distribution of income and the consumption of goods and services. This has severely limited the possibilities of analyzing the dynamics of household behavior, i.e., how labor supply, time-use, income, savings, the consumption of public services and private goods and services change over time for various groups of households and how the activities of a household are interrelated and also dependent on the activities of other households as well as on the action of other economic agents, including government policy. It has thus been almost impossible to analyze how economic policy measures like tax changes, supply of public services and changes in labor market legislation simultaneously influence more than one aspect of consumer behavior. The estimates of the effects of such changes might then have been underestimated and otherwise distorted because the interdependence of the activities of a household has been neglected.

The success of future research in this area thus very much depends on the availability of household micro data. One purpose of the project proposed by us is to initiate work on a new data file of household data. We want to emphasize the need to create and develop a new comprehensive measurement tool for the study of household economics as seen in contrast to the use of data collected to suit a particular administrative purpose. We know that it is not an easy task to overcome the methodological problems but previous experiences from, for instance, Norway and the United States indicate that we should be able to build up such a file also in Sweden. Longitudinal data or panel data would be

most desirable for the analysis of changes in household behavior. To create and maintain a longitudinal file, would require the collection of data to go on for a long period of time. If we are interested in knowing about the adjustment process in household time-use and consumption patterns that is currently taking place as a consequence of decreasing real wages the data collection has to be started very soon.

A good example of an already existing longitudinal file is the Panel Study of Income Dynamics at the Survey Research Center, Institute of Social Research (ISR), University of Michigan. It was started in 1968 and data have been added annually for 13 years.

In the project now proposed we intend to initiate the creation of a data base for household research comparable to those in the United States and, furthermore, provide internationally unique information on both time-use, use of subsidized public services and private consumption expenditures from the same observation unit. If the project appears successful we intend to seek co-operation from the Central Bureau of Statistics (SCB) and if needed also from other government agencies with the purpose that SCB takes over the responsibility for the data collection. Experiences from the United States, however, demonstrate how important it is that those who are to use the data also participate in the design and collection phases. Those who will analyze the data need a thorough understanding of the properties of the data. This is one reason why we suggest that the project for the first few years is run as a pure research project. A close and immediate co-operation with the SCB is, however, needed anyhow. Access to already existing files makes a joint venture between us and the SCB necessary and we will also need co-operation with someone who has a field organization for surveys. Relevant executive and research staff at the SCB have been informed about this planned research venture. They have expressed a strong, positive interest in the

project and do, indeed, wish to support its continuation if this first methodological part appears promising. For the SCB better household data is a priority area. For SCB to continue this project beyond the research planning horizon, the financing of course is dependent upon the regular SCB budgeting procedure and authorization from the Ministry of Economics.

After data have been collected, cleaned and deidentified we intend to make them available for research outside our own group to the extent that the Swedish data law permits. The "public use tapes" policy of the Survey Research Center at Michigan may serve as a model.

A second purpose of the project covered by this proposal is to use the data for the analysis of household behavior and the particular orientation of that analysis, to be outlined below, will, of course, strongly influence the first part on measurement methodology. (See section 2 below). But there will obviously be many other problems which can be analyzed with the same data. The research problems we suggest are all related to the interaction and interdependency of the labor market, consumption and leisure activities of the household. By integrating time-use, private expenditure, public service use and savings data in the same data base it should be possible to study the entire household production process and we expect - if we succeed - to have done pioneering research. In fact, without this joint approach it will not be possible to understand the supply of labor properly or the work sharing habits (man-wife etc.) of a household.

This project, when completed, opens up a great multitude of research opportunities. Experience, however, from the management of large projects like this one is that they have to be well reined in as to ambition and the number of problems in its early stages, in order not to get out of hand at some later stage. This



is another reason why we suggest that the project for the first few years is run as a pure research project primarily devoted to problems of measurement methodology and a few restricted applications (see below). The design of the project would have to match a set of relevant research problems in economics that will be discussed in the next chapters 2 and 3. But the design also has to be oriented towards solving methodological problems needed for the collection and analysis of the data. These problems are addressed in chapters 4, 5, 6 and 7.

The undersigned (Eliasson-Klevmarcken) will be responsible for the project at large. Docent Bengt-Christer Ysander, IUI, (the use of public services), Dr. Bertil Holmlund, IUI, (the supply and mobility of labor), Docent Göran Normann, IUI, (income taxes) and Dr. Siv Gustafsson, IUI and Arbetslivscentrum, (household economics and allocation of time) will play an active role in designing parts of the survey and later on to use the data in the analytical stage as indicated by their special field. Even if our own approach will basically be economic, research in this area is - and should be - an interaction of economics, sociology, psychology, political science and other fields. Interdisciplinary work is most desirable. For that reason we have had preliminary discussions with Professor Bertil Gardell at the University of Stockholm about an interaction with his research group. One or two statisticians will also join the project to work on design and estimation issues. We also intend to work in close contact with the Uppsala group (Professor Ragnar Bentzel and Docent Jan Södersten, also at IUI), who intend to submit a research proposal in an adjacent field. This forms a rather homogeneous and competent group with a long background experience of working together in various combinations. The size of the project, its administration and its strong relationship with an array of highly important policy problems and above all its high risk content makes us reluctant to enlarge the group further at this stage.

This proposal subsequently contains a description of the research problems we propose, a brief review of the state of art of this field of economics, a summary of a few foreign and Swedish studies of relevance to this project, a discussion of data needs and methodological research problems and finally a plan for the project. This plan gives a relatively detailed account of a first planning and pilot phase, the results of which will determine the final design of the main project, while the plan for the later part of the project is less detailed.

## 2. RESEARCH PROBLEMS

One of the most important features of this project is the collection of longitudinal data. This is not clearly reflected in the presentation of the research problems below since a considerable time will have passed before any longitudinal data to be analyzed have been collected. The only longitudinal data we could hope to obtain within the timespan of this project would come from already existing files (see section 7). The successful completion of the proposed project and its continuation should, however, make it possible in the future to study the dynamics of household behavior in a longitudinal perspective. The basic thrust behind this proposal in fact is that only then will we be able to understand household behavior properly, and this in turn requires the elaborate preparatory research that makes up the proposed project.

There are many problems which require longitudinal data. One of these deserves special mentioning since it is currently in the mainstream of consumer research. Such a project is also under way at the Central Bureau of Statistics in Norway, namely the application of complete systems of demand functions to longitudinal micro data. As mentioned below one of the major difficulties with the traditional application of demand systems to aggregate time-series data is the low informational content of these data and the consequent difficulty in discriminating between models. Longitudinal data might permit more powerful tests of demand models and also make possible the estimation of more realistic models which for instance take into account the dynamic aspects of consumer behavior, the most important being purchases of durables and saving behavior.

We might also mention that there already exists some experience within our research team from collecting longitudinal data. A study of the life histories of business firms has been under way at IUI for a few years within the micro-to-macro modelling project (MOSES).

## 2.1 The supply of labor

### 2.1.1 Labor force participation of both spouses

One of the most important changes since the second World War both in the labor market and in the household is the increased female labor market participation. There are a number of studies of female participation, the female occupational choice and the pay of females relative to males. Most of these have a market orientation and are usually based on relatively aggregated data. The increase in participation rates is basically explained by increased real wages and the increased educational level of females relative to men. We know, however, relatively less about the constraints within the household which affect the decision to participate. The most important would be the need to care for children and the cost of buying services for this purpose from outside the household. Other aspects of the female labor force participation which could be investigated, at least partially, using household data are the match (or lack of match) between the supplied and demanded qualities of labor, the intensity of the search process for a job, the choice between part-time and full-time jobs and the timing of interruptions from market work. Longitudinal household data would make it possible to analyze the female labor supply as joint decisions about children and work, and about the work inputs of husband and wife. Data on perceived opportunities and payoffs in a longitudinal data set would give unique opportunities to study the household's work decisions. In particular, it would help to solve the problems of the two-way causality between wage-rate and hours worked, i.e. the wage-rate does not only determine the supply of workhours, but hours worked might also determine the wage-rate. These data supplemented with information about relative qualifications of men and women in non-market activities versus market work would also make it possible to ana-

lyze the selection bias which arises in estimates of labor supply functions because the wages of those who do not work cannot be observed.

### 2.1.2 Hours of work and investments in human capital

Estimated hours of work are usually based on "stipulated" hours plus hours of overtime worked. This estimate might both underestimate and overestimate the true number of hours. A large share of the labor force does not receive overtime compensation and for this group there is no need to keep records of overtime hours. For many professional and other groups the borderline between market and non-market activities is not very sharp. A journalist who finishes an article over night and an engineer who reads some engineering literature during the weekend to solve a problem encountered on his job, do they use time in the market or not? Most likely their time is not registered as market work. Hours actually worked can also be less than "stipulated" hours since non-work activities can sometimes be done during working hours. For instance, the two time-use studies made at the Survey Research Center, University of Michigan, revealed a larger decrease in hours worked from 1965 to 1976 than the Current Population Surveys from the Bureau of the Census. More accurate measures of hours worked would be of importance both for estimates of the average wage rate and for measures of productivity.

Time-use data could also give more detailed information on the amount of time used for investment activities both at work and at home. This would be of importance for the specification and estimation of human capital models of earnings. Does the time-share for investment activities differ between part-time and full-time jobs? If it does, to what extent would it influence the occupational career and the earnings-profile of women?

### 2.1.3 Non-wage motives for work

The usual motive for labor force participation is that the consumer earns an income which can be spent on utility yielding goods and services. This is a very simplified model of the consumers motives for market work. In particular, if one does not only look at the major decision to work or not to work, but also looks at the number of hours put into work one will certainly find that the consumer to some extent bases his decision on the direct utility he is expected to derive from his work activities. Most likely the consumption element of a work activity is higher in the professional and creative occupations and smaller or non-existing for a blue collar worker at the conveyor belt. The "gross" correlation between consumption content and wage rate would thus be positive. In addition to the intellectual or creative reward an occupation might give, the work environment should contribute to the consumption aspects of a work activity. What is the trade-off between hours worked, the "intrinsic" utility derived from various occupations, work environment, other non-monetary benefits and monetary benefits?

There are studies which indicate that increased automation and computerization decrease the need for personal skill, ability and involvement, while at the same time the share of professional workers increases. Has the occupational dispersion of the consumption content of the job increased? If that is true, can it at least partially explain the decrease in wage and salary differences since World War II? Or alternatively, has the egalitarian incomes and tax policies in Sweden pushed job choices in the direction of work with a larger consumption content?

## 2.2 The influence of work activities on non-work activities

Is it true that those who do not have a stimulating and rewarding job are able to compensate for this by a rich and active leisure time, or is the truth rather the opposite? It can be argued that those who have invested in human capital, whether in school or on the job, will be able to use their time more efficiently not only in their work activities but also in their leisure activities (cf. below). However, since their human capital would be more specialized for use in work activities they may tend to use relatively more time in work and less in leisure. It is thus not clear if those who have acquired much human capital on the balance will derive more or less utility from their leisure time than a person with less human capital. There is some evidence from research done by psychologists that the work conditions will not only influence the worker's efficiency at work but also his leisure time activities. (Meissner, 1971; Gardell, 1976, chapter 11; Abramson & Seligman, 1978; Karasek, 1981). Workers with demanding jobs but with little possibility to influence their own situation have been found to behave more passively during their leisure-time than others. This could be explained to some extent by mere fatigue. Relatively more time is needed to recover. But it might also be a discouraged worker effect which carries over to a passive and uninvolved leisure behavior.

These relationships between work and non-work activities have a particular relevance for the issue of female labor force participation or rather the participation of both spouses. If women tend to get jobs of a routine type, what are the consequences for their non-market activities? More broadly, how does the market work of both spouses influence the distribution of market and non-market activities between household members? The time-use studies from the Survey Research Center at the University of Michigan, have shown, for instance, that increased hours of market

work on the part of the wife does not change the time-use of the other household members much, but she will still have to do most of the family support work in the household. The additional time needed for her market work is taken from her own leisure time and time for sleep. Would Swedish data show the same results? An interesting issue is for how long the female - and thus the whole household - will stand up to this additional work load and stress. In the long-run, some reaction might occur. It could be anything from increased sharing of both market work and family support activities and less time on time-consuming activities like child care, including fewer children, to sickness and divorces. Will the increased female labor force participation strengthen the family as an economic unit or break it?

### 2.3 Non-market activities

#### 2.3.1 Distribution of tasks and sharing of activities within the household

How are non-market activities within the household allocated between its members? Is it possible to distinguish between efficiency aspects and sex roles? To what extent do children participate in non-leisure activities? How much time do household members spend together in leisure activities? How much time do parents spend with their children?

#### 2.3.2 Time-use differences between households

For each activity or combination of activities one could estimate a time-use distribution which would be of interest from a welfare point of view. Is there a large dispersion of time-use between households? Which households will be found in the tails?



Do these distributions hide a low or a high degree of mobility, i.e. will we always find the same households in the tails or not?

### 2.3.3 Life-cycle allocation of time

Not only the allocation of time between market and non-market activities but also the allocation within non-market activities changes over the life cycle. What determines these differences between age groups? Are there generational differences as well? If data would permit, it would be particularly interesting to analyze changes in the time-use of children and of elderly. Do children tend to become independent of their parents (less time spent together) at a younger age? If so, how is it explained and what are the consequences for the household unit and for society as a whole? The time-use of elderly and retired people is of interest because they will soon make up such a large share of the total population.

### 2.3.4 Substitution between non-market activities and purchased goods and services

Substitution of household equipment, ready made food etc. for time intensive family support activities to gain more leisure time is a wellknown phenomenon although we have rarely been able to measure the change in time-use, only the change in consumption patterns. Time-use data would enhance our understanding of this process and improve our predictions of future changes in demand. Even more interesting is the substitution of market work for non-market work to produce goods and services which "normally" would be purchased from outside the household. Examples of these activities are maintenance work on owner occupied houses, cars and yachts. How does the tax structure influence the time-use in market and non-market activities? To what extent are serv-

ices exchanged between households? This survey technique would allow us to shed some light on the character and extent of the so called grey sector.

### 2.3.5 The relation between time-use and consumption of durable goods

Activities do not only take time, they also take inputs of purchased goods and services. Can changes in the demand for goods and services be explained by changes in the time-use of activities or by changes in the input of goods and services per time unit? Furthermore, the causal direction of the relation between time-use and purchases of market goods is not obvious. Certain activities require the input of goods but it is also true that the purchase and possession of durable goods in particular will induce the household to perform certain complementary activities. It is an expensive luxury to have a house, a car, a yacht or a TV without using it. Time-use data would contribute to a better understanding of consumption behavior and of household demand for market goods.

### 2.3.6 The consumption of subsidized public services and goods

The use of public services that are more or less subsidized is an integrated part of the time-use and spending decision of a household. Demand functions for private goods are in principle estimable by using information pertaining to the actual behavior of the household. The situation, however, is somewhat different as far as the demand for public goods is concerned. The quantity of public goods that is provided is the outcome of a political process and will not be the unanimous choice of all individuals. Traditional methods of estimating demand for public goods have related public expenditure by local governments to social and economic

characteristics of the jurisdiction. Several studies of this type have been performed in the U.S. However, there are certain problems associated with these studies (some of them noted in Bergström et al., 1980). One problem of special relevance for Sweden seems to be the relatively homogeneous nature of the country and also the mandatory rules governing several types of local expenditures. The researcher runs the risk of being faced with observations with a small degree of dispersion.

One interesting way to overcome some of these problems would be to utilize survey information on hypothetical behavior. (See Bergström et al). The idea is to try to elicit the individual preference for public goods by direct questions (e.g.: Would you favor increased spending on higher education? Even if taxes have to be raised?)

The ultimate ambition would of course be to reconstruct willingness to pay schedules for public goods and services, using such hypothetical questions. The surveys planned within this project will primarily be designed to describe the actual use of these services but they will be prepared for later complementary questioning of the above nature. Questions of the following kind will be enclosed in the first round of surveys.

- Number of courses (nightly/daytime) of adult education in which the household participated
- Number of days of institutional health care
- Number of open clinic contacts
- Use of public or subsidized nursery services
- Use of local "samaritans"
- Number of car kilometers (to measure private road use)
- Participation in local voluntary association
- Number of monthly visits to local library

- Number of direct contacts with local government administration
- Living in or interests in moving to a new-planned part of the local community.

Questions of the time and the money (fees or user charges) that households and household members spend on the use of public facilities from public roads to hospitals and labor agencies should be added.

The subsequent analysis will address the question of how this is correlated with their private consumption pattern and possibly also of the direction of causal order. Do people take adult training courses and/or upgrade themselves educationally to be able to maintain an expensive car, a new yacht or house or to take expensive vacations? To what extent does the need for hospital care arise from "overindulgence" in private consumption? Are local consumption counsellors used primarily by low-budget or high-budget households? Are private and public "cultural" expenditures complements or substitutes? What private purchases, if any, are postponed during the process of higher and other adult education respectively? To what extent can regionally and age determined "life-styles" be discerned from the mix of private and public consumption chosen?

One important question relates to the savings in time and money associated with an enlarged supply of public services like daycare and how such savings are used and distributed within the household. How much of the time and money saved by getting the kids into a public nursery is then spent on the kids? Does faster and cheaper public transportation pay for more expensive office lunches or for enlarged family activities? Does easier access to hospitals and clinics mean a saving in time and health - or just more frequent visits? Such questions can only be answered on the basis of data from a joint expenditure budgeting, time use and public service use surveys of the kind proposed here.

Some indications of how the growing "home-work-sector" affects the demand for public services and how both are affected by the tax and subsidy situation of the household are of interest. Are the people who are good at getting away from taxes also clever in exploiting public facilities? Does an enlarged spectrum of public services mean a correspondingly lowered need to earn money in the labor market to pay for consumption inputs - an enhanced possibility of engaging in profitable home-work activities?

Quantitative measurements of how a rising income and educational status affects the demand for various public goods should be attempted. At least some preliminary estimates of lead-times and delays in the exploiting of new public facilities and benefits are desirable. How long does it take for a household that moves to a neighborhood with better clinic facilities before they adjust to a new pattern of health service use? How long will it take from the time of new legislation about time-off for the care of children until the registered time of child sickness begins to rise?

Some first pieces of evidence about long-run relationships between private and public consumption may eventually be collected by the survey technique proposed here and econometric analysis if a longitudinal data base can be created. The more informationally complex the goods and services become - the more of potential uncertainty for the seller and the user - the greater the likelihood that arguments for public control and/or supply will appear. A major part of public consumption today can be regarded as a gigantic information service output which in various ways feeds into the simple time and money use decision framework of the household.

The study of these kinds of problems will require the survey approach of this proposed project and the creation of longitudinal files to capture the dynamics of the household adjustment process.

#### 2.4 Adjustment to decreased real resources

A decrease of real resources available to a household can take many forms: unemployment, sickness, nominal decreases in pay and other incomes, decreases in real income due to inflation, increased tax payments, etc. The adjustment made by the household might depend on the particular reason for the decrease, but in principle there are two major ways of adjustment. Either the household tries to compensate for the decrease by increased work efforts in the market in order to maintain its consumption standard, or it accepts a reduction in standard. Also a third possibility might, however, be mentioned. If the household believes that the decrease is temporary it might borrow to overcome the difficulty. The adjustment might thus be different in the short-run and in the long-run and it might depend as well on the size of the decrease. One might also note that the adjustment to a change in household resources could be asymmetric with respect to a decrease and an increase. With data on - ideally - income, wealth, labor supply, time-use and consumption for each household these adjustment mechanisms could be analyzed.

#### 2.5 Aggregation and the interaction between micro and macro

Estimated macro labor supply functions, demand functions, consumption functions etc. have not shown a great degree of stability. They depend on time period, country, market, etc. Neither is the prediction record for macro models overwhelmingly good. One possible reason for this is our insufficient knowledge of the aggregation problem. Also with relatively simple linear models this is a theoretically difficult problem. Simple "summation" of micro relations shows that in general, micro and macro relations will not be on the same form<sup>1</sup>. The aggregation problem is, however, not only a problem of summation of micro variables and relations,

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<sup>1</sup> See for instance Bergmann B., Eliasson G. and Orcutt G. (1980), in particular pages 99-120, 261-268 and 400-404.

but also an issue of how micro units adjust to each other, what constraints one micro unit will place on other units. This is likely to be important for the stability of macro relations and thus also for policy issues. Micro data will make it possible to investigate this. Households also interact with other sectors of the economy and the interdependence between them, taking the variations in micro household behavior into account, can be analyzed with the simulation model MOSES<sup>1</sup>.

One problem that requires micro data and would benefit from a micro simulation approach would be the analysis of the highly intricate relationships between income formation, income and wealth distribution and economic growth - a typical micro-to-macro problem. It is interesting to note that while practically all micro simulation analysis in the U.S. has been done on the household sector, all micro simulation work in Sweden has been performed on the industry sector<sup>2</sup>. A joint approach, here, obviously opens up a multitude of opportunities, once the required data base on the household sector has been created.

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<sup>1</sup> See Bergmann-Eliasson-Orcutt, op.cit.

<sup>2</sup> See Eliasson (1977) and Bergmann-Eliasson-Orcutt, op.cit. pages 177-389.

### 3. A BRIEF REVIEW OF THE ECONOMICS OF CONSUMER BEHAVIOR\*

Most economic models aimed at explaining the allocation of expenditures on goods and services and the allocation of time between market and non-market activities originate from the classical theory of choice, which assumes that the consumer maximizes a utility function subject to a budget constraint. The result is a demand function for each good, which depends on "income" and all relative prices. The properties of the utility function and the budget constraint imply certain, relatively weak, constraints on the demand functions which have been exploited in empirical applications of this theory. A number of so called complete systems of demand functions have been suggested and applied almost exclusively to aggregate time-series data. These kinds of data do not permit sharp tests and it is usually difficult to discriminate between models. It is, however, true that in a few cases the classical theory of choice has been rejected, but the econometric problems of these studies make the interpretation of this result difficult. The usefulness of these, from an economic point of view, relatively simple models for the analysis of micro data could be questioned on a priori grounds, but they have not yet been put to any extensive test.

The classical theory of choice has been extended in several directions. The possibility that the consumer considers the future consequences of his behavior and plans ahead for more than one period has been treated as the maximization of a sum of discounted future utilities subject to a constraint which takes saving (positive or negative) and wealth into account in addition to the income stream. The investment character of purchases of consumer durables has also been included in the model framework by the distinction between the purchase of a durable and the consumption out of the stock of durables. There are, however, relatively

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\* A comprehensive review of this field is given in the recent monograph, Deaton & Muellbauer (1980).



few empirical applications of these models within a complete systems approach. To our knowledge they have all used aggregate time-series data (Klevmarken, 1981b).

Another extension of this model framework is the inclusion of leisure time in the utility function and a consequent minor modification of the budget constraint. Income is now the product of the wage rate and hours of work. This model does not only explain the allocation of expenditures on commodities but also the supply of labor, i.e. the time used for market work. A related development is the explanation of investments in human capital over the life cycle. The present value of all future utilities is maximized while taking into account that investments are foregone earnings and consumption today, in exchange for higher earnings and more consumption tomorrow. The human capital embodied in the individual consumer will determine his productivity of time. As suggested by Michael & Becker (1973) it might not only influence the productivity of market work but also the productivity of non-market activities. Obviously there are market investments which are also relevant for non-market activities. Examples are craftsman skills, which could be used in home repair activities, training in child care, nursing and home economics. These three latter activities are all typically female. If it is true that the market training given to females to a higher degree than that given to men can be used in non-market activities, the model predicts that the female rate of labor force participation will be less than the participation rate for men. It is also possible that the accumulation of human capital as such, more or less independently of occupation, would give the consumer an ability to receive and to process information efficiently, to make informed decisions and to organize his or her activities efficiently; all skills which would not only be useful in market activities but also help to maximize utility from consumption and leisure activities. Those who are able to make major investments in human capital

would thus not only get the most interesting and rewarding jobs but they might also get a rich leisure time.

One important development of the choice model is the household production model, sometimes called the new theory of consumer behavior. A key reference is Becker (1965). In this approach the consumer is assumed to combine time and market goods to produce something called "commodities" which are the entities which generate utility. This model has some theoretical attraction since it makes it possible to apply the economic tools of production theory to the analysis of consumer behavior. This model explains differences between consumers, not explained by income and price differences, by differences in household production technology. As emphasized in Michael & Becker (1973) and Stigler & Becker (1977) it reduces the role of differences in taste as an explanation of otherwise unexplained differences.

Another important aspect of this model is that it explains the inter-relation between time-use and the consumption of market goods. The following quotation is from Michael & Becker (1973):

"It has long been recognized not only that consumers sell time in the labor market but also that they buy time in the form of certain consumer goods and services: the tax consultant, medical adviser, professor, and auto mechanic, as well as the cookbook, frozen foods, vacuum cleaner and television set are all in some measure time-savers. The demand for such items would be quite different if time were not a scarce resource.

Furthermore, the satisfaction obtained from many market goods depends upon the amount of time with which they are consumed. A boat moored to the dock all season, the daily newspaper tossed out without being unfolded, or a quick lunch gulped down between appointments contributes less produce and hence less utility than would a leisurely (time consuming) use of each of these items. So an understanding of the use of time seems necessary for an understanding of the consumption of most market goods and services".

However, as a vehicle for empirical research this model is relatively empty. It is true that the production function concept imposes the property of weak separability on the utility function which can be exploited empirically, in particular if one knows a priori which market goods are used as inputs in each production function and if few goods are used in more than one function, but the major draw-back with this model is that there are no output measures for the production activities and even worse there is no theory which could suggest how these activities should be defined and measured.

Another criticism of the household production theory is that time is not only an input in a production process but also a direct source of utility (or disutility). (See Pollak & Wachter (1975) and Juster, Courant and Dow (1980)). An alternative model suggested in Pollak & Wachter (1975) is to assume that the time-use and input of market goods in each activity enter the utility function. (Note that time-use in market activities could also be arguments of the utility function). The disadvantage of this model is that it requires - except when rather restrictive assumptions are made about the utility function - data on the use of market goods in each activity, not only the total for each good. However, it might not be impossible to define activities such that these data could be obtained. A compromise between this model and the household production model would be to assume that the consumer derives utility both from the time-use of each activity and from the "quality" of the activity where quality would be a function or an index of the input of market goods to that activity.

Household differences in time-use and consumption would have to be explained in a life cycle perspective. The value of a person's time varies over the life-cycle and influences both the allocation between market and non-market time and the time-use in various non-market activities. The life-cycle allocation of goods and time

have been analyzed in Ghez & Becker (1975), Heckman (1976), Ryder, Stafford & Stephan (1975) and Stafford & Duncan (forthcoming).

The models discussed so far are all of the form of a utility maximization subject to some kind of a budget constraint and a time constraint. In the case of the household production model there are also constraints arising from the production technology. These models thus trace out the consumer's adjustments to changes in these constraints. However, it is quite obvious that the consumer faces more constraints than only a budget and a time constraint. In a formal, but not yet operational way, the household production model recognizes this, but it is not clear that the constraints faced by a household are most conveniently put in the form of production functions. Examples of constraints which might determine the adjustment process of the household are the ownership of a house, a car or other consumer durables which require certain types of maintenance activities, commitments to fulfil instalment contracts, children which need time and other resources, local labor markets which might not offer a rich variety of job opportunities, monetary and psychic costs of moving, etc. Constraints of this kind would typically be more binding in the short-run than in the long-run. Consumer reactions to policy measures and other changes which influence the constraints which they face would thus tend to be different in the long-run and in the short-run. An important research problem would be to identify and model these constraints in order to estimate their effect on consumer behavior.

All models discussed above assume that differences between consumers and changes in their behavior can be explained by households facing different constraints and by changes in these constraints respectively, while preferences are the same or do not change. Michael & Becker (1973) make a virtue of this and claim

that there is no useful theory of the formation of tastes. In the terminology of the household production theory this would imply that any learning process and any adjustment to information received from outside the household would be looked upon as a change in the household production process, i.e. in productivity. As long as no method for direct measurement of taste has been designed it would not seem to be a very important issue for empirical research if learning, adjustments to past experiences or to the experiences of other households, etc. are interpreted as changes in taste or changes in the set of constraints facing the household. What is important, however, is to include the possibility of a learning process in the model framework.

One aspect of economic behavior which is both related to the production technology of the household and to learning but is not in the mainstream of the economics of consumer behavior is the interdependence both between household members and between households. Utility maximization models are basically models for one individual and they do not say anything about the interactions between different individuals and different households. In principle, the activity of one individual could be seen as influencing the constraints of other individuals. This might lead to a relatively complicated iterative procedure when each individual tries to maximize his utility. A model of this kind might be used both to explain the joint behavior of the members of a household and the influence on one household from other households and other economic agents.

This brief review does not pretend to suggest a particular model. At best it suggests a direction to go. It is indeed a very difficult task to design a comprehensive and consistent model which is able to explain the large variability usually found in micro data. Our goal can of course never be to explain the behavior of single individuals but on the other hand we are not satisfied with a

model which only explains average behavior. It would be desirable to explain time-use and expenditure distributions. The very nature of micro data with censored and truncated distributions suggests approaches different from those used in time-series analysis. One would, for instance, like to model adequately that there are activities in which many households never participate and that there are goods some of them never buy. One might also be interested in the skewness of time-use and consumption distributions and in the individual time-use and consumption mobility. It might be fruitful to look upon the behavior of a consumer, not as a utility maximization in one step, but as a random process in which the good decisions are remembered and allowed to determine future behavior.

At the present state of art it would probably not be a good research strategy to try a model which would include "all" important aspects of household behavior, but rather concentrate on one or a few activities at a time. This does not exclude that one could try to capture the broad trends in household behavior by a "complete systems approach".

#### 4. A NON-RANDOM SAMPLE OF EXISTING MICRO SURVEYS

Time-use studies have been carried out in a number of countries. In association with a Multinational Time Budget Project an International Research Group on Time Budgets and Social Events was formed in the mid-1960s. A publication from this group, Harvey (1977), gives some historical background. The first large scale 24 hours time budget study was made in the early 1920s on the industrial workers of Moscow. Time budget studies have since then been made frequently in the Soviet Union and other east European countries. Time-use studies have also been made in Japan. For instance, in 1960-61 the Japanese Radio and Television Culture Research Institute collected 170 000 "yesterday interviews". The multinational project mentioned above was set out to standardize the data collection in a number of countries to make possible international comparisons. Participating countries were: Belgium, Bulgaria, Czechoslovakia, the Federal Republic of Germany, France, the German Democratic Republic, Hungary, Peru, Poland and the U.S., the U.S.S.R. and Yugoslavia. For results from this project see Szalai et al. (1972). Since then other countries have also carried out time budget studies, including Great Britain and Norway.

Among the most comprehensive, if not the most inexpensive time budget studies are the two surveys made at the Survey Research Center, Institute for Social Research, University of Michigan. The first was done in 1965-66 as part of this multinational study. For this reason it was limited to adults between the ages of 19 and 65 living in urban households with at least one employed adult. Each respondent was interviewed only once and the sample size was 1200. The second study was a national sample of 1500 adults 18 years and older. Each respondent was observed four times (days) and the survey also included time-use of the spouses of the respondents. The following aspects were included in this study:

- Measurement of personal resources: health, organizational involvement, skills, and talents.
- Measurement of home maintenance activity: repairs, household "projects", both time and money spent.
- Measurement of "process" benefits (satisfaction from activities) for both respondents and spouses.
- Detailed data on earnings and hours worked for all family members over 14 (obtained in each of the four days).
- Data on life satisfaction: fertility plans, satisfactions with children.
- Data on household organization and attitudes toward household chores.
- Data on amount of energy and effort put into activities.
- Data on media use.
- Data on social networks - time spent with friends, relatives, family, business associates, etc.
- Extensive demographics, ranging from age and education through national origin, parents' education and religion.

The Survey Research Center is now preparing a new time-use survey with a sample size of 3000. Approximately 650 of these 3000 respondents will come from the 1975-76 sample which means that the new survey will partly become longitudinal. To a large extent the new survey will replicate the 1975-76 survey but there are also a few extensions. More data will be collected for spouses, time-use data will be obtained for children, there is a design for obtaining further detailed information about activities within the workplace and to obtain labor hours measures which could be used for productivity analysis, there will be better measures of joint activities and activities designed to serve more than one function, there will be a greater focus on time-saving devices and an expansion of measures on household output<sup>1</sup>.

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<sup>1</sup> The proposal budget submitted to the National Science Foundation ended on \$ 2,093,821 in 1979 dollars.



A list of articles and working papers from the time-use project at ISR is added as Appendix D.

One of the most important longitudinal household surveys for economic and social research with a wealth of data and results, namely the Panel Study of Income Dynamics (PSID), is also carried out at the Survey Research Center, ISR. The following paragraphs are quoted from the introduction of the 1979 proposal to the National Science Foundation.

"With the war on poverty of the 1960's came the realization that effective poverty programs depend critically on an understanding of the dynamics of family income. This prompted the Office of Economic Opportunity to initiate and support the Panel Study of Income Dynamics (PSID). The PSID was designed to follow the same people over an extended period of time to see what caused changes in family economic well-being. Since economic well-being is many faceted, the study has gathered information on many aspects of people's lives.

The Panel Study of Income Dynamics has, since 1968, followed, interviewed annually, and processed, analyzed, and disseminated information from a representative sample of about 5,000 families. Each family in the sample contains at least one member of a family originally interviewed in 1968. The family is not an unchanging unit; hence, the study has followed the 1968 original panel families which remained intact and also all members of the 1968 families who left home, each year interviewing one primary adult in any family containing a member of one of those original families. This produces an unbiased sample of families each year, as new families formed by children leaving home replace families which die off; thus, the panel continues to be representative with respect to its basic sampling design.

To facilitate studies of poverty, the original sample oversampled the poor, but weights were created to adjust both for that and for differential nonresponse and panel losses. Since the first two years, panel losses have been small, and checks against other data indicate no appreciable biases.

It was felt that a rich mixture of economic, behavioral, and attitudinal information would be required in order to analyze factors affecting changes in well-being, so the Panel Study has gathered

a wide variety of such information. The interviews have had a large constant content measured each year, covering income, education, labor force participation, occupation, work hours, family composition, housing, commuting, changing jobs or residences, housework, child care, and food expenditures. This has been supplemented with environmental data from counties where respondents live. In some, but not all, years additional information has been gathered on other topics. For each of the first five years extensive data were collected on potentially important economic behavior patterns, attitudes, and home production. Attempts were made in the fifth year to measure achievement motivation and cognitive ability. Special attention was given to housing and neighborhood in the eighth year. In the ninth year wives were interviewed as well as family heads, and extensive background data on the husband, the wife, and both sets of their parents were collected. In the eleventh year special sections covered how people got jobs, disabilities of each family member, and retirement plans and coverages.

The Panel Study data are unique as a combination of a national representative sample, oversampling the poor, comparable and detailed information on work and income over many years, and some attitudinal, expectational, and explanatory responses. Other data sets have larger samples, or much more elaborate attitudinal material, or intensive coverage of some very special subpopulation, but none combine the rich mixture of data with a representative national sample.

Use of the data is now extensive and is increasing as more people become aware of their existence and availability. The data files are used by various government agencies for policy analysis. Numerous academic researchers have used and are currently using the data to analyze welfare reform, labor market issues, housing, mobility, and many other topics. Well-documented data sets with simple file structure are made available free to researchers in the 200 universities belonging to the Interuniversity Consortium for Political and Social Research, and at out-of-pocket (marginal) costs to any other users. Each year a volume is published containing analysis by the Michigan staff and summaries of work being done elsewhere. That volume serves to make the main findings accessible promptly, to suggest further analysis, and to guide future design of the survey".

The proposal continues to emphasize the importance of the longitudinal design of the PSID. For instance, longitudinal data covering a sufficiently long time period

"will enable researchers to investigate much better a wide range of topics, including:

- i) intergenerational analysis with information on the children reported by the children, and information on the parents reported by the parents;
- ii) longitudinal analysis of rare events such as marital instability, job changes, and career decisions; and
- iii) analysis of the effects of the business cycle on the economic situation of families and individuals."

"A continuing panel provides the opportunity to study current events. As dramatic changes take place in food or gasoline prices, in welfare legislation, and in macroeconomic conditions, to assess the impact it is necessary to measure the state of the population both before and after the event. A continuing study such as the PSID ensures that this is possible".

"Some outcomes take a long period of time before they become visible above the 'noise'. Completed family size, the payoffs to mobility, and occupational advancement all take extended periods to unfold".

Since 1973 the Central Bureau of Statistics of Norway has carried out annual surveys of consumer expenditures. The sample size is approximately 1200 households. Since 1975 these surveys have a rotating panel design, i.e. a little more than 200 households report for two adjacent years. The rest is a fresh random sample. Each household is asked to do bookkeeping for a random 2 week period. In addition low frequency purchases are covered by retrospective questions for the latest 12 month period. A data base is developed with 28 disaggregate and 5 aggregate commodities. References are Bjørn & Jansen (1980 a,b).

In Sweden the two surveys on "quality of life" made by the Institute for Social Research, University of Stockholm, (Levnadsnivåundersökningarna) contain some time-use information. These surveys were based on a national sample of individuals born on the 15th of a month. The sample size was 6690 in 1968 and 6593 in 1974. These two samples include a common panel of 5820 individuals who were interviewed (or at least approached) on both occasions. Most data were obtained by interviews but additional information

has been added from existing public files. In 1968 the interviews were made during the months of May and June and in 1974 during the period of the middle of April to the end of September. All time-use data were obtained by retrospective questions. For each of the days in the week preceding the interview the respondent was asked when he/she left home and returned from work, the time used for breaks during work hours, overtime, travel time, time for market work at home and time on a second or third job. The respondents were also asked about the average weekly hours in various household maintenance activities. For leisure time activities there are no time-use estimates. The respondents were asked if they sometimes or frequently do certain leisure activities. The two surveys also give information on other aspects of the quality of life of Swedish households. Data are collected under the following nine headings:

- Health and use of medical services
- Market work and work environment
- Schooling
- Wage rates, income and wealth
- Political activity
- Social background and family
- Housing
- Eating habits
- Leisure

For our purposes the data on market work and the economic data are of particular interest. The former are relatively detailed. There are, however, no data on consumption expenditures. Other disadvantages are that time-use data were not collected by a diary method, that these data do not include time-use of spouses and other members of the household and that the interviews were not randomly allocated over the entire year. References are Levnadsnivåregistret (1973), Norlén (1974) and Vuksanovic (1979).

The National Swedish Public Broadcasting System (Sveriges Radio AB) has also - through its survey institute PUB - collected time-use data as part of their regular surveys of the listening and TV-watching activities of the Swedish public. Their main concern has been to estimate the potential number of listeners and viewers. These data provide estimates of time-use broken down by a rather limited number of demographic background variables. References are Kleberg (1972), Wikman (1974) and Schulman (1977).

## 5. DATA REQUIREMENTS

A tentative list of data needed is given below. The details of this list will have to be worked out during the planning and pre-test phase of the project jointly with the design of measurement instruments. It might be possible to obtain some data from already existing files, but most data would have to be collected in a new survey. This would be a household survey including all members of the household. With the possible exception of information obtained through retrospective questions this survey would only give cross-sectional data. The design of the survey would, however, be prepared to accommodate additional future surveys which eventually would make up a longitudinal file of household data. The idea is also to design the survey to give data on time-use, income and spending patterns of the entire household without too many details, while details on some aspects can be added in later surveys and be merged in a systematic fashion with the data already collected. This is, for instance, a technique used for the micro data base of establishments in the IUI Micro-to-Macro model that is based to a large extent on the annual "planning survey" of the Federation of Swedish Industries.<sup>1</sup> The periodicity needed for these future surveys probably depends on the information gathered. The volatility of household income and consumption expenditures might justify quarterly or annual surveys while one only might have to collect time-use data every third or every fifth year. This issue is not pursued further here but is left for future consideration.

However, since one of the major reasons to start a new data collection is the increased research potential of longitudinal data, it might be worthwhile to say something about the benefits of longitudinal data.

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<sup>1</sup> See Eliasson (1978, pp. 43-51) and Albrecht (1979).

In many "social processes" like labor force participation, earning an income, consuming, moving, staying healthy, etc. it is frequently natural to think of the process as influenced by factors associated with the age and the cohort of the observed individual and with the particular period for which the observation was obtained. For instance, increases in earnings might depend on years of experience (age), the size of the cohort and the general growth and cyclical conditions prevailing for the period. With cross-sectional data it is not possible to separate these three effects, but with longitudinal data it is. Longitudinal data can also contribute to a better understanding of why cross-sectional and time-series estimates of behavioral relations frequently differ.

Household decisions probably to a large extent depend on past behavior and past experiences. The only powerful way to analyze these dynamic aspects of behavior is by using repeated observations on the same household, i.e. longitudinal data. Also, results of decisions may take a long time to show up. For instance, "movers" compete with people in the best jobs at the new location so they may appear to secure little immediate benefit from the move, but might be able to get a better job in a few years.

Relatively rare events such as leaving home, marrying, having children, buying a car, etc. would preferably be studied by "before-and-after" data which can best be obtained in a panel. The longer observation period of a panel study would facilitate multivariate analysis of relatively rare events and increase the precision of the estimates of model parameters.

Finally, panel data have a potential for bias reducing estimation. If unobserved individual characteristics like, for instance "ability" or "personal drive", influence the dependent variable and if these characteristics are correlated with other explanatory variables, then cross-sectional estimates will become biased, but if the effects of these unmeasured characteristics remain stable they can

be netted out by a transformation of the model, for instance, the first difference, which can be unbiasedly estimated with longitudinal data.

For this project it might be possible to obtain partial longitudinal data or longitudinal like data without waiting for a completed panel study. One possibility is to utilize already existing longitudinal files. This is discussed below in section 6. Another possibility is to collect retrospective data. They might be distorted by memory bias but could still allow some dynamic analysis already with the very first waves of data which could point to promising areas where regular longitudinal data collection appears fruitful.

The desired information - collected for each household member - is outlined below:

#### Labor market data

##### Current data

- Employment (labor force status, full-time/part-time, more than one job)
- Occupation
- Job characteristics (work environment, stress factors, non-monetary benefits)
- Employer(s) (Industry, size, name and address<sup>1</sup>)
- Stipulated hours and "normal" hours with major and secondary employers
- Market time-use ("productive" work, overtime, investment activities, union activities and related activities, break hours)

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<sup>1</sup> Name and address to the employer might provide a unique opportunity to combine establishment data with household data.



- Reasons for not having a full-time job:
  - a) individual (school work, disability, sickness, prefer non-market work etc.)
  - b) home (children, care of other household members, inability to move because of spouse's work, etc.)
  - c) market (no jobs available locally, no jobs at reservation wage)
  
- If unemployed: duration of unemployment, past and present search efforts.
  
- Experiences of participation in labor market programs (retraining, relief work).
  
- Pay (wage rate, normal monthly (weekly) take home pay, fringe benefits, actual gross and take home pay including overtime etc. during measurement week (month); for unemployed: reservation wage).
  
- Commuting behavior (distance to workplace, public communication facilities - availability, time-distance, ticket price, comfort; ditto for car).

#### Retrospective data

- Schooling
- Years of experience
- Interruptions of market work (timing and duration)
- Job changes and changes of employer (if possible with associated change in pay)
- Possibly also questions about motives for changes in job status and interruptions of market work

### Non-market activities

- Time-use in various maintenance and leisure activities
- Expenditures (less detailed than usual in household budget studies, distinction between time-saving and not time-saving goods, for some goods it might be possible to link their consumption with particular activities)
- Time-use and expenditures in some detail for public services
- Savings (if possible).
- Possession of consumer durables (also access to durables not owned)
- Housing

### Financial status

- Factor income
- Non-factor income (including transfer payments)
- Household disposable income
- Wealth (if possible): total assets, liquid assets, total debts, consumption credits

### Other household characteristics

- Age
- Sex
- If immigrant, year of immigration
- Educational and occupational background of respondent's parents
- Type of home where respondent grew up (region, urban/suburban, foreign country, number of siblings, one or both parents working)
- Union membership
- Number of children not living at home
- Region of the country
- Urban/suburban area
- Attitudes towards labor force participation of women
- Attitudes towards use of public services.

## 6. DESIGN, MEASUREMENT AND ESTIMATION

The design of a survey should primarily depend on what uses the collected data will have. In this case we are interested in analyzing household behavior, i.e. we do not only aim at a good description of the average time-use in various activities and the average expenditure shares for various goods. We are also interested in something more fundamental, namely to find relatively stable relations which could explain the observed behavior. Stable relations do not mean that we would be able to explain and predict individual behavior with no error or even with only a small error but rather that there are stable stochastic or distributional relations. We might think of the problem as estimating a distribution function or a probability, for instance  $P(t,c/x,\Theta)$ ; where  $t$  is a time-use vector,  $c$  a vector of expenditures,  $x$  a vector of variables upon which this probability depends and  $\Theta$  is a vector of unknown parameters we seek to estimate.

We would also have to specify if this is a model for daily, weekly, monthly or annual time-use and consumption expenditures. This choice would not only depend on what is of primary interest but also on how one believes a likely model for household behavior would look like. More specifically, it would depend on the duration of reaction lags of the household. Annual data would most certainly include both stimuli and response but it might introduce a simultaneity problem. A short observation period like a day or a week might not make an analysis of cause and effect possible since for each household we might only observe the effect (or the cause). An advantage with annual data would be that they avoid the problem of seasonal differences in time-use and consumption expenditures, provided of course that these are not of primary interest. For obvious reasons it is, however, impossible to observe the time-use and the expenditure pattern of a house-

hold for all 365 days of a year. Even if we were interested in the annual figures for each household we would have to estimate them from observations of a much shorter time period. In the Michigan 1975-76 study time-use data from each household were collected for only 4 days. We would thus have to deal with an errors-in-variables situation with consequences both for the design of the survey and for the subsequent analysis of the data. Although there is a growing literature on model-based versus design-based inference in survey sampling this is a situation which has hardly been treated at all. Usually no measurement errors are assumed but in this case we have measurement errors which will depend on the sample design (number of measurement days and their allocation over the year). In addition they would depend on how households allocate time and expenditures over the year and this is certainly not a purely random process. This might suggest that we should not primarily try to model the annual but rather the daily time-use and expenditure pattern of households. If we would still insist that our primary interest is the annual time-use it could then be predicted by the model taking the sample design into account. The model structure, which in the terminology of the survey literature, will define the properties of the "super population", should be chosen on the basis of (economic) theory and solid experience and not from any convenience point of view. However, since consumers certainly make decisions about their allocation of time and expenditures at least daily, there are a priori reasons for a "daily model".

An alternative to a model-based approach would be to leave the idea of an underlying model and "only" aim at estimates of functions of the finite population values. The two approaches might not in practice come out very differently. In principle, however, there is one fundamental difference. In the second approach the in-

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ferences from the finite population of household values on time-use and consumption expenditures to some underlying, more basic (economic) behavioral law is entirely left to the economist (or whatever) without the support from probability theory.

The related issues of a model-based approach to sampling survey and of a good estimation strategy with survey data have in recent years received an increasing attention. Most of this literature treats the problems of survey design and prediction in finite populations. (See Särndal, (1978) and Cassel et al. (1977, 1979) and references herein). There appears to be less done on the estimation of parameters in super population models and on the design of surveys for this purpose. The estimation problem can be briefly described as the issue of weighting or not and if so by which weights. Those who favor a strict model-based approach would tend to suggest that the sample design need not be taken into account by weighting, while those who do not to the same degree trust their models have the opposite view. This controversy has not yet to any degree manifested itself in the literature, exceptions are Porter (1973), DuMouchel & Duncan (1977) and chapter 2 of Hill et al. (1979). There is a need for clarification of the issues. What do we want to estimate? Which random experiments contribute to the outcome of our samples? Do we emphasize lack of bias, efficiency or robustness of our estimates? How does the position we take on these issues influence design and estimation?

It would certainly be an interesting and relevant task to use the a priori information there is about household behavior formulated in a model to design the survey suggested in this proposal. There are, however, problems in this approach. One is that the data we propose to collect would actually not merely be used to estimate the unknown parameters of one model but to search for a model, i.e. at this planning stage we do not have in mind one well-defined class of models which is known except for a limited number

of parameters. In principle this does not exclude that we use a relatively general model, although it might turn out difficult to formulate it in operational terms. The robustness of model-based designs to specification errors of the model is also an area which has not been explored.

An additional problem which might well become a binding constraint is that we would have to use an existing sample design. At this point no definite conclusion can be reached as to the best approach to design a new sample survey. This would have to be part of the research project. We can, however, note that the intertemporal dependence of household behavior is essential for the design. The random selection of two weekdays, one Saturday and one Sunday as in the Michigan study might not be a good design if this dependence is taken into account.

Another design issue one might like to consider is the possibility to link the new sample to an already existing longitudinal file. One possibility would, for instance, be a co-ordination with the "low-income study", i.e. the new data collection we propose would be done for the same sample. There is, however, an apparent risk that the response burden would become too high, which could jeopardize both studies. Another possibility would be to base the new survey on an existing administrative file. For instance, a sample of people born the 15th of the month might make it possible to incorporate the information in the old "born 15th of the month" register at the Central Bureau of Statistics as well as in other files.

Part of the design problem are also the more traditional measurement problems as, what is the optimal combination of bookkeeping, retrospective questions and possibly other methods to measure time-use and consumption expenditures. A few evaluation studies are available from previous studies and they would provide some

guidance also for this study provided our overall design will not differ too much from what has been done previously. Experiences from time-use measurement are relatively limited and some additional work might have to be done. One approach which should be tested is to use retrospective questions about the annual time-use for major well-defined activities - annual data would make multivariate analysis easier, cf. above - while more detailed time-use information would be obtained only by the diary method.

Although there are more experiences from the measurement of wealth and savings this is a very difficult area. In principle, there are two approaches to estimate the savings of a household. One is to observe the savings flow during a period, the other is to estimate the stock of wealth in the beginning and the end of the period and then use the difference as an estimate of savings. One method might be better for some components of savings and the other for other components. On the whole estimates of wealth and savings usually have a large error margin. This is not only due to the sensitive nature of the questions but also to the major difficulties in evaluating stocks, for instance, real estate values and the value of used consumer durables. For this survey we might have to be content with estimates of some of the components of savings and wealth.

The choice between personal interviews, telephone interviews, mail questionnaires and register data also belongs to the design issues. In this case it is likely that we would have to use all methods. The complexity and the number of questions which would have to be asked probably require at least one personal interview. Telephone interviews can then be used to follow up this personal interview and also to support and follow up bookkeeping of time-use and expenditures.

There is a trade-off between sample size, i.e. number of households, and how frequently each household is observed and they would thus have to be determined simultaneously. A guess based on previous studies would, however, suggest that a sample size of at least 2000-3000 households is needed if an analysis of the entire Swedish population with a fair amount of detail is aimed at.



7. EXPLOITING EXISTING FILES BY "STATISTICAL  
MATCHING" AND OTHER METHODS

It would be desirable to complement the data from the suggested new survey with data from already existing files. As mentioned above it might be possible to design the survey to make an exact match between the new data and at least one old file feasible. There are, however, more data which might be relevant for this study which cannot be merged by an exact match because different individuals and households have contributed to each file. We have not analyzed comprehensively the practical and theoretical problems in pooling data from the following list of data sources. This list is just given to suggest existing data files which might be of interest.

Labor market	Wage and salary statistics from the Central Bureau of Statistics and the Swedish Employers Federation; AKU
Income	Hushållens inkomstförhållanden (HINK) ATP-registret Registret över 15:e födda Taxeringsregistren
Consumer expenditures	Household budget surveys 1950, 1958, 1969 and 1978. Hushållens inköpsplaner (HIP) (Households' purchase intentions) Private market surveys
Savings	Savings survey 1958 (Konjunkturinstitutet) Survey by Sparfrämjandet (Wikner, 1980).

Wealth	Taxeringsstatistiken Special study for a Government Committee on profit sharing in industry.
Other	Låginkomstutredningen (The low-income surveys) Undersökningen om hushållens levnads- förhållanden (ULF)

Given that the confidentiality problem and other problems can be solved and we get access to these files, the issue will be how these data could be used efficiently to analyze household behavior. One method which has been suggested is "statistical matching", i.e. given that there are at least a few common variables - not individuals - in every pair of files, these variables are used to find "alike" individuals in the two files and the information for these alike individuals is merged to a file of "synthetic" individuals. A recent survey of the literature on statistical matching is given in Statistical Policy Working Paper 5: Report on Exact and Statistical Matching Techniques, U.S. Department of Commerce 1980. There are a few particular methods suggested for statistical matching. Their main disadvantage is that in the merged synthetic file the matched variables will be conditionally independent on the matching variables. Assume there are two files, A and B, with the following data:

File A:  $Y_{n_A x^k}, X_{n_A x^r};$

File B:  $Z_{n_B x^n}, X_{n_B x^r} .$

The two files have no individuals in common but there are data on the same X-variables, for instance, age, sex and years of schooling. Those who have the same age, sex and years of schooling in file A (B) are randomly matched to individuals in file B (A) with the same characteristics. As a result we obtain a file with observations on the Y-variables from file A, on the Z-variables from file B and on the X-variables from either file. In this new file Y and Z will be conditionally independent on X. If this property is also a realistic assumption for an underlying super population model the joint distribution of Y and Z from the synthetic sample is likely to be a good estimate of the "true" distribution. If this is not a good assumption the distribution from the synthetic sample is more or less distorted. It is also obviously meaningless to try to estimate the effect of Z on Y conditional on X. For instance, if income is the matching variable and consumption expenditure and time-use are the matched variables, we would not be able to estimate how time-use influences consumption in addition to income. There are, however, situations when the conditional independence property of the matching procedures can be turned into an advantage as part of the estimation of a model which in itself does not necessarily have this property (cf. randomization and the use of instrumental variables). For instance, extend the example above by the assumption that time-use depends on income and marital status and that the latter two variables were both used as matching variables, then it is possible to estimate (consistently) the time-use effect on consumption holding income constant. Note that marital status does not enter the consumption function. The fact that a statistically matched sample can be used to obtain consistent estimates does not necessarily imply that this is an efficient method for using the information in the two original samples (cf. Klevmarken, 1981a).

The motives for statistical matching have not been stated very clearly in the literature. It is usually referred to some general purpose uses. It has also been suggested that statistical matches are

not primarily done for the purpose of estimating models but rather to reproduce distributions, for instance, the distribution of  $Y$  conditional on  $Z$ . One might also conceive administrative reasons for a statistical match when the files contain confidential information.

Before statistical matching can become an accepted methodology more work is needed on its theoretical foundation. We need to know when and for what purpose a statistical match can be used and what properties estimates from matched data will have. Obviously the design of the match and the choice of estimation method are interrelated and both depend on the underlying model. The assumption of a super population model is important because it provides the necessary link between the two samples. It is probably not possible to design a meaningful "model free" matching procedure. If this is true the general purpose argument for statistical matching becomes less convincing. We thus propose that this project will include research on statistical matching and alternative methods with special application to the analysis of household behavior.

## 8. CONCLUSIONS

We propose a project which will involve a major effort of data collection, methodological research and analysis of household behavior. Usually these three steps are not all covered by the same application and are not carried out within the same research group. The arguments for doing the data collection and analysis within the same project have already been given above. The reasons for also including the part on measurement methodology are analogous. The improved statistical methods would contribute to better data and to a more efficient analysis of data. The development and testing of statistical methods benefit from a close association with real life applications, i.e. with people who know subject matter theory, properties of data and the goals and problems of the data analysis.

In summary the project would include:

### A) Data collection

a) Data collected for a random sample of Swedish households including labor market activities, incomes, time-use, use of subsidized public services, consumption expenditures and savings. To our knowledge there is nowhere else a data file which includes comprehensive and consistent information on all these activities for each household. Most existing household data in Sweden have been collected for administrative reasons and research users have thus had to adjust the definitions, variables, sampling frames etc. determined for non-research uses. This data collection will be designed primarily for research uses. Data will be obtained from each household by interviews and diary methods.

b) Information added to the new data set from existing files when possible.

c) A survey design that provides a base for a future longitudinal file of household data (household life histories). Longitudinal data would be particularly useful for analyzing the dynamics of household behavior. They would make a control for unmeasured individual differences possible and also give an input to the analysis of aggregation from micro to macro. Data collected on a more regular basis would also give improved information about cyclical changes in the labor market and about consumption and savings behavior.

B) Research on statistical methods

a) Tests of different methods for the measurement of time-use, use of public services, consumption expenditures and savings. This research might not only be of interest for this project but also contribute to better measurements of labor supply, wage rates, productivity etc. in the national accounts.

b) Research on model-based methods of sample surveys and on estimation methods with survey data. In order to evaluate the applicability of model-based theory a close connection to applications is necessary. This project covers a field of applications with some theoretical a priori structure which might prove useful for this kind of research.

c) An evaluation of statistical matching and alternative methods to pool information from non-overlapping data sets. It might be difficult to obtain very general results but useful results might be obtainable within the framework of the applications of this project.

C) Analysis of household behavior

The list of research problems given in section 2 obviously contains more than can possibly be covered within the proposed time-span of four years. The new feature of this survey is that it integrates the collection of data on the household 1) time-use, 2) expenditure and 3) use of public services decisions. The first round of analysis of household behavior will of course concentrate on the opportunities that such a data base offer, although a large number of more traditional inquiries at the micro level will also be possible. In addition to a description and analysis of the major distributional characteristics of labor supply, time-use, public service use, consumption expenditures and savings which will be part of the data cleaning process, we propose a concentration to the following areas:

a) Labor supply and income: Try to identify which constraints on household behavior that are binding in the short and the long run in addition to the budget constraint and the time-constraint, and analyze how these constraints influence the time-use within the household, in particular its labor supply (cf. section 2.1). Analyze to what extent non-market work and the internal household allocation of labor is a constraint on the supply of labor and vice versa.

Estimate the income tax incentives on market and non-market work.

b) Consumption and saving: A substantial part of the analysis will be devoted to an econometric study on how time-use, consumption and - to the extent possible - savings patterns depend on household characteristics. With cross sectional data we would, for instance, analyze how households, which suffer from decreases in real resources like unemployment and sickness differ in time-use, consumption and savings behavior compared to otherwise similar households. We would also be able to compare households

of elderly people with other households and to shed additional light on the effect of retirement on economic behavior. If the data collection for a longitudinal data base gets started early enough it may eventually be possible to analyze the changes in time-use, expenditure and savings patterns forced on the households by the current decrease in real income.

c) Demand for public goods and services and how it interacts with time-use and the money constraint (cf. section 2.3.6). Problems of the following kind may be possible to investigate. To what extent do household income earners upgrade their income by the use of subsidized adult education or training? To what extent does the use of public services vary with income, educational and time-use patterns.

d) Micro to macro analysis (cf. section 2.5): Investigate the stability of macro consumption, expenditure and savings functions derived from distributions of micro relations. In which way do different time-use, income and wealth distributions of the households affect the production system and macro economic behavior? The estimation of micro based household expenditure systems for the IUI micro-to-macro model (MOSES) will make such an analysis possible at a late stage of the project.

#### D) A symposium

A symposium in the fall of 1981 or in the spring of 1982 on the theme of the project with emphasis on the analysis of time-use data would be helpful in the planning of the project. This would be a multidisciplinary symposium with participants from various countries.

There are four reasons for this. First, such a symposium would mean that the existing knowledge in this field will be made known to the project group and Swedish researchers at an early stage of the project.



In particular (second), the design of the Swedish project - which would then be ready in draft form - can be tested and discussed by the world expertize.

Third, practically all methodological experience in the field resides abroad, notably in the U.S. and Norway.

Fourth, and not least important, the project would be announced and be made known. The group would automatically be part of the information system within the international research community.

#### E) Research organization

The research organization would include a reference group and a research group. The former would serve as a discussion group and continuously review the work done by the research group. The reference group would gather senior people with experience from research on household behavior, econometrics and survey research. Preferably, the group should include also foreign researchers. The research group would be headed by a project manager with scientific and administrative responsibility for day to day operations. He would coordinate the work within the group and take initiative on external contacts. The research group would also include several (part-time) research economists, and 2 (part-time) statisticians. The group would also need the services of a person knowledgeable in systems-work and programming as well as secretarial services. A more detailed motivation for the staff requirements are given in Appendix B.

This project is a joint venture between The Industrial Institute for Economic and Social Research (IUI) and the University of Gothenburg and work on the project will be done at both places.

Methodological research will primarily be done in Gothenburg while the economic analysis will be located at IUI. The optimum division of labor cannot, however, be determined until staffing and contracting for the field work have been finalized. Obviously frequent meetings at both places will be necessary.

F) Time plan

This project is planned to last for at least three years. A time plan is given in Appendix A. The first year is set aside for planning and pretesting, the second year is for the field work of the main study and the third year is for cleaning and coding the data and for analysis. Methodological research on survey methods will be concentrated to the first year. This is also true for work on model-based designs while work on the estimation from sample survey data should continue through the whole project. The evaluation of statistical matching and related methods would go on for the first two years. Theoretical work on modelling household behavior would start already during the first year since it is important for definition of variables and for the design of a questionnaire. It might also be possible to do preliminary analysis on register data and pretest data.

The three years time span, however, does not leave much time for analysis based on the new data collected. Therefore, we anticipate that a fourth year will become desirable, aiming specifically at the analysis of household behavior. We suggest, however, that a decision on the fourth year is deferred to a later stage and thus based on a new application.

G) Budget

The proposed budget is laid out and motivated in detail in Appendix C. The first half year of the project will provide the information necessary to make a detailed and well motivated budget for the entire project, so in this proposal we only ask for a grant to cover the first year 1981/82 and we intend to return with a new application for years 2 and 3 in the beginning of 1982. However, we indicate the likely magnitude of the entire project to facilitate a decision in principle on the project as a whole. There are three major items in the budget for the first year: staff salaries and overhead, field work for a pretest (a pilot study) and computer charges. The total for the first year is Sw. kronor 1.6 million. The second year will be burdened by the expenses of the field work of the main study while computer costs are likely to go up during the third year because of the statistical cleaning work and because data will then be used for analysis. A rough estimate for a project with desirable design and scope covering the whole three year period would be between Sw. kronor 6.6 and 8.0 million expressed in 1980 prices. These empirical inquiries are undoubtedly costly compared to more traditional theoretical projects. Development in the U.S., where the National Science Foundation and various Federal agencies have financed large surveys of this kind, however, indicates a growing awareness of the need for better measurement methods to advance both theory and empirical knowledge. Neither is this project unduly costly. It compares with Sw. kronor 9 million (\$ 2 093 821) for a smaller proposed two years time budget study at the ISR in Ann Arbor. (For detail see excerpts from proposal to National Science Foundation, Appendix C, section 2). A reduction of the size of the project would mean less research staff and/or a smaller survey. In the first case less analysis would come out of the project and in the second case we would sacrifice the possibility to analyze interesting subgroups of the household population and also limit the potential future use of the data base for us as well as for other researchers.

We are quite aware of the high costs of this project and it is thus important to base a proposed budget on as reliable and realistic information as possible. Since the final design of the main survey will need further research, testing and planning we have chosen to submit our proposal in two steps, the present part of the proposal which only covers the first year and a second part covering years 2 and 3 to be submitted in January 1982. It is, however, of great importance to us that Riksbanksfonden takes a decision in principle also on years 2 and 3 - although the exact amount can wait for one year - so we know if and how the project will continue.

In order to create a longitudinal file of household data we also intend to seek non-academic funding for the period beyond the first three years, but since the primary purpose of this data file is research use, at least part of the funding also for a continuation beyond three years would probably have to come from research funds.

In conclusion we thus propose that Riksbanksfonden supports this project by

- a) funding its first year by 1,608 million Sw kronor, and
- b) reserving in principle funds to finance at least two more years

Stockholm, January 1981

Gunnar Eliasson  
Docent  
President of the IUI

Ann Arbor, Michigan, January 1981

Anders Klevmarken  
Professor of Statistics  
University of Gothenburg

TIME SCHEDULE

Month	1981/82	1982/83	1983/84
07			
08		Training of interviewers	End of fieldwork
09	Work out prelim. questionnaire and survey design;	Start of fieldwork, main-survey	
10	Feasibility of matching existing files.		
11	Printing of questionnaires etc. for pilot survey	Ask for cost estimates	Data ready for analysis
12			Work on statistical matching completed
01	Work out new proposal	Background material to new proposal ready	
02	Fieldwork on pilot study; 300 households	Submit new proposal	
03	Evaluation of pilot study; final questionnaire and survey design worked out		
04			
05		Manuscript to questionnaire etc. ready	
06	Printing of questionnaire etc.		Documentation of data file ready in manuscript; Descriptive analysis completed.

Parallel to the work on the survey run;

- a) work on theoretical models for household behavior; they can at least partly be tested on earlier Swedish data and U.S. data before new data become ready.
- b) work on statistical methods; model-based designs, in particular their robustness; estimation methods for estimating models from survey data; statistical matching and alternative methods.

STAFFPrincipal investigators with project responsibility

Docent Gunnar Eliasson  
Professor Anders Klevmarken

Research staffProject manager  
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Professor Anders Klevmarken

Responsible for day to day operations, follows and co-ordinates all sub-projects, makes external contacts.

Research on "estimation from survey data" and "estimation from incomplete data".

Research on modelling the joint household decision on time-use, spending and saving.

Economists  
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Docent Gunnar Eliasson

Represents the IUI part of the project.

Research on household decisions on spending, saving and wealth accumulation with special emphasis on building a micro-household sector in IUI MOSES model and micro-to-macro analysis on that model.

Dr. Bertil Holmlund

Responsible for IUI analysis on household time-use and labor supply.

Docent Bengt-Christer Ysander

Research on the household use of public services and how it interacts with other decisions in household on time-use, private consumption etc.

In addition to those persons Docent Göran Normann at IUI, Dr. Siv Gustafsson at IUI and Arbetslivscentrum and Jan Södersten at IUI and Uppsala University are planning an extensive use and analysis of the data base if it is created.

The total engagement of Eliasson, Ysander, Normann, Gustafsson and assistants, all of whom will be financed over the regular IUI budget will of course be dependent upon the final scope of this project. The proposal to the RJ includes the financing of one full-time senior economist and one full-time assistant economist at the IUI each of the project years or several making up the corresponding number of person years. The IUI intends to match this external funding with at least an equal research input in years and quality from its own budget, if the project is realized in the scope now planned, that makes such a sizable, total project venture worthwhile.

#### Statistician<sup>1</sup> (unnamed)

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Research on design issues. This person would have to take the main responsibility for the sampling design of the pilot and the main surveys and work out the necessary calculations for the purpose (half-time) at the University of Göteborg.

#### Research assistants

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One research assistant would be allocated to the economic analysis group at IUI and one to the statistical methods and data management group at the University of Göteborg. In both cases these persons would do research and related administrative work under the supervision of senior staff. After they have gained some experience they will hopefully be able to formulate their own dissertation topics and work on these within the project.

#### Fil kand Fredrik Bergholm (IUI)

Assistant at IUI on data base design and use, and econometric research and model building with particular emphasis on building and estimating a micro specified block in IUI micro-to-macro model.

Supports work on analysis of time-use, public service use and expenditure decisions in household.

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<sup>1</sup> It has not been possible to name this person before the deadline for the application. He has to be a qualified person.

Data management staff etc. (University of Göteborg)

System, computer and programming specialist

Since this project involves the collection, handling and analysis of a large amount of data it is essential that we obtain a scientific and an economically efficient systems design for handling and storing data. For research on statistical methods and for economic analysis we will also need qualified programming services. We estimate this work to be a half-time job for a qualified person with these experiences. An alternative to hiring a person would be to use consultants.

Data management, Fil kand Paul Olovsson

For the daily computer operations, coding, non-routine registration and simple programming tasks a full-time person is needed. This would be a person at research assistant level.

Secretary

This project is so large as to require secretarial service in addition to what is available at the Department of Statistics, University of Göteborg. To serve the Göteborg group at least a half-time secretary is needed.



PROPOSED RESEARCH BUDGET 1981/82 - 1983/84

(All cost estimates are in 1980 prices: 000 Skr)

I. Budget

A new application will be filed between the first and second years to be based on experience during the first year. The last (fourth) year is not formally part of this application. We have entered it to indicate that the successful completion of the analysis of the data from the large field survey will not leave sufficient time to complete the analysis. A final fourth year will be needed.

	81/82	82/83	83/84	84/85
I. <u>Staff</u>				
Research staff -----				
Project manager L24:2 100% of full time	142	142	142	142
Economist (and somebody else at senior level) F17:6 100% of full time	115	115	115	115
Statistician F17:6, 50% of full time	58	58	58	58
Research assistant: F12:6, two or more persons, corresponding to two persons 100% of full time	191	191	191	191

In addition to the above mentioned staff for whom RJ funding is requested, Docent Gunnar Eliasson, docent Bengt-Christer Ysander, Docent Göran Normann, Ph. D. Birgitta Swedenborg and Docent Jan Södersten at IUI will participate in the project in its initiating design stages and later analytical stages. The same goes for Dr. Siv Gustavsson at Arbetslivscentrum and IUI. They will be financed through the internal IUI budget and their joint research input on this project is estimated to what corresponds to approximately one person year for each of the planned years. Altogether the IUI is prepared to commit itself to financing two full research years at the IUI each year the project is running through its own budget corresponding to one senior and one assistant economist, provided the rest of the project, including the IUI part, can be externally financed by RJ as proposed by us. If the large field survey work turns out successful the IUI commitment is likely to be even larger.

<u>Data management etc. staff</u>	81/82	82/83	83/84	84/85
-----				
Systems, computer and programming specialist F17:6, 50% of full time	58	58	58	58
Coding, registration, data management and standard program operation F14:6, 100% of full time	102	102	102	102
Secretary F10:0, 50% of full time	39	39	39	39
-----				
Total staff	705	705	705	705
LKP 39%	275	275	275	275
-----				
Total, LKP inc.	980	980	980	980

## 2. Supplies and equipment

Overhead IUI (LKP exc.) 30%	88	88	88	88
Overhead Dep. of Statistics, Univ. of Göteborg 10%	67	67	67	67
Computer terminal	15			
Computer tapes, paper etc.	1	1	1	1
-----				
Total supplies and equipment	171	156	156	156

## 3. Travels

### Domestic travel

Stockholm - Göteborg train first class with discount 24 trips à 340:-	8	8	8	8
Hotel 24 nights à 250:-	6	6	6	6
Living allowances 48 days à 110:-	5	5	5	5

### International travel

Participation in international meetings	15	10	15	10
-----				
Total travel costs	34	29	34	29

	81/82	82/83	83/84	84/85
4. <u>Other</u>				
Field work*				
pre-test survey, 400 households	260			
main survey alt 1, 6000 households		3770		
alt 2, 3000 households		2390		
Computer				
analysis (design computations, statistical matching, economic analysis)	40	60	80	80
cleaning and data management	25	50	50	25
Matching of existing files (fees to other agencies)	20	20		
Symposium				
5 overseas visitors à 7000:-				
5 European visitors à 5000:-				
10 Swedish participants à 1000:-				
Supplies, expenses				
Subtotal	75			
Fee to Datainspektionen	3			
Editing and printing of data documentation			15	20
Translation services		4	11	10
-----				
Total**	423	2524-	156	135
		3904		

\* Based on cost estimates from the Central Bureau of Statistics (SCB). A more detailed background material is available. It is important to observe that this estimate depends very much on the particular survey specification that we currently believe is reasonable. The diary technique used in the Michigan survey (see below), for instance, is more time consuming and costly. The exact specification and cost estimate will have to await the results of the first part of the first project year when the necessary background experience has been collected.

\*\* This cost estimate excludes costs for printing of research reports.

5. Summary of budget with split between IUI and GU  
(in 1980 prices)

	81/82	82/83 (very preliminary estimates)	83/84	Total (3 years)	Total (4 years)
Staff					
IUI	295	295	295	885	1180
GU	685	685	685	2055	2740
Supplies etc.					
IUI	88	88	88	264	352
GU	83	68	68	219	287
Travels					
IUI	17	14	17	48	62
GU	17	15	17	49	64
Other					
IUI					
GU					
Sum:	423	2524- 3904	156	3103- 4483	3238- 4618
-----					
Grand total	1608	3689- 5069	1326	6623- 8003	7923- 9303

Comments

This project is large for Swedish standards but compared to similar projects in the U.S. both the size and the costs of the suggested project are very moderate. (Compare the budgets for the Michigan time-use study and the Panel Study of Income Dynamics below). We also believe that a proper standard of comparison should be science projects involving sophisticated laboratory instrumentation. By that standard, costs are normal or small.

For us to begin work on the first year a principal decision (a declaration of intent and scope) on the part of RJ on the second and third years (82/83, 83/84) is needed. However, a renewed application based on new experience is planned to be filed on January 30, 1982. To make a project like this efficient we expect that a fourth research year be optimal in order to fully utilize the data base collected. No decisions on this final year are, however, needed at this stage.

There are three major parts of the budget: staff, field costs and computer costs. The number of persons who would be primarily engaged in data collection and project management cannot be re-

duced even with a smaller sample size. As a matter of fact, compared to the ISR projects at the University of Michigan we are likely to be understaffed for this purpose. A reduction of costs for staff would mean fewer research persons and less research done within the project, i.e. some other group of researchers would analyze the data. One major disadvantage with such an arrangement is that the thorough knowledge about the properties of data obtained by those who have collected them would not be shared by those who will analyze data. It would be a great strength and probably decisive for the success of the project if those who do the economic analysis would also organize the data collection.

There are in principle two ways to cut the field costs: by reducing the sample size or by reducing the data collection from each household. In practice only the first alternative is likely to give any sizable reduction of costs. According to the cost estimates from SCB the survey cost per household is approximately 700:- for the field work. A smaller sample would imply that

- a) substantially less can be said about interesting subgroups of the household population. Estimates for geographical areas, educational and occupational groups, age groups etc. might become impossible;
- b) the design of the survey would have to meet only our particular needs while the needs of other researchers and future data needs cannot be accommodated;
- c) this project could not be the beginning of a longitudinal data file. Since more households tend to drop out from a panel the longer the panel is surveyed the initial sample cannot be too small.

Computer costs are essentially a function of the data collection and the amount of analysis done. A reduction of the economic analysis and a reduction of the sample size would both reduce computer costs somewhat, but an isolated reduction of the computer budget would not be very meaningful.

## II. Comparison with two ISR surveys

The following tables give first the proposed budget for a two year continuation of the ISR time-use study which would involve 3000 households and then the budget for 1980/81 for the on-going Panels Study of Income Dynamics at ISR. The budget for the time-use study includes research staff corresponding to approximately 45 man-months per year and data management staff also

corresponding to 45 man-months per year. The Panel study employs approximately 3.5 full-time all year researchers and 7 full-time persons for data management in addition to a few secretaries. Note that the field costs for the panel study are relatively low since most of the interviews are telephone interviews with households who have participated in the study for 13 years.

Table 1. Summary budget two-year total from ISR time-use study  
(000 dollars)

Direct Cost

Analysis	491.5
Sampling, Field and Coding	903.8
Total	1,395.3

Indirect Cost

Analysis	308.9
Sampling, Field and Coding	389.6
Total	698.5

Total Cost

Analysis	800.5
Sampling, Field and Coding	1,293.3
Total	2,093.8

Table 2. ISR Panel study of Income Dynamics, cost of operation  
1/11-80 - 31/10-81

Salary

Research salaries	290,558
Sampling	1,000
Fieldstaff, Ann Arbor	21,025
Field supervisors	16,500
Field interviews	76,200
Coding	86,284
Programming staff	21,364
Fringe benefits	83,682
Total salary and fringes	596,632

Non salary

Field travel	48,630
Computer:	20,000
Analysis	29,404
Data management	
Communication, postage, duplicating, supplies	42,051
Research travel	2,700
Machine rental	2,200
Consultants	3,500
Payments to respondents	100,950
Total direct costs	846,067
Total indirect costs	432,472
Grand total	1,278,539

### III. Concluding remarks

The proposed project is organized as a joint venture between the University of Göteborg and IUI. The total resources will be allocated roughly according to the tables in section 1 above. A major part of the total budget will not go to any of these two institutions but be paid out on contract for external services.

IUI has already incurred planning costs for this project amounting to at least Sw. kronor 75 000. IUI will support this project from its own budget to an extent that equals the external financing IUI receives from RJ, i.e., with at least two extra person years for each of the three years. (One at senior and one at assistant level) provided the full project as budgeted here for at least the three years will be funded as proposed.



## ANNOTATED LIST OF WORKING PAPERS ON TIME-USE

1. "Do Union Members Receive Compensating Wage Differentials", by Greg Duncan and Frank Stafford. An earlier version was entitled "Pace of Work, Unions and Earnings in Blue Collar Jobs". The paper demonstrates that union members have a work pace and job structure which is determined very heavily by the job technology. Because the job structure places restrictions on individual time-use (work pace, work schedule) and because most people do not like such restrictions, union members receive a wage premium for their work. The paper will be forthcoming in the American Economic Review.
2. "Changes in Americans' Use of Time: 1965-75--A Progress Report", by John Robinson. This paper reviews the major changes in time use in the last decade and indicates the technological determinants of these changes.
3. "Market Hours, Real Hours and Labor Productivity", by Greg Duncan and Frank Stafford, appearing in the Economic Outlook USA issue, 1978. This paper compares interoccupational differences in time use at work and changes in hours at work between 1965 and 1975.
4. "Parental Care of Children: Time-Diary Estimate of Quantity, Predictability, and Variety", by C.R. Hill and Frank Stafford. This paper presents time-diary estimates of child care time. One of the notable results is that college-educated women spend somewhat more time per child on preschool children than do less educated women but that they also continue to participate in the labor market at higher levels than their less educated counterparts. One question is whether they are able to use a time-saving household technology to achieve both of these time uses. While we find evidence of some substitution of timesaving technology (paper No. 5 below), the analysis reveals that these women give up sleep and passive leisure to make ends meet. The paper is being reviewed by the Journal of Human Resources.
5. "The Use of Time and Technology in Households in the United States", by Greg Duncan and Frank Stafford. This paper reviews time use at work and in nonmarket activity. The analysis includes some male/female comparisons of breacktime at work, family assignment of household chores, and ownership of time-saving durables, (forthcoming in Research in Labor Economics, Cornell University).

6. "The Investment of Time by U.S. Households: A Preliminary View", by F. Thomas Juster, prepared for the American Statistical Association Meetings in August 1978. This paper analyzes the extent to which different demographic groups allocate their time between investment and consumption activities of various kinds.
7. "Lifetime Fertility, Childcare, and Labor Supply", by C.R. Hill and Frank Stafford. This paper formulates theoretical and econometric models of fertility, care per child and proportion of time in the labor market. These models relate to lifetime plans and demonstrate a strong dependency between lifetime plans and short-run time use. The econometric model also demonstrates a trade-off between care per child and number of children. Those families which plan to have the most children tend to spend less time caring for each child. This paper has been submitted to Econometrica.
8. "Bayesian Consumer Econometricians", by Frank Stafford. This is a short, theoretical paper outlining the way in which households learn about new products. The paper argues that a statistical decision model is consistent with most of the factors which have been found to explain the adoption of consumer good innovations. The paper was presented at the International Seminar in Sociological Economics (Paris, September 1977), and will appear in a book of conference papers.
- 9.\* "Social Accounting and Social Indicators: A Framework for the Analysis of Well-Being", by F. Thomas Juster, Paul N. Courant and Greg K. Dow. This paper outlines a system of resource accounting and output specification that uses goods, time and capital stocks to produce a set of tangible and intangible outcome variables.
10. "Home Production and the Residential Electric Load Curve", by Daniel Hill. This paper utilizes the rich information on the timing of energy-intensive household activities to illuminate problems involved in understanding the response of households to innovative electric rate structures. It concludes, on the basis of theory and prior information, that households will be most responsive to time-differentiated rate structures in activities which utilize substantial amounts of hot water (clothes and dishwashing) and least responsive in space-conditioning activities (heating and cooking).

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\* See No. 20.

11. "Television and Leisure Time: A New Tomorrow?", by John Robinson. This paper finds a large increase in television viewing in the U.S. between 1965 and 1975, particularly among higher-educated and higher-income groups. The straight linear relation between television viewing and social status found in 1965 became a curvilinear relation in 1975. Further, television viewing seems to have drawn its increased time from decreased work and family obligations rather than other leisure activities.
12. "British-American Differences in the Use of Time", by John Robinson. Comparing time-diary data for American and British adults, this paper finds similar patterns of time-use in both countries, although Americans seem to be slightly more work-oriented and engage in a somewhat different mix of free-time activities.
13. "The Changing Character of the Daily News Audience", by John Robinson. This paper examines trends in time devoted to various forms of news media--newspapers, magazines, radio and television--between 1965 and 1975. A shift from newspaper reading to television news is found which cannot be accounted for by the influx of individuals socialized with television (the younger generation of adults). The shift is found to be more pronounced among older adults than among younger ones.
14. "Empirical Patterns of Time Use", by Martha Hill. This work involves a descriptive analysis of patterns of time use in 1975-76. It looks at variations in time use according to basic demographic characteristics of respondents--age, sex, marital status, labor force status, and regional location. In addition, it explores variations in time-use across days of the week (Saturday, Sunday and weekdays) and seasons of the year.
15. "Methodological Studies", by John Robinson. This paper discusses the results of several studies dealing with methods of measuring time-use. These include both "validity" studies of time diaries--research which tests the accuracy of information obtained from time diaries--and studies concerning such issues as the impact of length of recall on time-use information and the correlation between estimates of time spent on particular activities obtained from direct questions about these activities and estimates of time spent on those activities obtained from the respondent's time diaries.
16. "Constraints and Complementarities in Time Use", by Martha S. Hill and F. Thomas Juster. This paper examines factors affecting the time allocation of married couples to work activities (housework and market work) and to leisure activities (active as well as passive ones). While it is found that the effects of spouses' wages on the division of work activities in

the household are generally in the direction suggested by economic theory, sex role adherence appears to be more important in determining the division. There is a general tendency for people who enjoy an activity more than others to spend more time on that activity. There is also evidence of complementarities in spouses' time in leisure activities: the more time a person's spouse spends on a given leisure activity, the more time that person spends on it.

17. "Measuring and Valuing Nonmarket Time Spent in Maintenance of Major Durables and Home Improvements", by Martha S. Hill. This paper is concerned with the amount of nonmarket production activity in the form of do-it-yourself maintenance and improvements of major durables such as the home, cars and major appliances. It investigates issues concerning both assignment of dollar values to this nonmarket work and measurement of the time spent in the activity, as well as examining factors affecting time spent in this activity. It presents and applies a value-added method for valuing this work, and uses LISREL to simultaneously investigate measurement error components of estimates of time spent in the activity and the effects of factors such as skills and preferences on time allocated to this form of nonmarket work.
18. "Would the ERA Lead to a Swedish-Style Tax System in the U.S.?", by Frank P. Stafford.
19. "Goods, Satisfaction with Activities, and Well-Being: And Exploratory Analysis", by Greg K. Dow and F. Thomas Juster. This paper discusses the roles of goods and time-use in conventional economic models of utility, and proposes a method for describing the satisfactions obtained from the use of time in alternative activities. A descriptive study of the distribution of such satisfactions for the U.S. population and empirical models of time allocation are presented, and the dynamics of preferences among activities are discussed.
- 20.\* "The Theory and Measurement of Well-Being: A Suggested Framework for Accounting and Analysis", by F. Thomas Juster, Paul N. Courant, and Greg K. Dow. This paper develops an accounting framework which synthesizes recent work on social indicators with National income and product accounts. This framework focuses on the allocation of time by households to market work, nonmarket work and leisure activities, and attempts to associate flows of market goods with these patterns of time use. Social indicators are identified as stocks whose levels may be modified by private (household, business) or public investment activities.

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\* Replaces Working Paper No 9.

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