Notater

Statistisk sentralbyrå, P.b. 8131 Dep, 0033 Oslo

93/4 januar, 1993

The potential of Norwegian official consumption statistics in marketing research

by
Jing Li

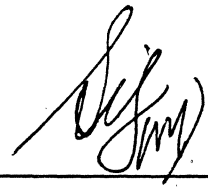
MASTER THESIS
Presented to:

The Central Bureau of Statistics of Norway
and
Norwegian School of Economics and Business Administration

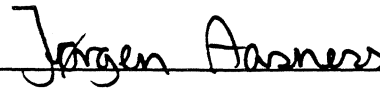
Abstract

The main intention of this paper is to facilitate and promote the application of secondary consumption data in marketing research activities. To serve this purpose, a comparision of the Norwegian consumption statistics from the National Accounts and Household Expenditure Surveys is carried out. It deals with the consumption data at the most detailed level from the period 1973-1985. Apart from presenting the empirical results of the comparision, effort is also made to evaluate the quality of the two sets of statistics, and to explain the discrepancies between them.

Approved:



Professor Sigurd Villads Troye
Thesis Advisor
Marketing Institute of NHH



Dr. Jørgen Aasness
Thesis Advisor
The Research Department of CBS

Grade Received

The acceptance of this thesis does not mean that methods used, the results found or the conclusions drawn are those of the Norwegian School of Economics and Business Administration

PREFACE

Three factors served as basic motivators when I decided to contribute to the topic of utilizing secondary data in marketing research.

First, I had worked in the State Technology Information Service of China for many years. My responsibility was to collect, transform and organize the latest publically available information in the field of machine and equipment automation from international sources, and finally make it accessable to industrialists and researchers. My experience was that many types of publically accessable, low cost information sources were not as well utilized as they might have been. Therefore, such topics as how public official statistics are applied in different fields and how they could potentially be used to contribute to the information needs of a wider user category have interested me.

Second, as a business student I have experienced many frustrations when confronted with secondary data. I was lost, especially when different sources provided "the same statistics" with great discrepancies. It is a too demanding task for each user to study the whole data collection process in order to decide which data source is most reliable. Sometimes there is even no indication in the publications about the origin of the data, definition of units, etc, which are very important to the secondary users because they intended to use the data for other purposes than the data were primarily collected for.

The third and the most important factor that enables me to actually carry out this study is the interest shown by the Central Bureau of Statistics of Norway. I got generous financial and personal support form CBS over the whole period with this study. My advisor Jørgen Aasness in The Central Bureau of Statistics actually suggested the concrete topic of the research and has always supported me with

encouragement and valuable advices.

The basic objective of this thesis is to evaluate the quality of Norwegian official consumption statistics for marketing purpose, and thus hopefully enhance the marketing researchers' understanding of these official statistics. At the same time, efforts were made to explain the process of marketing research to those who are involved in collecting these statistics, and to convey how their work can contribute to others.

I would like to acknowledge here the many valuable ideas from my advisors Jørgen Aasness of the Central Bureau of Statistics(CBS) and Sigurd V.Troye of Norwegian School of Economics and Business Administration (NHH).

A special note of thanks goes to the following persons: Lorents Lorentsen who has made useful comments and provided constant support and encouragement; Stein Opdahl and Ann Lisbeth Brathaug who have supported me generously with their patience in response to my endless inquiries.

In addition, I would like to express my appreciation to the many colleagues at the Central Bureau of Statistics, who, in one way or another, have assisted me over the four months of preparation and work with this thesis. They are: Anne Lodberg Holm, Bård Lian, Bjørn Olaf Pedersen, John Dagsvik, Kjell Hogstad, Leiv Solheim. Finally, I would like to give my gratitude to Edith Haugen at the CBS personnel office and The Administration Group at the Research Department for their administrative support which has enabled me to concentrate on the work with this thesis, and the User Support Center at the system office for their assistance concerning use of the SAS program.

December, 1993

CONTENTS

1. INTRODUCTION

There are two independent official data sources available for the Norwegian private consumption. They are "household expenditure surveys" and "national accounts". These sources serve primarily as basis for macro economic monitoring, planning and budgeting at the national level. At the same time, they could also be used as secondary data sources for other purposes such as marketing research. If used effectively, they can be the most economical sources for marketing researchers since they are readily accessable and priced according to the marginal cost of printing the extra copies. Of course, from the marketing point of view, the level of aggregation of these statistics are only meaningful for certain marketing decisions. Some crucial questions are: What kind of information requirements arise from different marketing decisions? How can these consumption data be used in marketing decision making? How reliable are these data sources for certain commodity and service groups? This thesis tries to address these questions and is organized in the following way:

Chapter 2 - Marketing research and its process - introduces some basic concepts about marketing, marketing research and the research process.

Chapter 3, 4 and 5 deal with the quality evaluation of the Norwegian consumption statistics. In searching for principles to decide which data source is more reliable for which commodity/service groups, the problem has been approached from two directions. One way is to study the data collection processes of the two sources separately and try to find the clues of absolute quality (close to the true values). Another way is to compare the time series estimates (1973-1985) of the same statistics from the two sources and decide on the relative quality of these statistics. In the first approach, all the primary sources have been traced out and studied from the sampling plan to measurement unit

and calculation. In the second approach, the ratio and regression of the two data sets have been studied at the three digit classification level (chapter 5).

Chapter 6 - The potential of consumption data in marketing research - explores the possibilities of using consumption statistics in assisting marketing decision making.

2. MARKETING RESEARCH AND ITS PROCESS

2.1 Marketing decisions and information needs

2.1.1 Marketing

Marketing is the performance of business activities that direct the flow of a company's goods and services to customers or users for a profit (Philip R. Cateora, 1987). Traditionally, marketing consists of four elements called 4-Ps or marketing mix, they are:

* Price
* Product, which includes all the property of the physical products or services
* Promotion, which refers to advertising, personal saling, publicity and sales promotion
* Place, which is related to the channels of distribution

Any activities concerning the above areas are within the definition of marketing.

As business evolves on the trend of internationalization, firms which have been serving their domestic markets are also subject to keen international competition no matter how badly they might want to avoid it. In response to the new challenge, marketing has been enriched with new contents. Marketing decisions are not only revolved around the domestic market emphasizing the 4-Ps. Marketing in an international sense put more emphasis on the activities associated with country risk/opportunity assessment, mode of entry decisions and assessment of product market size in foreign/multi markets.

2.1.2 Marketing decisions

Table 2.1 Marketing decisions and information needs

Type of decisions	Marketing decisions		Type of indicators	Detailed information
Strategic decisions	Country Entry	Risks	political risk	export ratings of stability
			financial risk	inflation, exchange rate risk, capital flow restrictions
			legal risk	export/import and ownership restriction
		Opportuni--ties	macromarket potential	GNP per capita, growth of GNP, urbanization
	Mode of entry		production & marketing cost	raw material/energy, labour/capital costs
	Product market		product market size	sales volume of prod. sale of complementary /substitute product, number and size of competing firms
Tactical decisions	Product policy		new product ideas, the direction of customers' preference shift, how customers assign weight on the different attri--butes of the company's product	
	Pricing		price sensitivity of customers price sensitivity of competitors	
	Distribut-ing		customer's shopping pattern and behavior customer's attitudes to store styles distributor's attitudes and policy	
	Advertis-ing		advertising effects media habits	
	Sales promotion		customer's response to alternative types of promotion	
	Sales force		effects of alternative sales presentation	

The decisions, that a marketing manager might have to make, can be classified into strategic and tactical decisions. Strategic decisions are usually made at the corporate level of the organization, It deals with market entry, mode of entry and product market potential. Tactical decisions are often taken care of by the local operating

unit, and the marketing manager has to decide on the proper marketing mix, such as product policy, pricing, distribution, advertising, sales promotion and sales force (refer table 2.1).

2.1.3 Information needs

In order to make these decisions, the marketing manager needs a minimum amount of information. For example, a marketing manager who is making pricing decision should know the cost of the product, the price elasticities of the product and its substitutes, how the competitors will react to a price change, if there is any government regulations of prices etc.. Different decisions have different information requirements. The strategic decisions might only require surrogated indicators. At the tactical level, more specific information about a narrow product line or even a single brand is necessary.

2.2 Marketing research and the research process

2.2.1 Marketing research

Most marketing managers have only indirect knowledge of their customers. Even at the operational unit level, the ones who make decisions spend most of their time in their office. Also, as the company grows big and the industry matures, a complicated system of branch offices, wholesalers, and retailers intervenes between managers and their scattered customers. Yet the managers must know who and where their customers are, what they want, and what the competitors are doing, if they hope to make sound decisions. Often the executives rely on internal sources like their marketing representatives and accounting records for information. The need for marketing research arises when these sources alone could not provide adequate information, which is often the case.

Marketing research is the systematic gathering, recording, and analyzing of data about problems relating to the marketing of goods and services (The American Marketing Association). The essential purpose of marketing research is to provide information which will facilitate the identification of an opportunity or problem situation and to assist managers in arriving at the best possible decisions (Boyd, Westfall & Stasch, 1981).

2.2.2 The marketing research process

The marketing research process incorporates three phases:

The preliminary phase of the research process usually deals with such activities as problem definition, assessment of information needs, and the desk research to decide on if or how well the secondary sources

can meet the information needs, or if and how primary data collection have to be carried out.

In most circumstances, secondary data sources are preferable. Primary data collection is used only when in depth information is needed or relevant secondary data is lacking.

The second phase is related to the actual data collection either from secondary sources or primary sources or both.

Third phase involves data analysis, updating date banks, and finally implementation of the research results.

2.3 Information sources

2.3.1 The types of sources

For practical purpose, the classification of data sources into primary and secondary is used. A data source is primary when the data collection is tailored to the purpose of the data user. When somebody uses data from a source which was not specifically designed for him/her, we say this data is secondary data to him/her. Therefore, primary or secondary is not a property of the data. It is meaningful only relative to the data user. The same set of data can be primary data for one user, but secondary to another.

Needless to say, primary data would be the ideal data for any types of decisions or problems, but on the other hand, primary data collection demands lots of efforts. Sometimes the cost of conducting the primary data collection, control and organizing could not be justified by the increased benefit of making better decisions. In this case, secondary data have to be used. In some other cases, there exists data collected for more or less the same purpose, and it might be a great saving of both efforts and money to find such secondary sources.

A secondary data user should be aware of all the shortcomings as well as the advantages of the secondary data. It is usually difficult to assess quality of secondary data. More often than not, their definitions or unit of measurement or aggregation level do not fit the problem at hand. Bad publication currency is a common drawback for many of the internatinal secondary sources. The advantages of such data are low cost and ready avaiability.

Secondary data often play an more important role in international marketing research, in an initial phase of the research, and for strategic country level decisions. They are also heavily used in monitoring the environment in established markets.

There are four important types of secondary data sources used in marketing research:

(1) Company internal statistics
(2) Official publications of countries or international organizations
(3) Private marketing research organizations
(4) Commercial banks

Among them, this thesis is exclusively concerned with the second category and particularly with Norwegian official consumption statistics from the Central Bureau of Statistics of Norway.

In practice, this type of national statistics is seldom used directly by marketing researchers, rather the researchers are more used to searching data from the publications of international organizations such as the OECD, World Bank, The United Nations etc. In fact, the official statistics of individual countries are, in most cases, the data sources of these publications from international organizations. I would therefore assume that the discussion of data quality in the next three chapters about Norwegian official consumption statistics could also contribute to enhance the understanding of users of these international publications.

2.3.2 The criteria in evaluating secondary data

Researchers are apt to underestimate the amount of secondary data available, and are overly enthusiastic about primary data collection. This is unfortunate. Even though secondary data are collected for other purposes, and thus rarely fit perfectly the problem defined, secondary data possess some significant advantages over primary data as long as their quality can be properly assessed. Therefore it is necessary and crucial to develop a critera for evaluating the quality of secondary data.

First, secondary data may have lower accuracy than primary data because of the additional source of errors involved. Secondary data contain all the errors that areincurred in the primary data collection, such as sampling error, nonresponse error, etc.. Besides this, additional inaccuracy arises when the data is copied from one publication to another or transferred from one type of measurement to another under certain assumptions. The retail sales statistics are transferred into consumption figures under the assumption that the retail stores follow certain pattern in their product compositions. Typing errors may happen in the process of retyping, or there may be subjective modifications for certain purpose.

Second, secondary data can be ill-suited to the problem at hand because of the incomparability in measurement unit and classifica-

tions or because that the data is out of date for the present purpose. For example, consumption can be expressed by individual, family and household. Food consumption can be measured as one category or classified into as many detailed categories as meat, bread, vegetables, etc.. The income level can be defined as $(0-4999), $(5000-9999), or as $(0-3000), $(3001-6000), etc.. A recurring source of frustration in using secondary data is that the sources present the desired information in unit of measurement or classifications or definitions differ from that needed.

The third criterion by which the quality of secondary data can be assessed is the quality consistency both over a period of time and across sectors and commodities. If a secondary data source provides data with an inconsistent quality level, it would be very difficult for the data user to control the overall quality level of the research results. The problem of inconsistency exists for primary data sources as well.

So, accuracy, fitness and consistency are the three criteria by which the quality of secondary data can be judged. In the following two chapters, the consumption data from household expenditure surveys and national accounts will be assessed against these three criteria.

3. GENERAL EVALUATION OF CONSUMPTION DATA FROM HOUSEHOLD EXPENDITURE SURVEYS

3.1 An introduction to the household expenditure surveys

3.1.1 Purpose and data source

The household expenditure survey serves principally to give a detailed description of the consumption of private households by commodity / service groups in order to update the weights used in calculating the consumer price index of the country. The consumptions across demographic characteristics of households such as household composition, occupational status and age of the main income earner, residential area, size of total consumption expenditure, etc. are also investigated to make it possible to apply economic / econometric demand analysis for social policy purposes (Skjerpen, Terje and Jørgen Aasness (1989)).

The Central Bureau of Statistics of Norway has been carrying out the household expenditure survey annually since 1974. Before 1974 the nationwide surveys were carried out in 1958, 1967 and 1973.

The surveys collect data directly from private household consumers. Its closeness to the primary data sources excludes many possible sources of error arising from the process of reproducing and transforming the data. Having a primary data source also makes it easier and possible to search for general evidence of quality by data users.

3.1.2 The survey design

a) Sampling design

The whole sample consists of households selected by two separate processes: General sampling and special sampling. While the general sample is drawn from the whole population, the special sample comes from the general sample of the previous year (refer appendix 1 for details).

b) Data collection procedures

Personal interview and accounting books are combined in the data collection.

3.1.3 Survey administration

a) Survey design: the household expenditure survey design has been conducted centrally in the Central Bureau of Statistics.

b) Field work: the Central Bureau of Statistics has its own part time field staff scattered around the country. Whenever an area is drawn into the sample, the interviewers in that area is responsible for the field work. The households selected are usually visited twice (introductory interview and concluding interview).

c) Data analysis: The raw data of the survey are handed up to the CBS staff for centralized processing and analysis.

3.1.4 Corrections for error

Corrections have been made for the published average figures. Relatively high weight has been assigned to household groups with a high non-response rate. The expenses for households in which one or several members are absent during the accounting period have been adjusted upward, while downward adjustments on food expenses have been made for those with casual visitors in regular board.

3.2 General evaluation

The criteria used to judge the quality of survey data

1. DATA ACCURACY

a) data source reliability
- *sampling error*
  - * *sample size*
  - * *the length of the registration period*
  - * *sampling procedure*
- *non sampling error*
  - * *noncoverage*
  - * *nonresponse*
  - * *field: data collection*
  - * *office: data processing*

b) the purpose of publication
c) general evidence of quality

2. DATA FITNESS
a) unit of measurement
b) classification and definition
c) publication currency

3. DATA QUALITY CONSISTENCY

3.2.1 Data Accuracy

a) Data source reliability

* Sampling error

The sampling error is defined here as: the type of error that are within the control of the survey researcher by changing the sample size and choosing a more probabilistic sampling procedure. The biases arisen from low quality sampling frame and nonresponse are classified as nonsampling errors.

Sampling size

The decision of a proper sampling size depends on factors such as population variability, degree of confidence required of the estimation and the budget available to the survey. The sample sizes are given in this study, hence, a relative measure T is introduced, along with the assumption that the estimated mean consumption values are normally distributed, to measure the precision of the surveys.

$$T_i(t) = H_i(t) \; / \; X_i(t)$$

$$H_i(t) = 1.96 * S_i(t)$$

Where $H_i(t)$ - half of the confidence interval with a degree of confidence of 0.95

$X_i(t)$ - mean consumption for commodity group i in year t

$S_i(t)$ - standard error of the estimates

Table 3.1 presents the value of H and T for total consumption estimates in the period 1973 -1985. The results for one digit groups are presented below. For information on two digit groups, see appendix 1, Table A1.3.

Table 3.1 Precision of estimate for total consumption per household (1973 - 1985)

Year	mean annual consumption per household (NOK)	H (NOK)	T (%)
1973	36 832	1560	4.24
1974	40 876	2360	5.77
1975	43 963	1835	4.17
1976	50 387	2182	4.33
1977	58 830	2783	4.73
1978	61 938	2785	4.50
1979	61 931	2281	3.68
1980	68 697	3285	4.78
1981	80 622	2895	3.59
1982	86 636	2956	3.41
1983	95 794	3205	3.35
1984	108 312	3779	3.49
1985	121 386	4324	3.56

From table 3.1, we see that the level of precision judged by T for the total consumption estimate has been reasonablly stable over the whole period. The value of T stays around 4% - 5% of the mean value. Which means that there is 95% chance that the true value of the total consumption lies within an interval of ±(4%-5%) of the estimated average figures during th ewhole period of 1973-1985. For example, in 1985 there is 95% chance that the true value of average total consumption per household is between (121386-4324) NOK and (121386+4324) NOK, if the estimated consumption figures are normally distributed. This level of precision is acceptable for many marketing purposes. But, the level of aggregation is almost meaningless for

marketers. So, beside the total consumption figure, the marketing researchers are much more interested in the reliability of the estimates for more detailed commodity and service groups which is presented in appendix 1 (table A1.3). The summarized results for one digit groups are given in table 3.2.

In table 3.2. variation is measured by the magnitide of the standard error of the estimates during the period 1973 - 1985. While stability is measured by the maximum difference of the standard errors of estimates during the same period.

Table 3.2 The ratings of variation and stability
(1973 - 1985)

variation	one digit commodity group	stability
(low) 1.	Food (code:0)	1(high)
2.	Rent, fuel and power (code:3)	4
3.	Clothing and footware (code:2)	2
4.	Furniture and household equipment (code:4)	3
5.	Beverages and tobacco (code:1)	2
6.	Transport (code:6)	2
7.	Other goods and services (code:8)	3
8.	Recreation and education (code:7)	4
(high)9.	Medical care (code:5)	5(low)

Since the standard error of estimation was calculated from the total sample of the year, it includes both the sample error of each accounting period and seasonal fluctuations. Therefore, the variation described in Table 3.1 and 3.2 may have ambiguous interpretations. For example, the reason why the consumption of food has small variation may be due to either reliable registrations or its stable consumption pattern over the whole year; Products like recreation and education are the typical items that are subject to strong seasonal influence, therefore the high variation may not be interpreted as a signal of low data quality. Medical care expenses may be even more incidental.

Except variation, table 3.2 also gives information on stability of variation over the period of time for each group. Which can be valuable, because it shows the consistency of the data quality. A stable development of the sample variation can be an indication of good data quality.

the length of registration period

Even though the registration period for each household is only 14

days, the sample has been evenly distributed over the whole year. This means, on one hand, that the seasonal consumption fluctuation has been taken into consideration. On the other hand, this effort may result in greater errors because of the largely shrinked sample size for each period. Suppose the households in the selected sample has been evenly assigned to the 24 registration periods of the year, then in each period, the sample size has been reduced to only 1/26 of the total sample.

Sampling procedure

Stratified and area sampling technique are combined in the surveys, and it is a relatively sound procedure with limited bias. See Thomsen (1977).

* Non-sampling error

One important feature of sampling errors is that they decrease as the sample sizes increase and as the us of a better sampling procedure. On the other hand, nonsampling errors reflect errors which may not be elimilated by increasing the sample size. Therefore, these nonsampling errors, especially systematic nonsampling errors, are much more pervasive, difficult and costly to control. They can only be reduced by improving the survey method instead of increasing the sample size.

Noncoverage

One of the most important nonsampling error sources is the sampling frame. An incomplete and out of date sampling frame could ruin any carefully designated sampling plan and turn all the previous efforts fruitless because of the unbalanced nonresponse rate and reduced sampling size. Noncoverage error arises when some segments of the population that are not listed in the sampling frame. In this case, nothing can be done, except to find a better sampling frame. The sampling frame used by the household expenditure surveys is "The Index of names and addresses of the population in the local area", which is a reasonably sound frame. Refer ??.

Survey nonresponse

Nonresponse is a failure to obtain information from some elements of the population that were selected and designated for the sample (Churchill, G.A. 1983). Nonresponse can be caused by either the respondents or the sampling frame. The first source of nonresponse is easier to control than the second. Efforts have been made to correct nonresponse error in the household expenditure surveys by assigning higher weight to the household groups with high nonresponse rates based on evidence accumulated in the past surveys. The overrall

nonresponse rates during 1973 and 1985 are given in table 3.4.

Table 3.4 non-response rate (%) of the survey (1973-1985)

1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
29	33	32	31	30	35	38	40	34	37	37	40	39

The nonresponse rate seems to have the tendency to increase over time. Generally speaking, the nonresponse rates in the household expenditure surveys are acceptable (??) at present level, but measures have to be taken to prevent the downward trend from continuing.

Data collection

Field error in data collection is one of the main sources of bias that threatens the accuracy of the survey results for two reasons. One is that the field work of the household surveys has been delegated to mostly part-time local personnel. The quality of this staff varies greatly from area to area and time to time. The other reason is that the physical distances and scattered sample areas make it difficult to supervise or monitor the implementation of data collection process, and to find the error of bias arising from field work.

Beside the interviewer, field error can result from the respondents, respondent-interviewer interaction and the recording system. Since only background data and consumption data are involved in the household expenditure surveys, we have reason to believe that these data reported by respondents are generally more reliable than attitude data. The degree of reliability probably varies greatly among commodity and service groups. For some special commodity group, such as alcohol consumption, the survey results should be questioned (a detailed analysis is carried out in chapter 5). Even though Norwegian household expenditure surveys tend to underreport the alcohol consumption, it may not be true for other countries. So the conclusion about Norwegian household consumer expenditure statistics in this thesis is not necessarily valid for other countries.

The recording system used in the surveys is quite structured (see CBS, Survey of household expenditure, apppendix 3). It poses no serious problem when recording consumption data. The nature of the data collected and the structured recording system also makes it acceptable to employ less skilled field interviewers.

Data processing

Errors can and do arise in the editing, coding, tabulation and analysis of data. In most circumstances, these errors can be reduced, if not eliminated, by careful checking and adopting advanced,

systematic data processing system. All the office work in the household survey has been centralized in the Central Bureau of Statistics and carried out by professional staff.

b) The Purpose of Publication

The purpose of publication is the second criterion by which the accuracy of secondary data can be assessed.

Sources published to promote sales, to advance the interests of certain groups, to present the cause of a political party, or to carry on any sort of propaganda, are suspect. Data published anonymously, or by an organization which is in a defensive position, or under conditions which suggest a controversy, or in a form which reveals a strained attempt at "frankness", or to controvert inferences from other data, are generally suspect. (Nemmers and Myers, Business research, 1980, p43)

On the other hand, sources the primary function of which is publishing data deserve confidence. The Central Bureau of Statistics of Norway is an independent institution which undoubtedly should be classified in this category.

c) General evidence of quality

The third criterion by which the accuracy of secondary data can be assessed is through general evidence of quality. First of all, the ability of the organization to collect the data. As to this aspect, the Central Bureau of Statistics of Norway has relatively greater leverage in securing the nation-wide survey data than other independent marketing firms. In fact, CBS is the single source that possesses the resources necessary in carrying out such a large scale annual survey. On the other hand, because of its unique position and non-profit nature, there might be a problem of lack of incentive to maintain data quality and keep publication up to date. Another important evidence of quality is whether or not a detailed description of how the data were collected is provided along with the data in the publication. Any omissions could be indicative of sloppy methods. The results from the household expenditure survey have always been published in the form of three years' aggregate (Survey of consumer expenditure, Norwegian Official Statistics) and contained detailed description of the survey design, implication, errors and reliability estimates, adjustment to errors in calculating the average, definitions of different items, etc..

3.2.2 Data fitness

Until now, we have discussed how the survey results could deviate from

their true values. From this section, a quite different aspect of the quality of the survey data will be examined. When discussing data fitness, there is no absolute high quality data or low quality data, everything depends on what purpose the data will be used for.

a) Unit of measurement

The selection of household as the basic unit for data collection in the household expenditure surveys excludes many possibilities for use in marketing research. The most ideal unit for most marketing purposes is the individual consumer. But there are still many marketing decisions that are not sensitive to the selection of unit. Refer chapter 6.

b) Class definition

The relevant problem with respect to class definition in the survey is that the level of aggregation for commodity and service groups is quite high for many marketing purposes.

c) Publication currency

The three year average consumption figures from the surveys are available to the public users on an average of 2-3 years after the surveys. From the business point of view, the data has already become historic record before its publication! This low publication currency restricts the consumption statistics to a very limited use such as testing consumer marketing models.

3.2.3 Data quality consistency

Since the household expenditure surveys use consistent methods over time, I would assume that the quality of data is reasonablly consistent as a whole. But it varies a lot among groups, as the measure of stability of variation indicates in the study of sampling size in chapter 3.2.1a.

4. GENERAL EVALUATION OF THE CONSUMPTION DATA FROM NORWEGIAN NATIONAL ACCOUNTS

4.1 An introduction to the Norwegian National Accounts

4.1.1 Purpose

The primary aim of compiling the national accounts has been to present an overview of the economic condition of the country, to describe the economic performance from one point in time to another, and thus to serve as an empirical basis for monitoring, national budgeting and macro-economic planning.

4.1.2 The accounting standard

The concepts and classifications in the Norwegian accounting system are in accordance with United Nations' new System of National Accounts (SNA) from 1968. The main features of the framework provided by the summary matrix in the SNA has been used as a basis for the Norwegian National accounts.

4.1.3 The accounting period

The national accounts are divided into preliminary accounts and final accounts. There are three types of preliminary account. They are:

* Economic Survey accounts
* March accounts
* November accounts

The economic survey accounts for year t are prepared at the end of January or begining of February in year t+1; The March accounts are

published in the Weekly Bulletin of Statistics in April of year t+1; The november accounts are avaiable at the end of January in year t+2.

The Final accounts are published at the end of January together with the economic survey accounts for year t+1.

4.1.4 The structure of Norwegian National Accounts

At the aggregate level, there are four types of accounts which represent 4 types of distinct economic processes:

* Production accounts
* Income accounts
* Accumulation accounts
* Rest of the world accounts

At the more detailed level, the accounts can be divided into two major parts: Production and commodity accounts, Income and outlay and capital finance accounts and balance sheet accounts. Refer Fløttum (1981) for more detailed description of the system.

This thesis deals with the accounts for private households consumption, which is one of the connecting points between the two major parts of the national accounts. In the accounting system, 135 categories of consumption are specified under private final consumption expenditure at the 3 digit level, consisting of 98 groups of consumer goods and 37 groups of services. This classification system is equivalent to that used in the household expenditure surveys at 1 and 2 digit level. They differ for several commodity and service groups at the 3 digit level.

4.2 General evaluation

The criteria to judge the quality of secondary data

1. DATA ACCURACY
a) reliability of data transformation

2. DATA FITNESS
a) unit of measurement
b) class definition
c) publication currency

3. DATA EQUIVALENCE

4. DATA QUALITY CONSISTENCY
a) over a period of time
b) across commodity groups at the same time point

The consumption statistics in the national accounts differ, in many ways, from that of the household expenditure surveys:

(1) They come from many different data sources

(2) They are further away from the primary data sources

(3) The primary data is collected through registration (in the final accounts) of the total population.

(4) The data is not collected directly from consumers, but calculated through logical deductions and assumptions based on sales and production statistics.

(5) The data are heterogeneous concerning the quality of data sources, way of calculation and the distance from the primary sources.

Due to these characteristics of the methods in the national accounts, some issues are more important than others when studying the quality of consumption figures. The highlighted areas include (1)the process of data transformation from the primary figure to the final consumption, and (2)the quality consistency of different primary sources and transfer factors. The discussion of data source reliability will be omitted. A discription of the data collection process is available in appendix 2.

4.2.1 Data Accuracy

a) Reliability of data transformation

The National Accounts figures differs from that of the consumer expenditure surveys in that National Accounts use secondary data sources. Due to the differences in the purposes of data collection, measurement units etc., the consumption data in the national accounts have to be estimated indirectly based on certain logical relationships of variables and assumptions. Therefore a chain of transformation from the original data sources to the final consumption figures is needed.

Consumption = Function(Primary statistics,Transfer factors)

The reliability of these final figures is not only determined by the errors incurred during the primary data collection, but also affected by the accumulated errors in the transformation process. Since most of the primary statistics, in the case of final National Accounts, are collected through official registration, their quality can be reasonably trustworthy. In this section, the transformation factor will be discussed for the main commodity and service groups.

There are three methods used in the national accounts to calculate the final private consumptions. They are intermediate method, volume method and service method (refer appendix 2 for details).

(1) The intermediate method transformation factor

A key link, in the case of intermediate method, is the consumption matrix used to transfer the retail trade data into consumption data. The transformation formula can be written like this:

$$C_j(t) = \sum_i W_{ij} * X_{ij}(t)$$

Where $C_j(t)$ - consumption for commodity j in year t

W_{ij} - the weight assigned to type i store when computing consumption of commodity group j (transformation factor)

$X_{ij}(t)$ - annual sales of commodity j from type i retail outlay in year t (source data)

Before 1979, the consumption matrix had been based on Statistics on Purchases for Retail Trade which had been prepared every 3-4 years on a sample of retail establishments. The matrix was revised when new results from the Statistics on Purchases for Retail Trade were available, and was held constant in the intervening years. A major revision was carried out in 1979 after a national survey held

especially for the consumption matrix. Since then, the matrix has been unchanged. This means that it is assumed that the value composition of different commodity categories from certain type of retail stores have been constant over more that 10 years. This is obviously a nonconvincing assumption, which may be an important source of error for the consumption figures in the National Accounts.

(2) Volume method used for 18 commodity groups and 2 service groups

For 18 commodity groups and 2 service groups (refer appendix 2), the transformation formula is:

$$C_j(t) = Q_{sj}(t) * T_j(t)$$
$$T_j(t) = (Q_{cj}(t-1)*P_j(t)) \;/\; Q_{sj}(t-1)$$

Where:

- $C_j(t)$ - consumption of commodity j in year t
- $Q_{sj}(t)$ - volume sold/registered/taxed for commodity j in year t (source data)
- $Q_{sj}(t-1)$ - volume sold/registered/taxed for commodity j in year t-1 (source data)
- $Q_{cj}(t)$ - volume consumed for commodity j in year t
- $Q_{cj}(t-1)$ - volume consumed for commodity j in year t-1
- $P_j(t)$ - price index for commodity j (transformation factor)

In this calculation, it is implicitly assumed that the growth rate in sales volume equals the volume growth rate of consumption. These two variables should be perfectly correlated in the long run according to economic theory, but there may be great deviations in the short run.

Apart from the above assumption, the price index is another factor that can cause inaccuracy in the transformation process. In this case, the consumer price index is used which is based on the household expenditure survey. Here we can see that the two consumption data sources (HES & NA) in CBS are not totally independent of each other.

(3) Service method for the service groups

With regard to the service groups, the transformation formula simply is:

Consumption = Gross output of the service sectors

The assumption here is that services have zero stocks.

4.3 Data fitness

As discussed in chapter 3 for the survey data, the issue of fitness as regard to measurement unit and classification should be evaluated in relation to the problem at hand. Therefore will not be repeated here.

As to the publication currency, it is always vitally important to get the most updated information in marketing decision making. In this respect, the national accounts data is better than household expenditure data because the first preliminary accounts for year t is available between January and February at year t+1.

4.4 Data equivalence

The question of data equivalence becomes relevant when the user wants to compare the research results with some alternative research in order to make final decisions. One such situation is to make market entry decision where the decision maker has to compare the volumes of demand in different markets. If the research figures are not comparable, no matter how reliable each of these figures are, they will not serve the purpose of the decision maker. The problem of incomparability may be due to definition, unit of measurement or point in time etc.. Since the National Accounts have principally followed the relevant international standard, figures from National Accounts have a relatively high degree of equivalence when comparing to the national accounts figures from other countries in international marketing research.

4.5 Data quality consistency

4.5.1 Over a period of time

The data collection and calculation methods adopted in National accounts have been relatively consistant over the years. We could assume that the quality of the national accounts data are relatively time consistant.

4.5.2. across commodity groups at the same time point

In this dimension, there are two sources of inconsistency. The quality inconsistency may be caused by the nature of the products themselves. The consumption of some commodity or service group may have better estimation than others. The other source of inconsistency may result from the fact that the national accounts use many data sources. Especially for the service groups, the final consumption are the results of piecing together scattered information. Also the validity of the assumptions made by the three estimation methods varies to a great extent.

5. COMPARISION AND EVALUATION OF CONSUMPTION DATA FROM THE HOUSEHOLD EXPENDITURE SURVEYS AND THE NATIONAL ACCOUNTS

5.1 Methods

5.1.1 Data triangulation

The availability of certain statistics about the same population from two or more independent data sources enables us to compare the results. Large deviations between the data from different sources can give us a starting point to search for the causes for or reasons to explain the inconsistency and decide on which source is more accurate for certain purposes. If the data from different sources fit together, this could enhance users' confidence about these data sources because the probability that two or more independent measurements / methods have the same systematic error may seem small.

5.1.2 Aggregating the survey data

The private household is used as the basic unit of consumption in the surveys, while the national accounts keeps the accounts of total private consumption of the country. To facilitate the comparision, the statistics from the surveys have to be aggregated country level as in the national accounts.

To convert the average consumption per household into aggregated consumption for the country, another statistic - the total mumber of households in the country - is needed. Here, this statistic is calculated by dividing the Norwegian population (source: Statistic Year Book, 1988) by the average number of persons in the household from the surveys. The complete formula used for the conversion is:

$$C_i(t) = P(t) * c_i(t)$$
$$= P(t) * K_i(t) / m(t)$$

Where:

$C_i(t)$ - Total consumption of the country for commodity i in year t

$c_i(t)$ - Average consumption of goods i per person in year t

$K_i(t)$ - Average consumption per household in year t

$P(t)$ - Population of the country in year t (Source: Statistic Year Book 1988)

$m(t)$ - The average number of persons in each household at year t

(Refer appendix 5 for information on each data source.)

5.1.3 Method of comparision

There are several methods that have been used by researchers in CBS to compare the same sets of consumption statistics. Refer Fløttum (1975) and Herigstad (1979). They are:

a) To compare the percentage changes of the absolute consumption level;
b) To compare absolute consumption figures of the two stastistics in the same year;
c) To examine the ratio between the two statistics in the same year.

In this thesis, the ratio method will be adopted. One important reason of doing so is to elimilate the influence of inflation on the consumption value.

The ratio is defined here as the result of dividing the consumption estimate of the survey by that of the national accounts in the same year for the compared commodity / service group i.

$$Ratio(i,t) = X_{fbu}(i,t) / X_{na}(i,t)$$

Where:

$X_{fbu}(i,t)$ - consumption estimate of the surveys for year t for commodity i

$X_{na}(i,t)$ - consumption estimate of the national accounts for year t for commodity i

5.2 An overview of the empirical results

5.2.1 Frequency distribution of the average ratios in the period 1973 - 1985 for three digit groups

The frequency distribution of the average ratios for all the 128 three digit groups is presented in Figure 5.1. The distribution has a clear central tendency. More than 95% of the groups have a ratio lying between 0 and 2. There are only five groups that have ratio greater than 2, but the ratios of these five groups range from around 3 to 8.

The mode of the distribution is 0.8, where the frequency is 39 which represents about 31% of all the three digit groups. Figure 5.1 suggests that there is a systematical tendency that the survey statistics has lower value than the national accounts statistics.

5.2.2 Distribution of the average ratios in the period 1973 - 1985 across 3-digit groups

Figure 5.2 dipicts the distribution of the average ratios across the 128 3-digit groups. We may find that there are as large variations among the 3-digit groups within the same 1-digit category as that between the 1-digit categories. But differences do exist between some 1-digit groups. For instance, all the 3-digit groups within Beverage and Tobacco category have a low ratio around 0.5. All the groups within Other goods and services category have ratios lower than 1; More than half of the groups in the Recreation, Education and Cultural Services category and all the groups in Operation of Personal Transport Equipment category within the Transportation group have ratios greater than 1. This means that the published consumption figures by the household expenditure surveys are less than half of that by national accounts for Beverage and Tobacco group, while the national accounts has been reporting lower figures than the surveys for Recreation and Education groups.

5.2.3 Time evolution of the ratios for total consumption and selected commodity/service groups

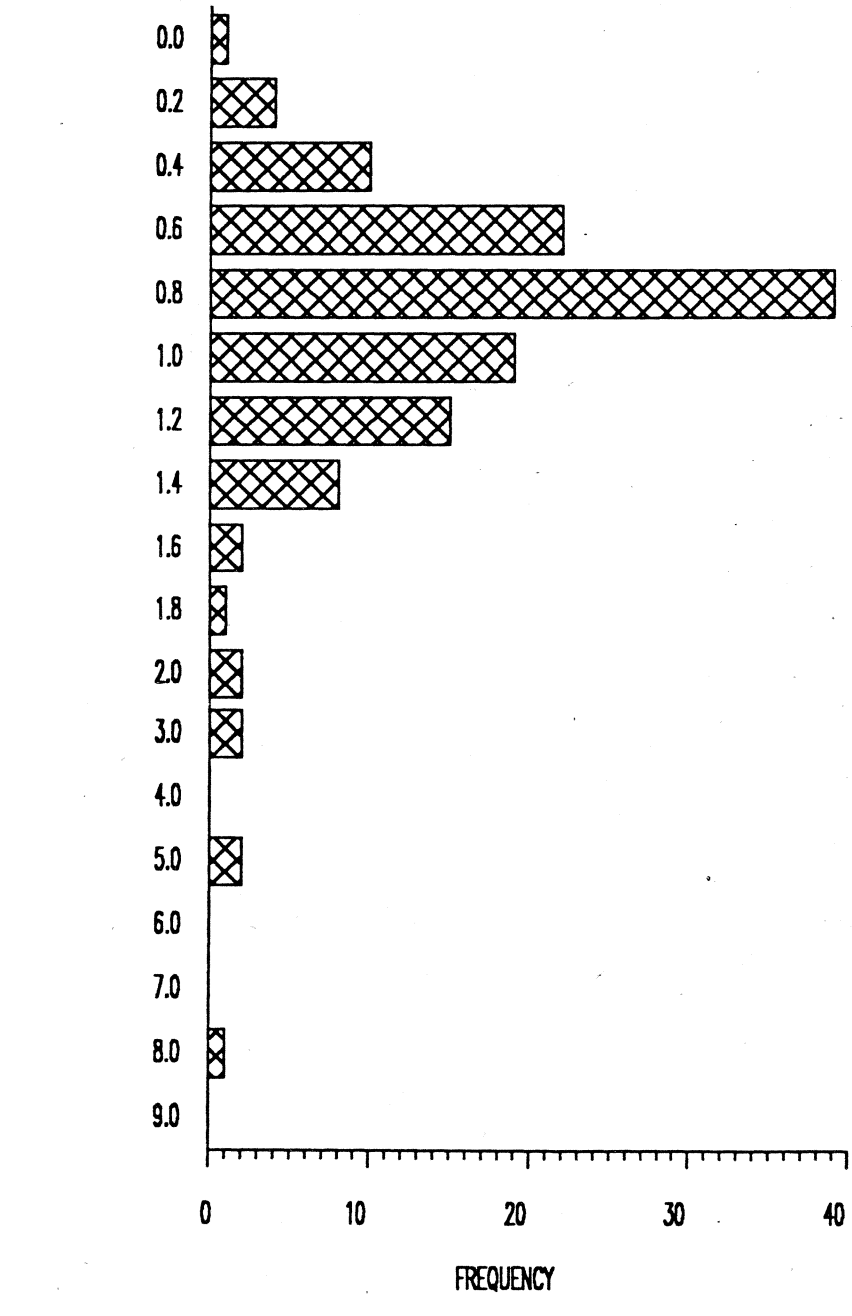
In the last two sections, the average ratio of the time period 1973 - 1987 for each commodity group has been examined, that is, each group has only one ratio value which is the average of the 13 yearly values. This average value may give us a picture of the magnitude of the gap between the macro and micro statistics for that group, but the distributions presented above can not give us any information about the evolution of the ratios over a period of time for certain commodity group. This is exactly the main purpose of the coming section.

a) Total private consumption

The ratio for total private consumption of the country during the period 1973 - 1985 is shown in Figure 5.3a. The national accounts data used in constructing Figure 5.3a are adjusted to the difference bet-

Figure 5.1

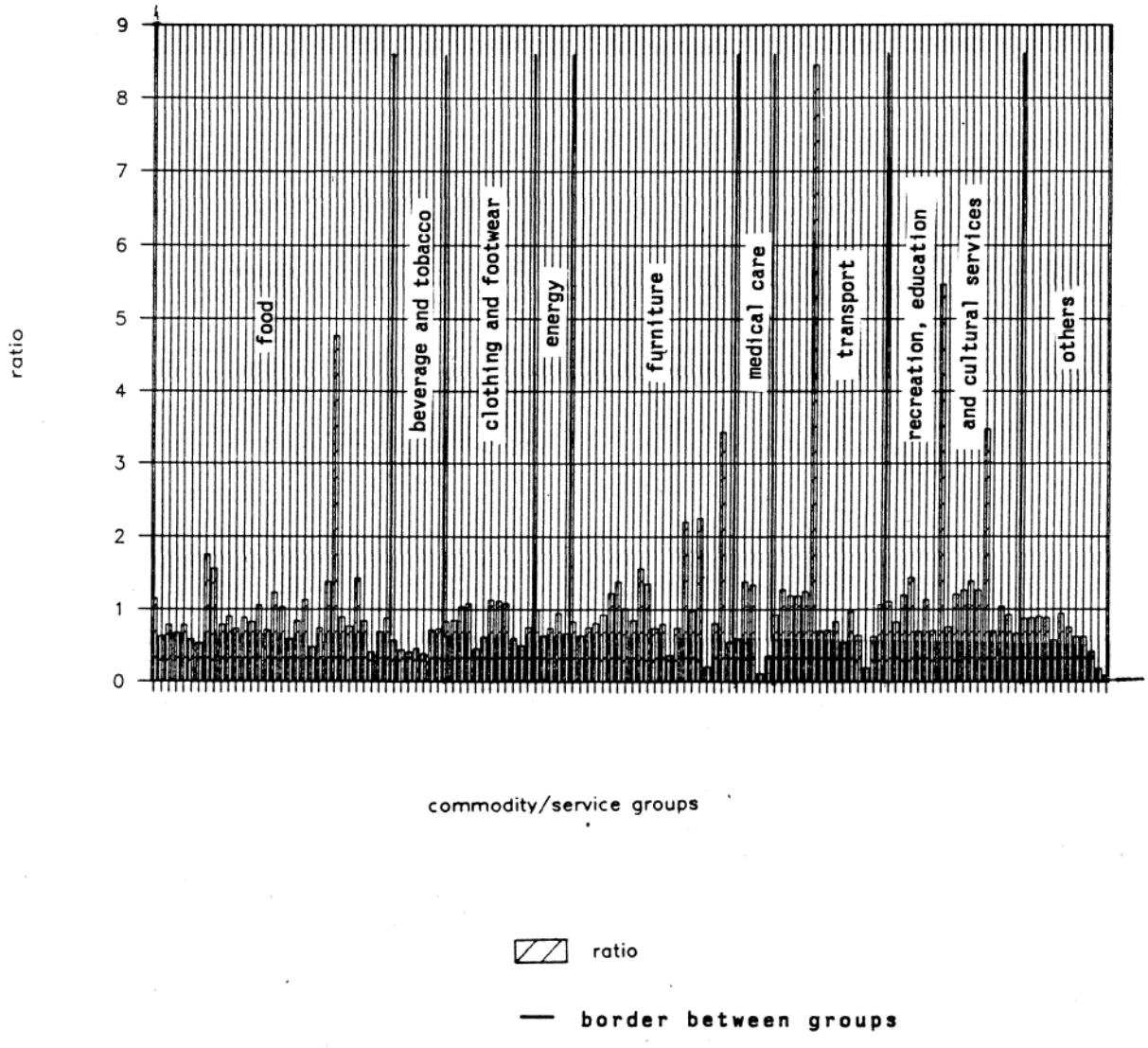
THE FREQUENCY DISTRIBUTION OF RATIOS



FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
1	1	0.78	0.78
4	5	3.13	3.91
10	15	7.81	11.72
22	37	17.19	28.91
39	76	30.47	59.38
19	95	14.84	74.22
15	110	11.72	85.94
8	118	6.25	92.19
2	120	1.56	93.75
1	121	0.78	94.53
2	123	1.56	96.09
2	125	1.56	97.66
0	125	0.00	97.66
2	127	1.56	99.22
0	127	0.00	99.22
0	127	0.00	99.22
1	128	0.78	100.00
0	128	0.00	100.00

Figure 5.2

Distribution of mean ratio cross groups



ween foreigners' purchases in Norway and Norwegians' purchases abroad. Since Norwegians' purchases abroad are higher than foreigners' purchases in Norway for all the years, this adjustment of the National Accounts figures are negative for the whole period 1973 - 1985. The total private consumption of the country in the National Accounts is the only statistics that can be adjusted to this difference. This suggests that the ratios for total private consumption in Figure 5.3a are lower for all the years than that from direct aggregating all the 3-digit groups.

The adjusted ratio for total private consumption is rasonablly stable over the whole period around the value of 0.82.

b) One digit groups

The development of the ratio over period 1973 - 1985 for one digit groups are depicted through figure 5.4a - figure 5.4i. The extent and pattern of variations vary largely among the groups. Some of them developed smothly with clear trends, while others showed large variations with dramatic ups and downs, still others were in between. The maximum variation is defined as the difference between the highest and lowest ratios during the period 1973 - 1985.

One digit groups	Max. Variation
Food	0.180
Beverage and tobacco	0.097
Clothing and footwear	0.140
Rent, power and fuel	0.184
Furniture	0.089
Medical care and health	0.094
Transport and communication	0.325
Recreation, education, etc.	0.190
Other goods and services	0.128

c) Summarizing the results for three digit groups

The level of variation over the studied period varies greatly from one three digit group to another. Generally speaking, groups in Other goods and services, Beverage and Tobacco, and Clothing and footwear categories have relatively small variation, while Furniture, furnishing and household equipment, Transport, and Recreation, education and cultural service categories contain the groups that have relatively large variations of the ratio. Figure 5.3b - 5.3l give the development pattern for some selected three digit groups.

Figure 5.3a

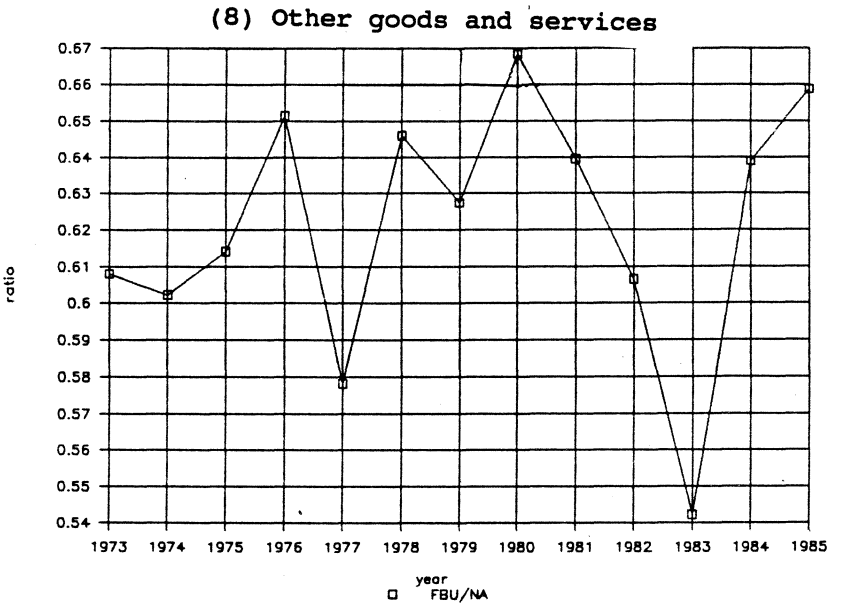


Figure 5.3b

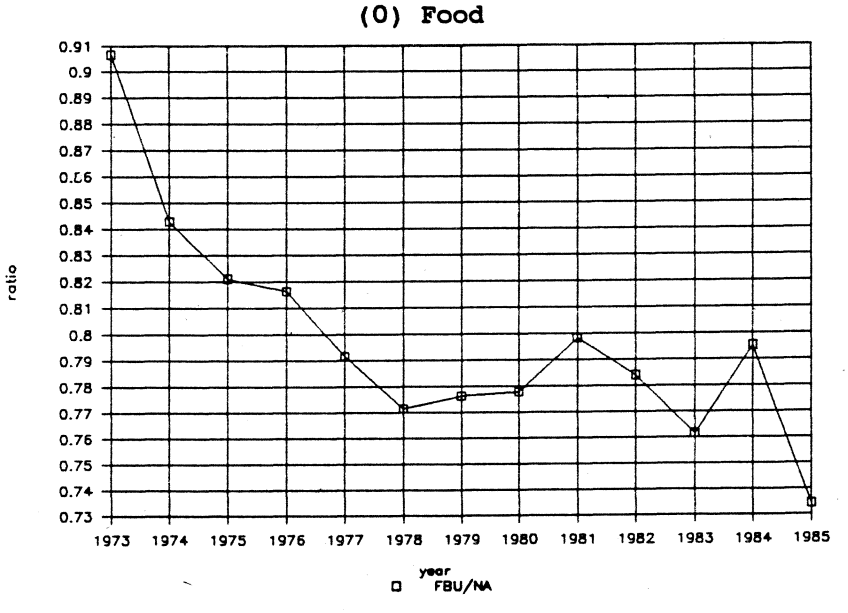


Figure 5.3c

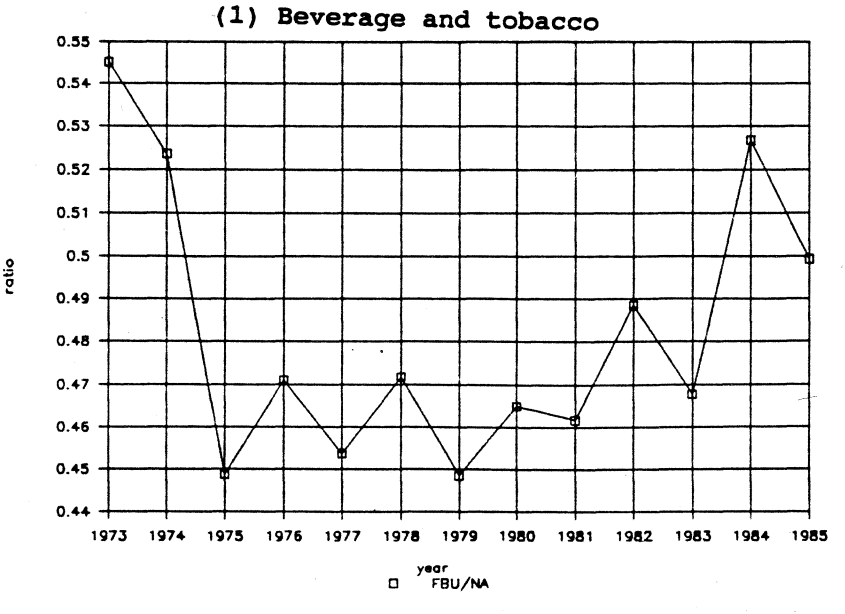


Figure 5.3d

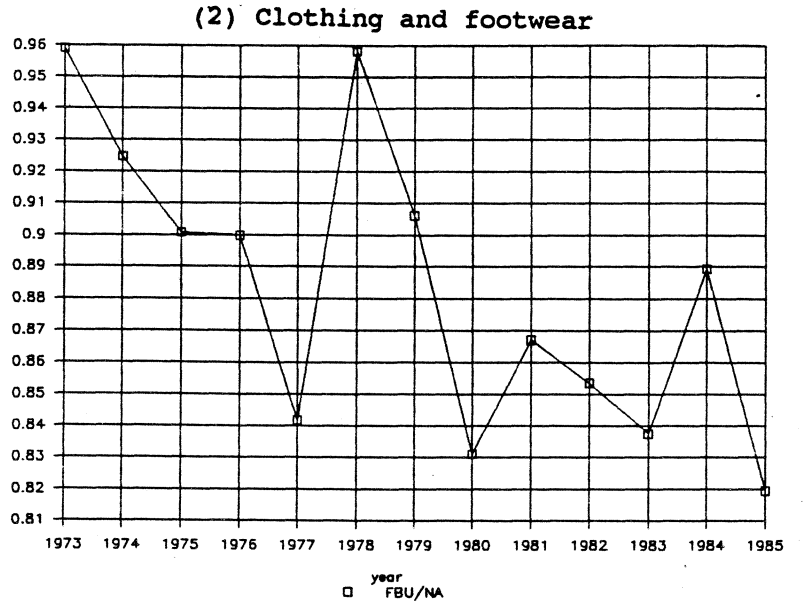


Figure 5.3e

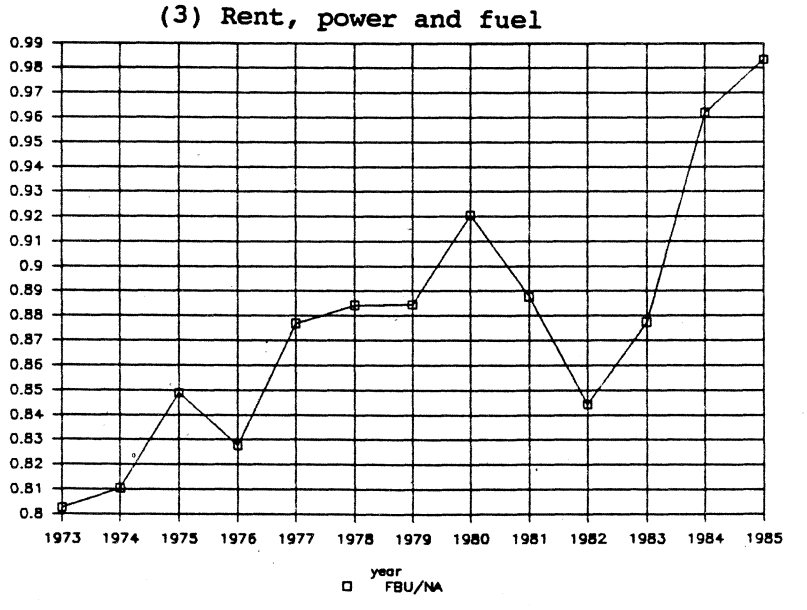
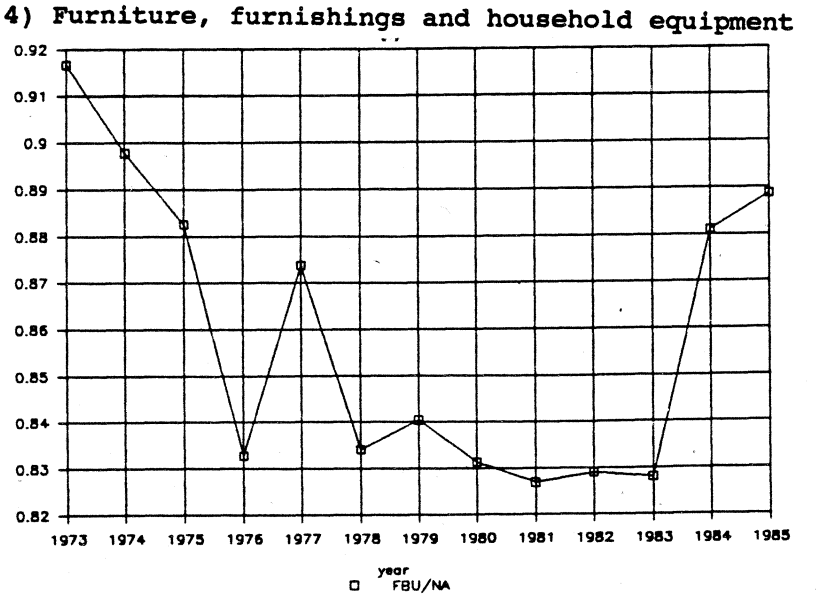
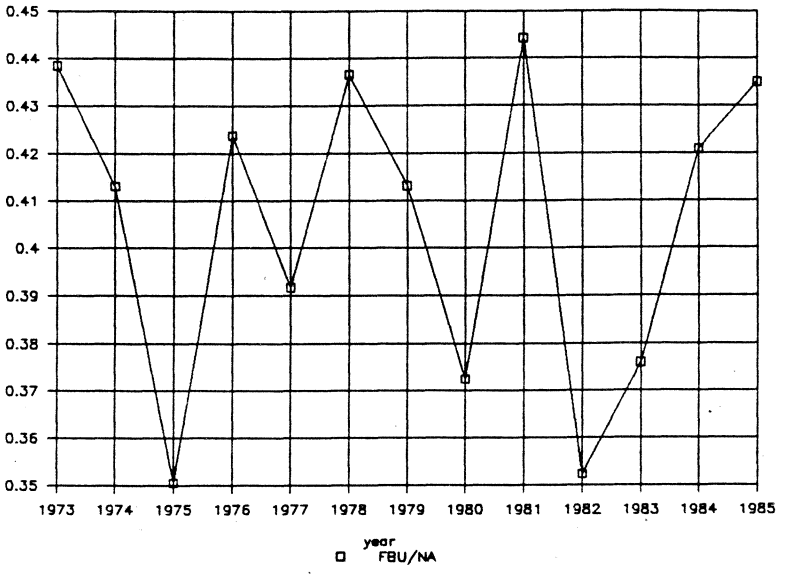


Figure 5.3f



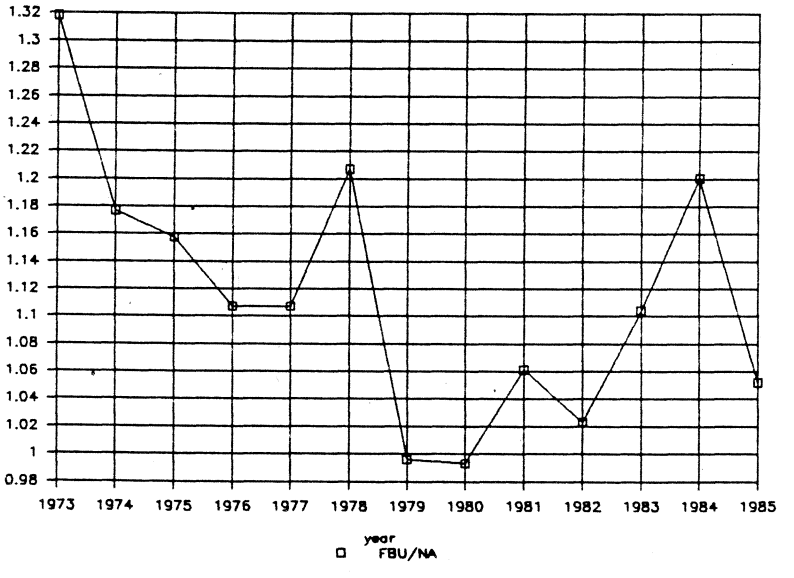
(5) Medical care and health

Figure 5.3g



(6) Transport and communication

Figure 5.3h



(7) Recreation, entertainment, education and cultural services

Figure 5.3i

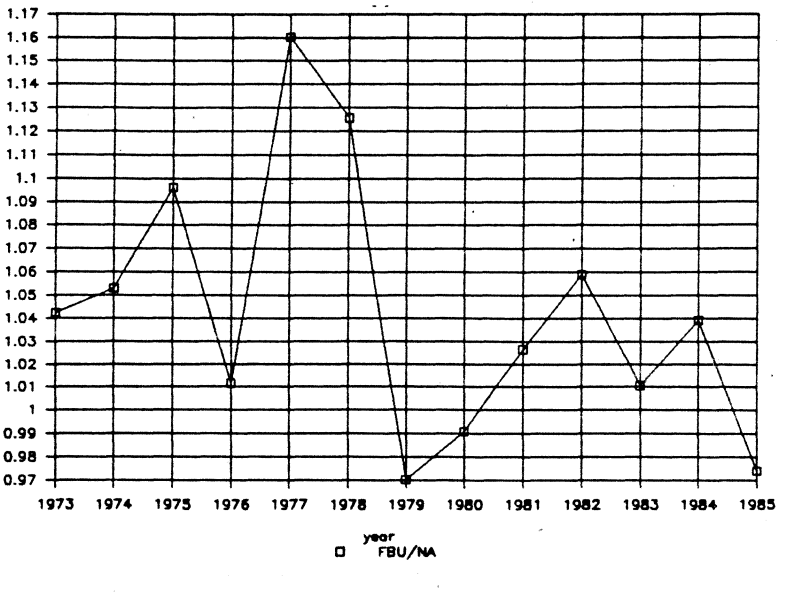
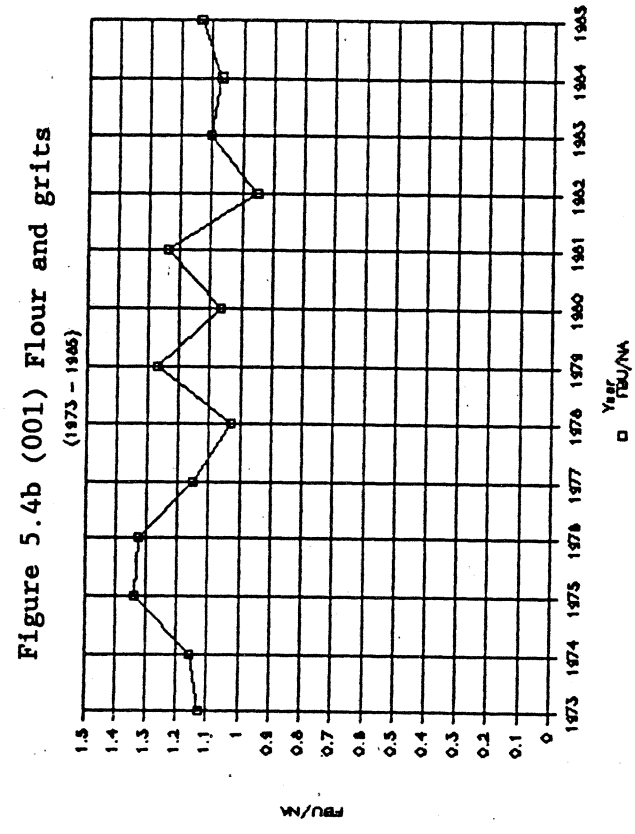
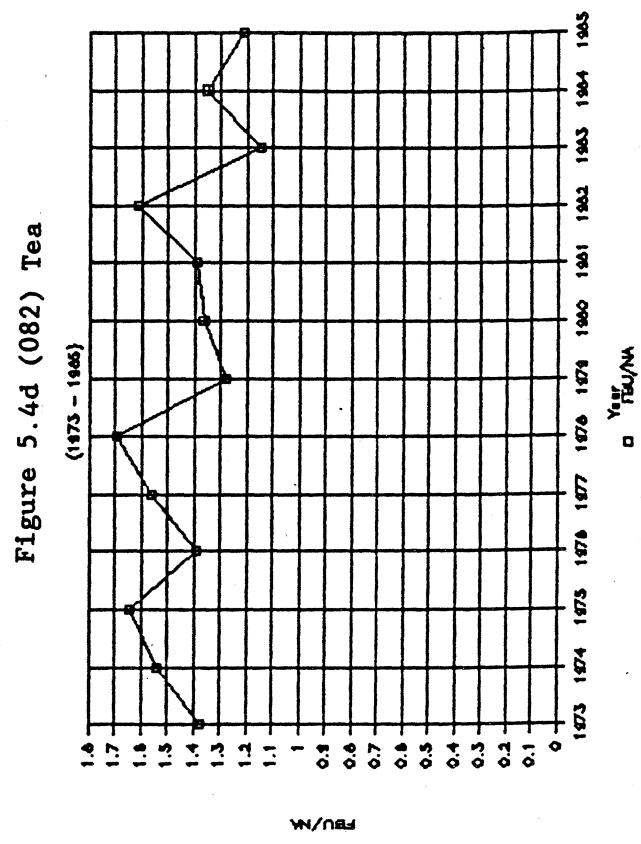
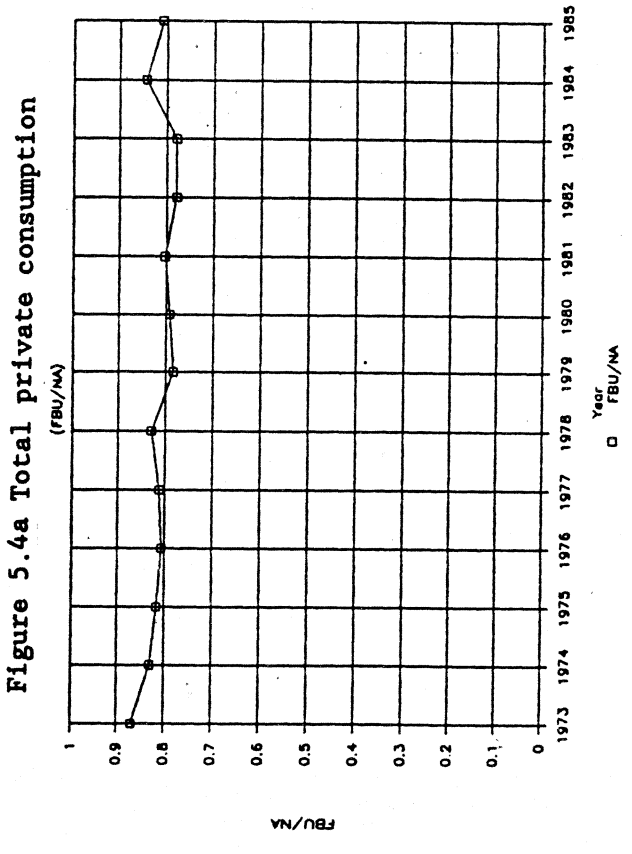


Figure 5.4a - Figure 5.4d







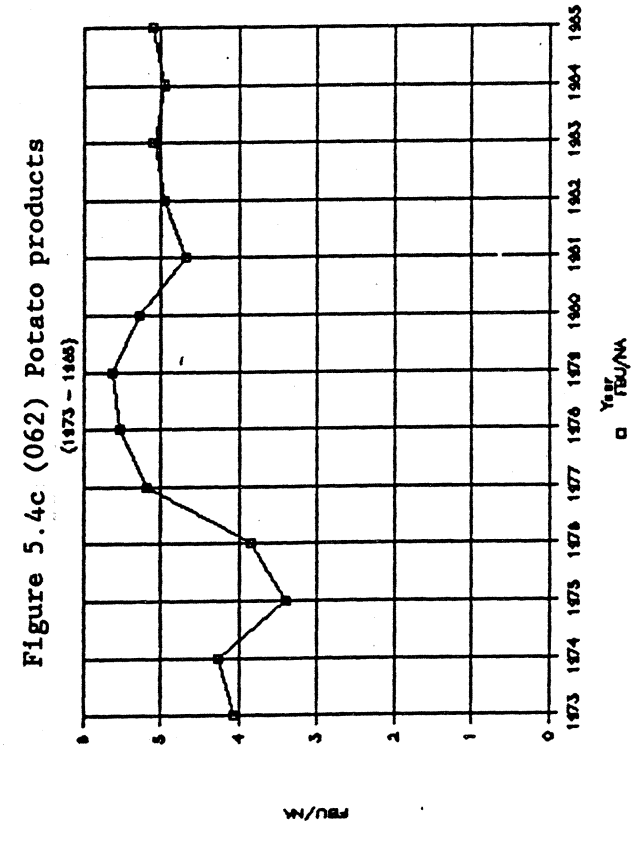
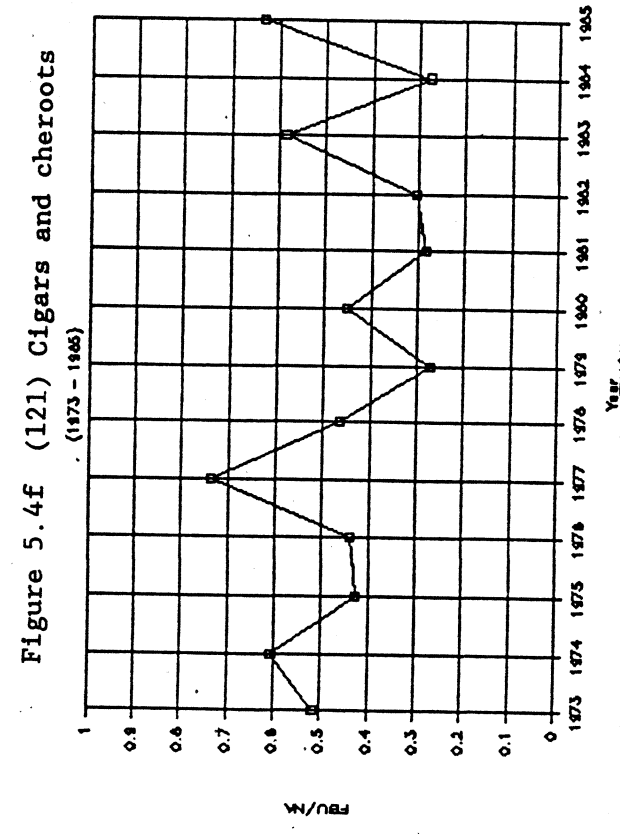
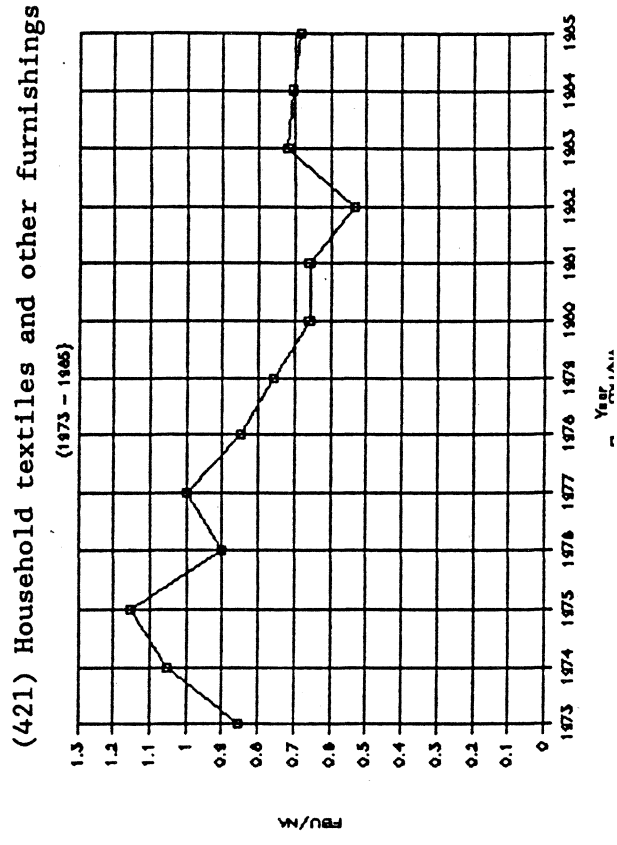
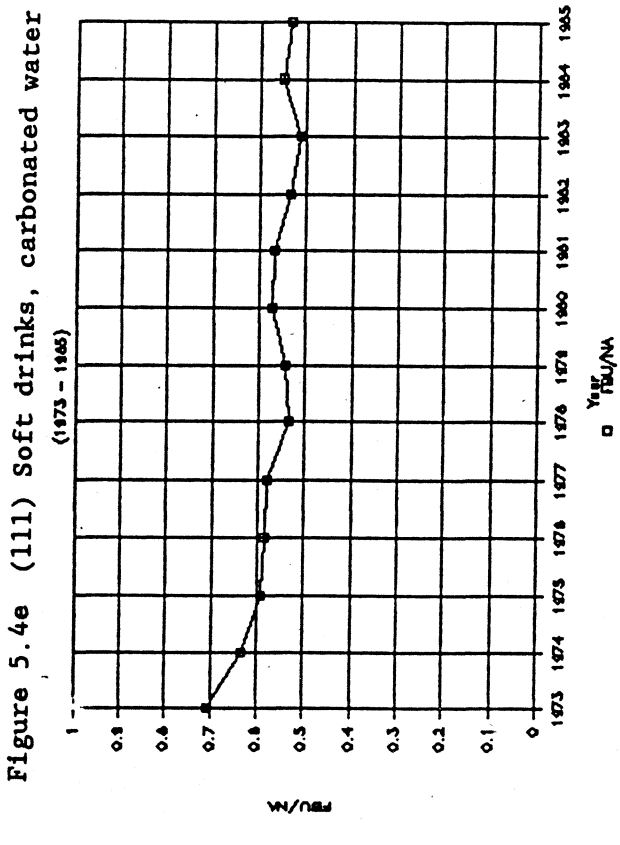


Figure 5.4e - Figure 5.4h







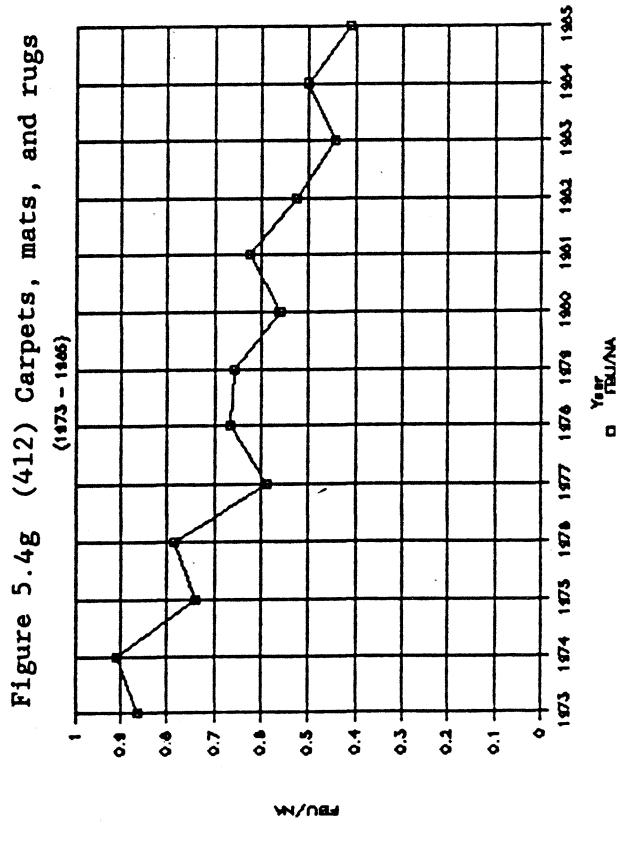
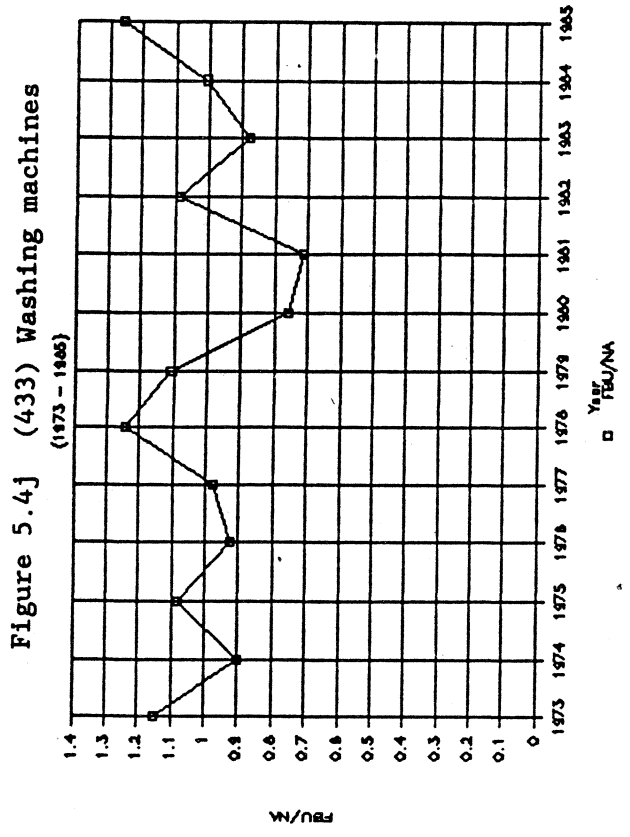
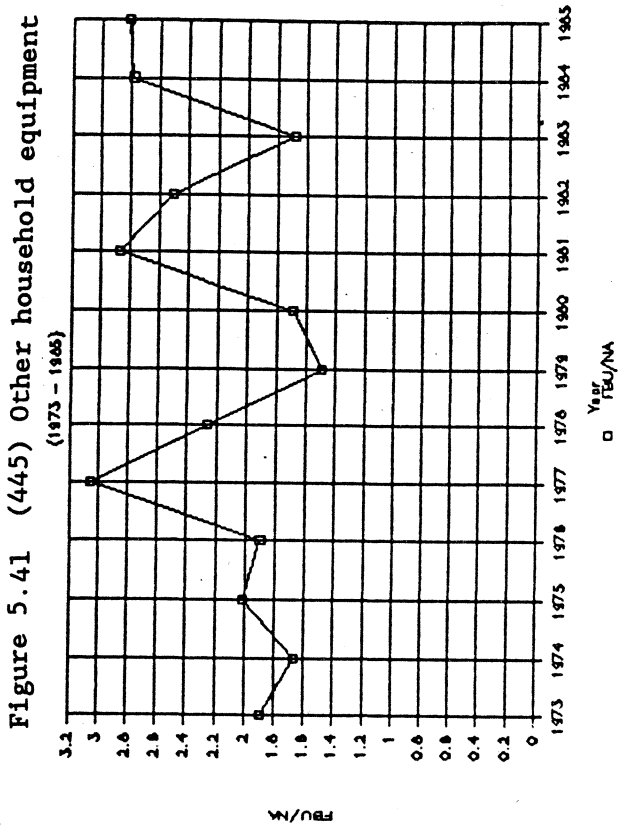
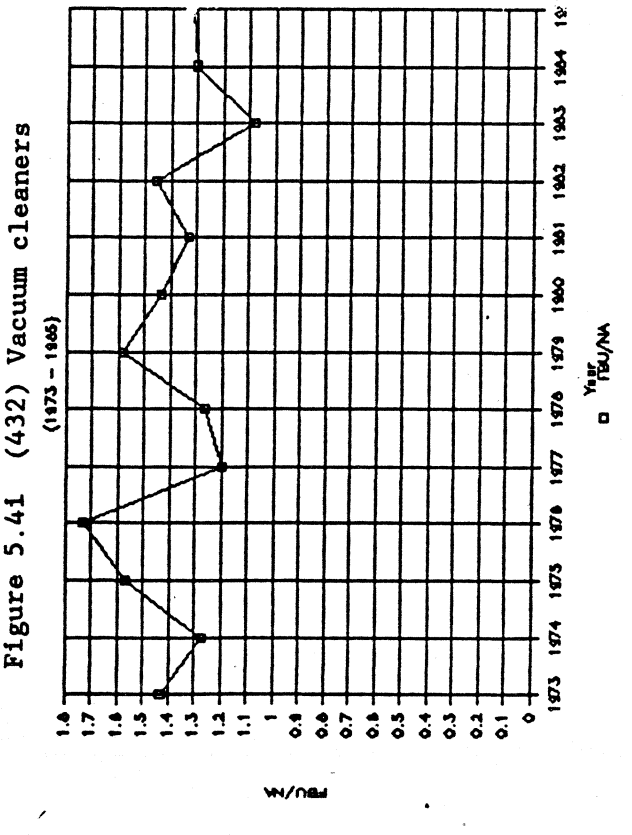
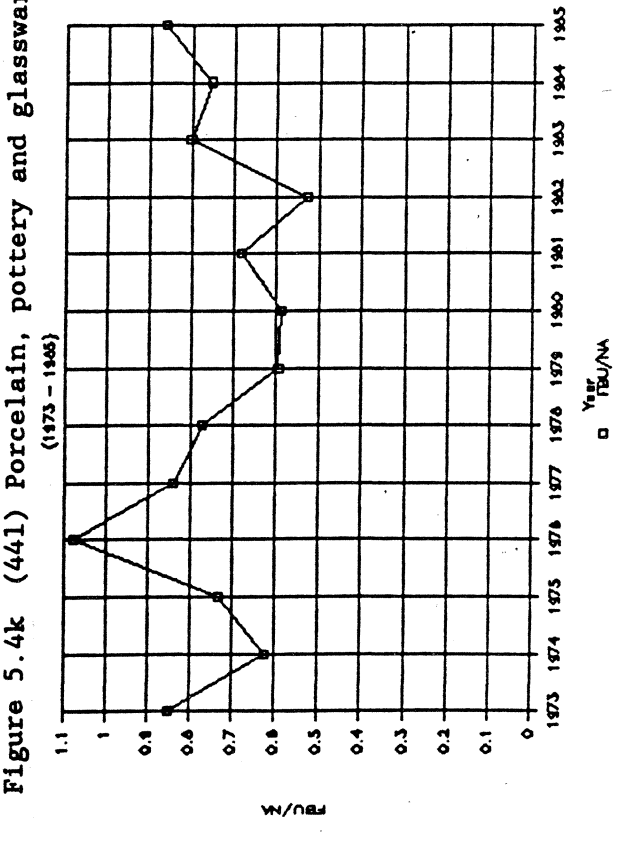


Figure 5.4i - Figure 5.4l









5.3 Presentation of the results of regression for one digit groups and selected two/three digit groups

In the last section, we explained the variations of the ratio between the household expenditure survey and national accounts statistics over a period of time. In this section, we shall examine if there is any trend (or autocorrelation) in the development for each group between the two sets of statistics. To do this, regression is carried out based on these two sets of statistics. Two models are constructed:

$$\text{Model 1} \quad X_{fbu}(t) = a + b * (X_{na}(t) - X_{na}(1980)) + u$$

$$\text{Model 2} \quad X_{fbu}/X_{na} = a1 + b1 * (t-1980) + u1$$

Where:
- X_{fbu} - consumption estimate from the surveys for year t
- X_{na} - consumption estimate from the national accounts
- t - year
- u, u1 - residuals of the models

Model 1 assumes a linear relationship between the national accounts and the survey statistics. Parameter 'a' is equal to $X_{na}(1980)$.

Model 2 assumes a linear relationship between the ratio (X_{fbu}/X_{na}) and the time. The parameter 'a1' represents the ratio (X_{fbu}/X_{na}) for relevant group at year 1980, while parameter 'b1' describes the trend of the ratio over the period of time. If b1 is positive / negative and significantly different from zero, it means that there is probably a systematic tendency for the ratio to increase / decrease over time. If the null hypothesis: parameter b1=0 can not be rejected, we say that the gap between these two sets of statistics is constant.

5.3.1 A brief overview of the results for one digit groups

The household expenditure surveys report considerably lower consumption of food than the national accounts. The average ratio between the two statistics during the period 1973 - 1985 is 0.7983. And this ratio has a significant downwards trend with a decreasing rate of 0.009 each year (refer table 5.1, column 10). Both model 1 and model 2 are significant for the food group.

Table 5.1
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[1)]

one digit commodity/service groups

Code	Name	RATIO[2)]	Regression $X_{fbu}=a+bX_{na}{}'$[4)]+u				Regression Ratio=a1+b1t'[5)]+u1			
			a	b	R-Sq.[6)]	p	a1	b1	R-Sq.	p[3)]
	Total consumption	0.8220 (0.009)	110969 (1889)	0.88 (0.02)	0.99	0.0001	0.82 (0.009)	.002 (0.002)	0.04	0.5041
(0)	Food	0.7983 (0.012)	22179 (754)	0.63 (0.07)	0.86	0.0001	0.79 (0.008)	-.009 (0.002)	0.60	0.0011
(1)	Drink and tobacco	0.4824 (0.009)	4425 (170)	0.45 (0.06)	0.84	0.0001	0.48 (0.010)	-.0007 (0.002)	0.08	0.7925
(2)	Clothing and footwear	0.8837 (0.013)	10590 (362)	0.66 (0.09)	0.81	0.0001	0.88 (0.010)	-.008 (0.003)	0.42	0.0102
(3)	Rent, power and fuel	0.8777 (0.015)	20115 (1056)	0.87 (0.10)	0.86	0.0001	0.89 (0.009)	.011 (0.002)	0.64	0.0006
(4)	Furniture, furnishing and household equipment	0.8587 (0.009)	10470 (416)	0.70 (0.10)	0.79	0.0001	0.86 (0.009)	-.003 (0.002)	0.07	0.1917
(5)	Medical care & health expenses	0.4052 (0.009)	2367 (97)	0.36 (0.05)	0.83	0.0001	0.40 (0.010)	-.0003 (0.003)	0.09	0.9112
(6)	Transport	1.1157 (0.026)	22914 (975)	0.95 (0.10)	0.88	0.0001	1.10 (0.024)	-.012 (0.006)	0.19	0.0756
(7)	Recreation, education and cultural services	1.0430 (0.016)	12457 (476)	0.81 (0.10)	0.84	0.0001	1.04 (0.016)	-.006 (0.004)	0.09	0.1680
(8)	Other goods and services	0.6217 (0.010)	8505 (425)	0.54 (0.07)	0.82	0.0001	0.62 (0.010)	.001 (0.003)	0.07	0.6759

1) standard errors in parenthesis
2) Ratio = X_{fbu}/X_{na}
3) the significant probability level of the hypothesis: 'b' is different from zero
4) $X_{na}{}' = X_{na} - X_{na}(1980)$
5) t = Year - 1980

Beside the food group, the parameter 'b' in model 1 is significantly different from zero for the total consumption and all the other 1-digit groups. But the value of b varies a lot. Among them, the highest value is 0.95 (Transport), while the lowest is 0.36 (Medical care and health expenses).

The results for model 2 is somewhat different. Beside the consumption of food, there are only three other groups, Rent, power and fuel, Clothing and footwear and Transport that have parameters 'b' different from zero. Among them, the Rent, power and fuel has a upward slope of 0.011, and the other two groups slope downward with a rate of 0.008 and 0.012 per year respectively. The hypothesis b1=0 in Model 2 can not be rejected for the total consumption and the remaining five one digit groups, which suggests that the ratio (X_{fbu}/X_{na}) for these six groups are constant over the whole period 1973 -1985.

Among the one digit groups, three of them are selected for more detailed study in the next three sections: Food; Beverage and tobacco; Rent power and fuel. These three groups represent three different development pattern of the ratio (X_{fbu}/X_{na}), that is, increasing, constant and decreasing over the period of time. The results for the comparision of the other 6 one digit groups are presented in Appendix 3.

5.3.2 Two/three digit food groups

The results is presented in tables 5.2 - 5.5. Large discrepancies exist between the estimated consumption from the surveys and the national accounts for most of the three digit food groups. For 15 out of the 32 three digit groups, these differences have been growing; 14 groups have constant ratios, while the gap for the last 3 groups (cheese, frozen fish and salted dried and smoked fish) have been decreasing over the whole period.

Table 5.2
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Bread & cereals, Meat & meat products

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bX_{na}'$[4)]$+u$				Regression Ratio=a1+b1t[5)]+u1			
			a	b	R-Sq.[6)]	p	a1	b1	R-Sq.	p
00	Bread and cereals	0.7929 (0.016)	1933 (55)	0.61 (0.05)	0.93	0.0001	0.78 (0.007)	-.013 (0.002)	0.80	0.0001
001	Flour and grits	1.15 (0.03)	285 (11)	1.01 (0.06)	0.97	0.0001	1.14 (0.031)	-.0123 (0.008)	0.10	0.1548
002	Biscuits, crispbread	0.62 (0.01)	221 (7)	0.52 (0.05)	0.92	0.0001	0.62 (0.014)	-.003 (0.004)	-0.04	0.5007
003	Bread and cakes	0.78 (0.02)	1298 (40)	0.54 (0.05)	0.90	0.0001	0.76 (0.010)	-.016 (0.003)	0.76	0.0001
005	Macaroni, cornflakes	0.68 (0.03)	110 (4)	0.46 (0.05)	0.87	0.0001	0.66 (0.022)	-.018 (0.006)	0.45	0.0069
01	Meat, meat products and pork	0.77 (0.016)	6169 (238)	0.60 (0.08)	0.81	0.0001	0.76 (0.014)	-.009 (0.004)	0.29	0.0349
011	Fresh, salted and dried meat and meat products	0.78 (0.02)	5921 (231)	0.61 (0.087)	0.80	0.0001	0.78 (0.014)	-.008 (0.004)	0.26	0.0450
013	Canned meat	0.58 (0.02)	248 (10)	0.45 (0.06)	0.83	0.0001	0.57 (0.021)	-.011 (0.005)	0.23	0.0552

1) Ratio = X_{fbu}/X_{na}
2) the significant probability level of the hypothesis: b=0
3) standard errors in parenthesis
4) $X_{na}' = X_{na} - X_{na}(1980)$
5) t = Year - 1980
6) R square of the model adjusted to the degree of freedom

Table 5.3
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Fish & fish products, Milk, cheese and eggs

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bX_{na}$'[4)]+u				Regression Ratio =a1+b1t[5)]+u1			
			a	b	R-Sq.[6)]	p	a1	b1	R-Sq.	p
02	Fish and fish products	0.8290 (0.033)	1474 (62)	0.52 (0.07)	0.80	0.0001	0.80 (0.02)	-.025 (0.005)	0.66	0.0004
021	Fresh fish	0.53 (0.03)	390 (32)	0.35 (0.08)	0.58	0.0014	0.52 (0.03)	-.019 (0.007)	0.32	0.0246
022	Frozen fish	1.75 (0.09)	187 (9)	1.14 (0.16)	0.81	0.0001	1.7 (0.07)	-.057 (0.019)	0.40	0.0115
023	Salted, dried & smoked	1.56 (0.06)	348 (16)	0.92 (0.14)	0.78	0.0001	1.51 (0.04)	-.048 (0.010)	0.66	0.0005
024	Canned dinner food	0.79 (0.03)	84 (3)	0.49 (0.07)	0.80	0.0001	0.78 (0.02)	-.013 (0.006)	0.24	0.0514
025	Other canned fish	0.90 (0.03)	206 (9)	0.83 (0.14)	0.73	0.0001	0.92 (0.03)	-.018 (0.007)	0.36	0.0176
026	Other fish products	0.73 (0.06)	270 (10)	0.34 (0.05)	0.77	0.0001	0.69 (0.04)	-.044 (0.009)	0.63	0.0007
03	Milk, cheese and eggs	0.89 (0.009)	3643 (110)	0.76 (0.06)	0.93	0.0001	0.89 (0.006)	-.006 (0.002)	0.57	0.0018
031	Milk	0.88 (0.01)	1938 (54)	0.72 (0.05)	0.95	0.0001	0.87 (0.006)	-.011 (0.002)	0.78	0.0001
034	Cheese	0.82 (0.01)	1023 (41)	0.81 (0.08)	0.91	0.0001	0.82 (0.008)	.008 (0.002)	0.53	0.0027
035	Eggs	1.05 (0.02)	688 (20)	0.79 (0.11)	0.80	0.0001	1.05 (0.015)	-.006 (0.004)	0.10	0.1525

1) Ratio = X_{fbu}/X_{na}
2) the significant probability level of the hypothesis: b=0
3) standard errors in parenthesis
4) $X_{na}' = X_{na} - X_{na}(1980)$
5) t= Year - 1980

Table 5.4
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3]

Edible fats and oils, vegetables and fruits

Code	Name	RATIO[1]	Regression $X_{fbu}=a+bX_{na}$[4]$+u$				Regression Ratio=a1+b1t[5]$+u1$			
			a	b	R-Sq.[6]	p	a1	b1	R-Sq.	p [2]
04	Edible fats and oils	1.015	680	1.06	0.95	0.0001	1.02	.005	0.22	0.0602
		(0.010)	(14)	(0.07)			(0.009)	(0.002)		
041	Butter	0.72	208	0.56	0.80	0.0001	0.71	-.0074	0.12	0.1280
		(0.02)	(6)	(0.08)			(0.017)	(0.005)		
042	Margarine, edible oil	1.23	461	1.33	0.95	0.0001	1.24	.012	0.30	0.0306
		(0.02)	(11)	(0.09)			(0.019)	(0.005)		
05	Vegetables and fruits	0.758	3746	0.55	0.78	0.0001	0.75	-.008	0.58	0.0015
		(0.012)	(136)	(0.083)			(0.008)	(0.002)		
051& 052	Fresh vegetables	1.03	921	0.78	0.77	0.0001	1.02	-.011	0.10	0.1506
		(0.03)	(38)	(0.123)			(0.026)	(0.007)		
053	Apples, Pears, Plums	0.59	524	0.32	0.73	0.0001	0.57	-.017	0.74	0.0001
		(0.02)	(20)	(0.055)			(0.011)	(0.003)		
054	Citrus fruits, bananas, grapes, etc	0.84	658	0.72	0.84	0.0001	0.84	-.003	-0.015	0.3846
		(0.01)	(19)	(0.089)			(0.011)	(0.003)		
055	Dried fruits and nuts	1.13	240	1.09	0.71	0.0002	1.15	.020	0.33	0.0234
		(0.03)	(11)	(0.199)			(0.029)	(0.008)		
056	Fresh berries	0.48	353	0.28	0.46	0.0063	0.48	-.003	-0.06	0.6065
		(0.02)	(21)	(0.084)			(0.022)	(0.006)		
057 058	Preserved fruits and vegetables,jams & juice	0.74	1042	0.53	0.76	0.0001	0.73	-.006	0.32	0.0265
		(0.01)	(44)	(0.086)			(0.010)	(0.003)		

1) Ratio = X_{fbu}/X_{na}
2) the significant probability level of the hypothesis b=0
3) standard errors in parenthesis
4) $X_{na}' = X_{na} - X_{na}(1980)$
5) t = Year - 1980
6) R square of the model adjusted to the degree of freedom

Table 5.5

Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Potatoes and potato products, sugar, coffee and tea and cocoa, other goods

Code	Name	RATIO[1)]	Regression $X_{fbu}=a+bX_{na}$[4)]+u				Regression Ratio=a1+b1t[5)]+u1			
			a	b	R-Sq.[6)]	p[2)]	a1	b1	R^2	p
06	Potatoes and potato products	1.793 (0.063)	696 (14)	2.23 (0.20)	0.91	0.0001	1.84 (0.04)	.048 (0.010)	0.64	0.0006
061	Potatoes	1.38 (0.04)	474 (11)	1.61 (0.19)	0.85	0.0001	1.40 (0.04)	.018 (0.011)	0.12	0.1328
062	Potato products	4.77 (0.19)	208 (10)	4.76 (0.60)	0.83	0.0001	4.87 (0.17)	.101 (0.04)	0.285	0.0368
07	Sugar	0.894 (0.04)	396 (18)	0.49 (0.096)	0.68	0.0003	0.86 (0.02)	-.032 (0.006)	0.72	0.0001
08	Coffee,tea, cocoa	0.803 (0.011)	1403 (56)	0.55 (0.10)	0.70	0.0002	0.79 (0.006)	-.009 (0.002)	0.72	0.0002
081	Coffee	0.77 (0.01)	1201 (48)	0.53 (0.10)	0.70	0.0002	0.77 (0.007)	-.009 (0.002)	0.68	0.0005
082	Tea	1.43 (0.05)	92 (5)	1.02 (0.15)	0.79	0.0001	1.41 (0.044)	-.021 (0.011)	0.178	0.0869
083	Cocoa etc.	0.84 (0.02)	106 (6)	0.43 (0.12)	0.47	0.0056	0.82 (0.012)	-.018 (0.003)	0.73	0.0001
09	Other goods	0.60 (0.01)	1978 (90)	0.59 (0.07)	0.86	0.0001	0.60 (0.012)	.002 (0.003)	-0.05	0.5509
091	Chocolate, sugar confectionary etc.	0.41 (0.01)	747 (30)	0.36 (0.04)	0.86	0.0001	0.41 (0.007)	-.002 (0.002)	0.07	0.1939
092	Icecream	0.69 (0.03)	224 (15)	0.48 (0.06)	0.83	0.0001	0.69 (0.032)	-.004 (0.008)	-0.07	0.6675
093	Other foods	0.88 (0.04)	1042 (59)	1.06 (0.15)	0.80	0.0001	0.90 (0.033)	.017 (0.009)	0.18	0.0811

1) Ratio = X_{fbu}/X_{na}
2) the probability significant level of the hypothesis: b=0
3) standard errors in parenthesis
4) $X_{na}' = X_{na} - X_{na}(1980)$
5) t = Year - 1980

The picture is somewhat different for the 9 2-digit groups. The fluctuations of discrepancies among these groups is much smaller because the differences of the three digit groups (within certain 2-digit group) cancel each other out. Among the 2 digit groups, only one group, Other foods and services, shows constant discrepancy over a period of time. The discrepancies for the other 8 groups have been increasing.

Helge Herigstad's research on the same topic concerning the statistics for the period 1967 - 1977 showed also the same trend of growing discrepancy for the food group (Herigstad, 1979, p11). The average ratio for food in the period 1967-1977 was about 0.86. After having studied the recent statistics from 1973 to 1985, it is confirmed that this trend has been continuing, and the ratio is on average dropping at a speed of 0.009 per year.

5.3.3 Two/three digit Beverage and Tobacco groups

Except for Cigars and Cheroots, all the three digit groups in this category have b values significantly different from zero. Even though the aggregated one digit group has constant ratio over the period 1973-1985, there are three 3-digit groups (Soft drinks carbonated water, Cigarettes and Other tobacco) that shows clear tendency. Among them, the ratio for the Cigarette group is increasing, that is, the discrepancy of the two sets of statistics is getting smaller, while the discrepancy is increasing for the other two groups. Except for these three groups, the other four 3-digit groups have constant ratios over time.

5.3.4 Two/three digit Rent, Power and Fuel groups

Table 5.1 shows that the gap between X_{fbu} and X_{na} is increasing for the aggregated Rent, Power and Fuel group. For that of its five 3-digit groups, three of them (Electricity, Liquid fuels and Coal and Coke) have significant growing trend (Table 5.4). Model 1 gives b values different from zero for all the two/three digit groups except Coal and Coke which has a moderate significant level also for model 2. The difference between the two sets of statistics for Gross Rents and Firewood and peat are narrowing over the period of 1973 -1985.

Table 5.6
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Beverages and Tobacco

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bX_{na}$[4)]+u				Regression Ratio=a1+b1t[5)]+u1			
			a	b	R-Sq.[6)]	p[2)]	a1	b1	R-Sq.	p
11	Beverages	0.4539 (0.009)	2861 (125)	0.38 (0.06)	0.76	0.0001	0.45 (0.009)	-.002 (0.002)	-0.04	0.4707
111	Soft drinks, carbonated water etc.	0.57 (0.01)	763 (28)	0.42 (0.06)	0.82	0.0001	0.56 (0.009)	-.010 (0.002)	0.60	0.0011
112	Beer	0.44 (0.01)	718 (27)	0.40 (0.04)	0.90	0.0001	0.44 (0.007)	.001 (0.002)	-0.08	0.7279
113	Wine and spirits	0.41 (0.01)	1357 (79)	0.33 (0.08)	0.56	0.0019	0.41 (0.014)	-.000 (0.004)	-0.09	0.9795
12	Tobacco	0.5446 (0.015)	1539 (55)	0.58 (0.05)	0.91	0.0001	0.55 (0.016)	.001 (0.004)	-0.09	0.8826
121	Cigars and cheroots	0.46 (0.04)	21 (2)	0.40 (0.20)	0.21	0.0680	0.45 (0.044)	-.009 (0.011)	-0.03	0.4399
122	Cigaretter	0.38 (0.01)	594 (25)	0.43 (0.04)	0.89	0.0001	0.38 (0.010)	.005 (0.003)	0.17	0.0909
123	Smoking tobacco	0.72 (0.02)	810 (30)	0.82 (0.07)	0.92	0.0001	0.73 (0.023)	.003 (0.023)	-0.07	0.6739
124	Other tobacco	0.73 (0.04)	75 (2)	0.33 (0.04)	0.83	0.0001	0.69 (0.01)	-.037 (0.004)	0.89	0.0001

1) Ratio = X_{fbu}/X_{na}
2) the significant probability level of the hypothesis b=0
3) standard errors in parenthesis
4) $X_{na}' = X_{na} - X_{na}(1980)$
5) t = Year - 1980
6) R square of the model adjusted to the degree of freedom

Table 5.7
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Rent, power & fuel

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bX_{na}$[4)]$+u$				Regression Ratio=a1+b1t[5)]+u1			
			a	b	R-Sq.[6)]	p[2)]	a1	b1	R-Sq.	p
31	Gross rents	0.986	15100	1.11	0.84	0.0001	1.01	.029	0.80	0.0001
		(0.03)	(876)	(0.14)			(0.016)	(0.004)		
32	Power and fuel	0.67	4916	0.50	0.89	0.0001	0.65	-.017	0.79	0.0001
		(0.02)	(220)	(0.05)			(0.010)	(0.003)		
321	Electricity	0.64	201	0.12	0.91	0.0001	0.55	-.059	0.70	0.0002
		(0.02)	(168)	(0.05)			(0.009)	(0.002)		
322	Liquid fuels	0.74	1273	0.36	0.63	0.0008	0.70	-.034	0.67	0.0004
		(0.04)	(70)	(0.08)			(0.03)	(0.007)		
323	Firewood and peat	0.95	146	1.29	0.67	0.0004	1.00	.058	0.58	0.0016
		(0.08)	(13)	(0.25)			(0.054)	(0.014)		
324	Coal and coke	0.66	48	0.09	-0.072	0.6693	0.64	-.022	0.30	0.0294
		(0.04)	(3)	(0.19)			(0.03)	(0.009)		

1) Ratio = X_{fbu}/X_{na}
2) the significant probability level of the hypothesis: b=0
3) standard errors in parenthesis
4) $X_{na} = X_{na} - X_{na}(1980)$
5) t = Year - 1980
6) R square of the model adjusted to the degree of freedom

5.4 An attempt to explain the variations of ratios across commodity/service groups

5.4.1 The sources of discrepancy

The data discrepancy between the national accounts and household expenditure surveys may result from three possible sources: a) characteristics of the products; b) the differences of data collection, calculation and classification methods used by the two data sources; c) the way of aggregating survey data.

a) The characteristics of the products

Certain product characteristics can affect the accuracy of the recorded figures in the surveys. For instance, the purchasing size, defined by the value of one time purchase, may affect the survey results in such a way: those items with small one time purchasing value may have higher chance to be under- registered by the surveys; while this product characteristics may have negligible effect on the registered figures from the producers / retailers by the national accounts.

There are other product characteristics such as purchasing frequency, consumption pattern, being subject to social opinions or regulations etc that may have strong impacts on the difference of registered figures by the surveys and national accounts. The alcohol consumption is a typical example of the influence of social opinion. Past research shows that consumption data for the alcohol product category has been steadily lower in the surveys than that in the national accounts. The respondents react to the surveys either by reducing purchasing alcohol or not reporting. Regulations, taxation, and import tariff etc. might also affect the accuracy of reporting. An example may be that if a product is heavily taxed, the producer will tend to report lower sales figure to the tax authority because he is supposed to make use of all the possible deductions to reduce the taxable amount. On the other hand, he might respond to the inquiry of a private marketing research firm with the gross figure before the deduction.

b) The differences of methods

Methods here refer to the methods of data collection, data calculation, unit definition and classification.

The household expenditure surveys and national accounts use completely different methods in collecting the consumption data. The indirect and intermediate method (refer appendix 2) are empolyed in the national accounts, while in the surveys consumption data is collected directly

from the consumers. The national accounts use multi-methods and a chain of intermediate mathematical transformations, while The household expenditure surveys use two registration methods, and uniformed simple mathematical transformation. One thing worth attention is that the methods used by both sources have been unchanged over the whole period studied. Therefore, the discrepacies between the two statistics that are due to the method differences will be constant over a period of time.

Classification differences can be a serious problem because it is not easy to detect in order to take actions, especially when the respondents misunderstood the classification boundary in the surveys. One clue of possible classification misfit (appendix 1) is that if the
variations of the 3-digit groups within the substitutable product category cancel each other while the ratio for the aggregated group is stable over the period of time, this might be a indication of classification inconsistancy. The empirical results shows that this is a phenomenon common to many two digit groups.

Definition difference between the two sources is a relatively easy to figure out, and enable the user to decide which data source fits better into the problem at hand. The main definition differences in the aggregated level are listed below. These are differences in definitions between the two sources applicable to all the groups.

* The household expenditure surveys define individual household as the unit of observation, while the national accounts collects aggregated figures at the country/region level;

* The national accounts includes the private non profit institutions in its final consumption figures, while the household expenditure surveys contain the private households only;

* The foreigners' consumptions within the country are not included in the surveys, and Norwegian citizens' consumptions abroad are excluded in the sub-groups of the national accounts. The total consumptions in the national accounts is adjusted for the difference, not the single commodity / service groups. Therefore inaccuracy arises when these two figures have large discrepancy for some commodity / service groups.

c) Aggregating the survey data

The way of aggregating the survey data may result in inaccuracy due to two possible sources.

One is the error in estimating the average consumption of goods per person $c_i(t)$ which, in this case, is estimated from samples of private

household. However, part of the Norwegian population does not live in the normal private households, but institutions such as health centers. Their consumption pattern differs a lot from people living at their own home.

The second possible source of error is related to the population statistics, which are based on the number of registered citizens in the country. The real size of the population can be larger because of the unregistered population, foreign diplomats, etc.. if this is true, the survey data would be systematically lower that that of the national accounts.

5.4.2 Testing for the effects of product characteristics and data calculation / registration methods

In order to facilitate the statistic test, all the variables being tested have to be measured quantitatively and objectively. This is a difficult task, especially for variables representing product characteristics such as social opinions etc.. To avoid the bias of subjectivity, we adopt the method of substituting the variables with relevant objective indicators. Unfortunately, Only two objective indicators are found. 'The percentage of households that have this type of expenditure' in 1980 is used to measure the purchasing frequency for the relevant commodity group. Purchasing size is measured by dividing the consumption per husehold in year 1980 by the purchasing frequency. Therefore, purchasing frequency and purchasing size along with the calculation methods in the national accounts and the data registration methods in the surveys are going to be studied in this section.

a) Purpose

The purpose of this study is to (1)Test if purchasing frequency, purchasing size, national accounts calculation methods and survey data registration methods have any effect on the difference of consumption estimates between the national accounts and the household expenditure surveys; (2) If positive, how much of the the discrepencies of the consumption statistics between the two sources can be explained by each of the four variables; (3) What is the direction of influence.

b) Method

A ratio between the consumption statistics from the surveys and national accounts (X_{fbu}/X_{na}) is constructed to measure the discrepancy for each three digit commodity/service group. Since the ideal situation is that the ratio equals 1, another indicator 'RATE' is introduced which measures the absolute deviation of the ratio from 1.

$$\text{Ratio} = X_{fbu}/X_{na}$$
$$\text{Rate} = |\text{Ratio}-1|$$

Purchasing frequency is measured by 'the percentage of household that have this type of expenditure' in year 1980 which was taken directly from Lodberg-Holm (1981, table3); purchasing size was calculated by dividing the consumption per household X_{fbu} in year 1980 by purchasing frequency.

As presented in chapter 3 and appendix 2, the national accounts consumption data is calculated using three different methods with different assumptions, while the survey data is collected based on the registrations of either consumption over the two week's accounting period or consumptions over the last 12 months period. If these methods are not consistant, the differences of the ratios among the commodity/service groups using the same method should be significantly smaller than that between the groups. The purpose of this section is to test the significance of influences of the methods used by the national accounts and the surveys.

The categoric variables national accounts method and survey method are named M1 and M2 respectively. Variable M1 has three level of values: 1,2,3; While variable M2 has two level of values: 0, 1.

Table 5.8 Classification of methods

Variable	level	values	meaning
M1	3	1	intermediate method
		2	volume method
		3	service method
M2	2	0	two week's consumption
		1	last 12 months' consumption

note: the values assigned to each 3-digit group are presented in appendix 5.

Two linear models are constructed for this analysis:

Model A $\quad \text{Ratio} = a_0 + a_1 * M1 + a_2 * M2 + a_3 * F + a_4 * S + u1$

Model B $\quad \text{Rate} = b_0 + b_1 * M1 + b_2 * M2 + b_3 * F + b_4 * S + u2$

Where
- M1 - data calculation methods in the national accounts
- M2 - data registration methods in the household expenditure surveys
- F - purchasing frequency
- S - purchasing size

The analysis of variance technique is used to examine the effects of these four variables on the ratio (X_{fbu}/X_{na}) and rate across 3-digit commodity / service groups.

c) Analysis of variance for all the 3-digit groups

There are 128 3-digit groups that entered into this analysis. the results for Model A and Model B are presented in Table 5.9 and Table 5.10.

Table 5.9 Analysis of variance for ratio (X_{fbu}/X_{na})

Model A: Ratio=f(M1, M2, F, S)

General linear models procedure
Dependent variable: RATIO

Source	DF[1]	SS[2]	MS[3]	F-value	Prob.[4]	R-Square	C.V.[5]
Model	5	12.5	2.5	2.84	0.0184	0.104	91.2

		TypeI[6]			TypeIII[7]		
Source	DF	SS	F	Prob.[8]	SS	F	Prob.[8]
M1	2	3.6	2.06	0.1315	2.1	1.22	0.3001
M2	1	0.4	0.46	0.5012	0.03	0.03	0.8575
F	1	0.7	0.84	0.3603	1.28	1.45	0.2303
S	1	7.4	8.78	0.0037	7.75	8.78	0.0037

1) degree og freedom
2) sum of squares
3) mean squares
4) the significant probability of the test of the hypothesis all the parameters $a_1, a_2, a_3, a_4 = 0$
5) coefficient of variation
6) type I sum of squares, called sequencial sum of squares, are the incremental improvement in error SS as each effect is added to the model
7) type III sum of square is called partial sum of squares. For more detailed information, refer SAS User's Guide: Statistics, The GLM Procedure, p146
8) the significant probability of the test of the hypothesis $a_i = 0$ (i=1,2,3,4 for variables M1,M2,F,S, respectively)

Table 5.9 shows that Model A is significant at the probability level of 0.0184, which means that the chance that all the parameters a_1, a_2, a_3, a_4 equal zero is 1.84%. However the value of R square indicates that only 10.4 percent of the variances has been explained by Model A. Among the four variables, purchasing size has most significant effect on the dependent variable ratio.

The estimated parameters for Model A are given in Table 5.10.

Table 5.10 Estimates for parameters in Model A
-- independent variable: Ratio

Variable	Value	Estimated parameter	Significant probability
intercept		0.9768B	0.0067
	1	-0.257 B	>0.23
M1	2	-0.452 B	0.1265
	3	0	0
M2	0	-0.049 B	>0.23
	2	0	0
F		0.004	>0.23
S		0.005	0.0037

B estimates followed by the letter B are biased estimators and do not estimate the parameter but are blue for some linear combination of parameters. For example, the parameter for the value 3 of the variable M1 was normalized into zero, the parameters for the other two value levels were calculated with reference to the zero point. The same is true for variable M2.

Other things being equal, those groups whose national accounts consumption figures had been collected by volume method have the lowest ratio, while the service groups have the highest ratio. Other things being equal, those products with larger one time purchasing size tend to have higher ratios. The survey method and purchasing frequency seem to have no significant effects on the value of the ratios.

Due to the normalized parameters, conclusions can only be drawn on the directions and relative magnititude of the influences of those variables on the ratio , not the absolute magnititude from the above analysis. To supplement the above results, and to get a complete overview of the impact of the indenpendent variables, we constructed another variable 'RATE' which represents the absolute discrepancy of the two sets of statistics. The analysis of variance for RATE is presented in Table 5.11.

Table 5.11 Analysis of variance for Rate(|Ratio-1|)

Model B: Rate = f(M1, M2, F, S)

General linear models procedure
Dependent variable: RATE

Source	DF[1]	SS[2]	MS[3]	F-value	Prob.[4]	R-Square	C.V.[5]
Model	5	13	2.6	3.97	0.0022	0.14	176

		TypeI[6]			TypeIII[7]		
Source	DF	SS	F	Prob.[8]	SS	F	Prob.[8]
M1	2	8.2	6.26	0.0026	3.2	2.46	0.0893
M2	1	0.16	0.24	0.6258	0.89	1.35	0.2468
F	1	0.04	0.06	0.8025	0.00	0.00	0.9905
S	1	4.62	7.05	0.0090	4.62	7.05	0.0090

1) degree og freedom
2) sum of squares
3) mean squares
4) the significant probability of the test of the hypothesis all the parameters $a_1, a_2, a_3, a_4 = 0$
5) coefficient of variation
6) type I sum of squares, called sequencial sum of squares, are the incremental improvement in error SS as each effect is added to the model
7) type III sum of square is called partial sum of squares. For more detailed information, refer SAS User's Guide: Statistics, The GLM Procedure, p146
8) the significant probability of the test of the hypothesis $a_i = 0$ (i=1,2,3,4 for variables M1,M2,F,S, respectively)

Table 5.12 Estimates for parameters in Model 4
-- independent variable: Rate

Variable	Value	Estimated parameter	Significant probability
intercept		0.3942B	>0.2
M1	1	-0.4076B	0.0404
	2	-0.4760B	0.0625
	3	0	0
M2	0	-0.2719B	>0.2
	2	0	0
F		3.6E-0.5	>0.23
S		0.004	0.0090

B estimates followed by the letter B are biased estimators and do not estimate the parameter but are blue for some linear combination of parameters. For example, the parameter for the value 3 of the variable M1 was normalized into zero, the parameters for the other two value levels were calculated with reference to the zero point. The same is true for variable M2.

Model B is significant at the probability level of 0.0022. The national accounts method and the purchasing size are significant factors that may affect the absolute value of the discrepancies. The volume method results in smallest discrepancies, while the consumption estimate by the sevice method have the largest discrepancies. Those groups with larger purchasing size have larger discrepancies between the two sets of statistics, other things being equal.

To summerize the analysis for all 3-digit groups, three conclusions can be drawn:

* The volume method (Volume*price index) used by the national accounts tends to give lower consumption estimates than the consumption metrix method and service method. The consumption figures in the national accounts that were estimated by the volume method tend to be more close to the survey estimates. Therefore, we may conclude at this stage that the volume method gives the best estimates, while the service method results in the most unreliable figures.

* Other things being equal, for those product groups with larger purchasing size, the survey consumption figures tend to be higher than that of the national accounts, and the gaps between the two sets of statistics are greater.

* Purchasing frequency and survey method have no significant effects on the ratio or the rate.

d) Analysis of variance excluding the groups with extreme ratios

As shown in Figure 5.1, there are some "outliners", i.e. groups that are located far away from the center of the distribution, especially towards the direction of large ratios. These extreme groups may give valuable informations about the causes of discrepancies. These outliners may also "destroy the data set" and mislead the interpretation of the results of the analysis. Therefore, the effect of extreme values will be excluded from the analysis in this section, and be studied separately in next section.

The critical value of the ratio used to exclude the extreme groups is 3. Five groups are thus excluded.

Table 5.13 Analysis of variance for ratio (X_{fbu}/X_{na})

Model A: Ratio = f(M1, M2, F, S)

General linear models procedure
Dependent variable: RATIO

Source	DF[1]	SS[2]	MS[3]	F-value	Prob.[4]	R-Square	C.V.[5]
Model	5	1.65	0.33	2.67	0.0251	0.103	40.7

		TypeI[6]			TypeIII[7]		
Source	DF	SS	F	Prob.[8]	SS	F	Prob.[8]
M1	2	0.76	3.10	0.0489	0.38	1.55	0.2168
M2	1	0.65	5.23	0.0240	0.63	5.08	0.0261
F	1	0.18	1.46	0.2299	0.19	1.57	0.2132
S	1	0.06	0.49	0.4835	0.06	0.49	0.4835

1) degree og freedom
2) sum of squares
3) mean squares
4) the significant probability of the test of the hypothesis all the parameters $a_1, a_2, a_3, a_4 = 0$
5) coefficient of variation
6) type I sum of squares, called sequencial sum of squares, are the incremental improvement in error SS as each effect is added to the model
7) type III sum of square is called partial sum of squares. For more detailed information, refer SAS User's Guide: Statistics, The GLM Procedure, p146
8) the significant probability of the test of the hypothesis $a_i = 0$ (i=1,2,3,4 for variables M1,M2,F,S, respectively)

Table 5.13 and Table 5.14 give us a totally different picture from the result in table 5.9.. The effect of purchasing size diminished and the survey method becomes a significant effect. The reason for this change is obviously due to the fact that the group " Workshop Repairs" has extreme values for ratio, purchasing size and purchasing frequency (refer Table 5.17). It is this most extreme group that made the influence of variable Purchasing size more drastic than it should be. As for the survey registration method, its increased influence seems due to the fact that 'two-weeks' registration method is used by the extreme groups in both ends(Table 5.17). After the high extremes were excluded, the analysis will inevitably conclude that those groups whose consumptions had been collected by the two-weeks registration method have a systematic lower ratios and larger discrepancies, which is misleading.

Table 5.14 Estimates for parameters in Model A
-- independent variable: Ratio

Variable	Value	Estimated parameter	Significant probability
intercept		0.9012B	0.0001
M1	1	0.1395B	0.1246
	2	0.0362B	>0.2
	3	0	0
M2	0	-0.2313B	0.0261
	2	0	0
F		0.0017	>0.2
S		0.0005	>0.2

B estimates followed by the letter B are biased estimators and do not estimate the parameter but are blue for some linear combination of parameters. For example, the parameter for the value 3 of the variable M1 was normalized into zero, the parameters for the other two value levels were calculated with reference to the zero point. The same is true for variable M2.

For the same reason given before, the analysis of variance for Rate is carried out. the results are presented in Table 5.15 and Table 5.16.

Table 5.15 Analysis of variance for Rate(|Ratio-1|)

Model B: Rate = f(M1, M2, F, S)

General linear models procedure
Dependent variable: RATE

Source	DF[1]	SS[2]	MS[3]	F-value	Prob.[4]	R-Square	C.V.[5]
Model	5	0.7	0.15	3.03	0.013	0.12	70.4

		TypeI[6]			TypeIII[7]		
Source	DF	SS	F	Prob.[8]	SS	F	Prob.[8]
Method1	2	0.3	3.41	0.0365	0.12	1.27	0.2848
Method2	1	0.06	1.22	0.2713	0.09	1.94	0.1659
Freq	1	0.3	5.78	0.0178	0.3	6.14	0.0147
Size	1	0.07	1.36	0.2460	0.07	1.36	0.2460

1) degree og freedom
2) sum of squares
3) mean squares
4) the significant probability of the test of the hypothesis all the parameters $a_1, a_2, a_3, a_4 = 0$
5) coefficient of variation
6) type I sum of squares, called sequencial sum of squares, are the incremental improvement in error SS as each effect is added to the model
7) type III sum of square is called partial sum of squares. For more detailed information, refer SAS User's Guide: Statistics, The GLM Procedure, p146

[8] the significant probability of the test of the hypothesis $a_i=0$ ($i=1,2,3,4$ for variables M1, M2, F, S, respectively)

Table 5.16 Estimates for parameters in Model B -- independent variable: Rate

Variable	Value	Estimated parameter	Significant probability
intercept		0.3835B	0.0001
M1	1	-0.0899B	0.1138
	2	-0.0720B	>0.15
	3	0	0
M2	0	0.0895B	>0.15
	2	0	0
F		-0.0021	0.0147
S		-0.0005	>0.15

B estimates followed by the letter B are biased estimators and do not estimate the parameter but are blue for some linear combination of parameters. For example, the parameter for the value "3" of the variable M1 was normalized into zero, the parameters for the other two value levels were calculated with reference to the zero point. The same is true for variable M2.

Model B is significant at the level of 0.013. Purchasing frequency has the most significant effect on the absolute value of discrepancy, the higher the purchasing frequency, the smaller the discrepancy.

Two conclusions can be drawn from the analysis of the 123 3-digit groups:

* The survey method has a significant effect on ratio and moderate effect on the rate. The groups for which two-weeks' registration was used have lower ratios, higer rate. That is, the surveys report lower figures with the two-weeks' registration method than the alternative method, and these consumption figures registered by the two-weeks' registration tend to be lower than the national accounts estimate.

* Other things being equal, the higher the purchasing frequency, the higher the Ratio tends to be, and the smaller the gap between the two sets of statistics. This may indicate that those items with high purchasing frequency are registered with higher value.

e) Analysis of the extreme groups

Table 5.17 Facts for extreme groups

Name	Code	Ratio	Method1	Method 2	Size	Frequency	X_{fbu}
GROUPS WITH RATIOS LARGER THAN 2							
Frozen fish	022	1.75	1	0	8.3	24.5	203
Other household equipment	445	2.20	1	0	33.5	15.9	533
Other household goods	453	2.25	1	0	11.0	71.6	791
Insur. of househ. property	456	3.44	3	0	4.4	72.9	319
Photographing etc.	726	3.48	3	0	44.5	15.2	676
Potato products	062	4.77	1	0	4.8	48.6	235
Repairs & supplies for rec.	719	5.47	3	0	30.1	17.9	539
Workshop repairs	624	8.46	3	0	323.2	5.7	1842
GROUPS WITH RATIOS SMALLER THAN 0.3							
Other services	851	0.090	3	0	28.3	6.9	195
Physicians Services	514	0.120	3	0	18.8	14.2	267
Life insurance	841	0.180	3	0	70.7	1.5	106
Moving expenses & freights	637	0.187	3	0	21.0	1.0	21
Laundering,cleaning &dyeing	454	0.210	3	0	28.3	2.3	65

In order to find out as much as possible the causes of discrepancy, the groups with extremely high and low ratio are singled out for a separate study. Since neither of the two groups have enough numbers of observations to carry out statistical analysis, only comments will be given based on table 5.17.

We may see, from the table 5.17, that most of the product groups that are contained in the high ratio group are with residual group definitions and ambiguous boundary of classification, such as, other household equipment, other household goods, photographing etc., etc... There exists no clear sign on the possible one way influence of frequency and size.

The low ratio group includes those product groups that have higher than average purchasing size, lower purchasing frequency. All of them are services.

The clear trace of the influence of methods can be found from the two extreme groups. It is not by chance that all the three digit groups with extremely large discrepancy are calculated by either the intermediate method or service method in the national accounts, and are all registered based on two weeks' spending by the surveys.

5.4.3 Findings from the analysis

The findings from the analysis in section 5.4 can be summarized as following.

a) The national accounts calculation method

The effect of national accounts method is significant. The service method tends to result in extremely large discrepancies. The direction is both ways, most of the groups that have extremely high or low ratio happened to be in the service product category.

The consumption matrix results in lower ratio and smaller discrepancy than the service method.

The volume method (Volume*price index) used by the national accounts tends to give highest consumption estimates of all the three methods. The consumption figures in the national accounts that were estimated by the volume method tend to be more close to the survey estimates.

b) The survey data registration method

The effect of survey method is significant at the level of 0.25. This

is evidence that the two-weeks registration method results in larger discrepancies, but the method has no one way effect on the ratio.

c) The purchasing frequency

The impact of purchasing frequency on ratio is significant at the probability level of 0.21. For a product group that have 1% more consumer household during the registration period, its ratio is 0.0017 point higher.

The impact of purchasing frequency on discrepancy is significant at the level of 0.015. The more frequently purchased product groups have smaller discrepancy.

d) The purchasing size

The purchasing size has no significant impact on ratio, and has very moderate effect on rate (at the probability level of 0.25). The smaller the purchasing size, the larger the discrepancy between the national accounts data and the survey data.

5.5 Suggestions for future research

The obvious weak point in the discussion of section 5.4 is that it failed to include as many product characteristic variables as possible. Lacking of objective indicator is the main obstacle. Therefore, the decision to include these four variables in the analysis does not mean that the excluded variables are not important for explaining the discrepancy, but purely due to the reason of measurability and time restriction. The possibility of including more variables with objective measurement is the area suggested for future research. A test with five product characteristics based on subjective value assignment is presented in appendix 5.

6. THE POTENTIAL OF NORWEGIAN OFFICIAL CONSUMPTION STATISTICS IN MARKETING RESEARCH

Chapter 2 presented the information needs of marketing decision makers, the nature of the task of marketing researchers, and the possible sources of information. This chapter will proceed this discussion to how the potential of the official consumption statistics, as one of the most important secondary data sources, can be fully exploited to assist marketing decision making.

6.1 The characteristics of the official statistics

The Norwegian official consumption statistics have characteristics as such:

* High availability
* High continuity
* High level of aggregation
* Low currency
* Lack of individual background and attitude data

It is these properties of the consumption data that directly affect its applications. In the rest of this chapter, the possible scope of application for the consumption statistics in marketing research are discussed based on these characteristics.

6.2 Direct use of the consumption statistics

The Norwegian consumption statistics can be used directly for many purposes by marketing researchers. Especially for those who are situated far from and have no or little knowledge of the Norwegian

market, and are in the initial phase of the research process, the consumption statistics can be a very valuable source of information of the market potential. The household expenditure survey data provides extra information on background variables which can be useful in identifying the geographical location and characteristics of customers.

6.2.1 Market entry

For companies either entering the international markets for the first time or planning to expand into new markets, an important choice has to be made: which one or several markets should be picked up from the bewildering array of countries and markets in accordance with the companies' limited resources and the attractiveness of each market.

To make this decision, some indicators about each market need to be collected. Since it is clearly prohibitable to examine each possible market in-depth, an initial screening procedure is necessary. It is in this case, the Norwegian official consumption statistics can be very valuable as one of the market potential indicator, and enable these firms to assess the magnitude of private consumption of certain broad commodity group of the Norwegian market without dealing with the difficulties of investigating the market in a totally unfamilar environment.

Several other indicator are combined with the market size indicator to judge the attractiveness of certain market, which will not be discussed her (refer table 2.1).

6.2.2 Mode of entry

Companies that have decided to enter the Norwegian market, face the decision of choosing the mode of operation. There are basically three types of mode of operation. They are:

(1) exporting to the market from a established production base abroad
(2) contracting operation which refers to many forms like licensing, franchasing, management contract, joint ventures etc.
(3) production in the market.

The choice of mode of operation is affected by many factors, among them, the product market size is a very crucial one. A large sales potential would justify the cost of setting up local production plants, while the company may resort to a licensing agreement with a small local firm in a small market. The Norwegian official statistics can be useful in making this decision for some homogeneous products and services such as eggs, potatoes, tea, sugar, electricity, repair of footwear, etc.. But for the many of the commodity and service

groups, the level of aggregation of the consumption statistics is too high to be appropriate for the market operation mode decision. In this respect, the survey data are more useful.

6.2.3 Demand estimation

To estimate the market demand for the purpose of production and marketing planning is a more demanding task than in the initial market potential estimation. The ideal level of the estimation should be defined as the firm's served market which is defined as the market consisting of the directly competing products or brands. In this sense, the consumption statistics has limited use. But for some commodity product like salt, sugar, electricity etc, this statistics can be a reliable estimation of the market demand as well.

6.2.4 Distribution and promotion decisions

In addition to the consumption data, the household expenditure surveys collect also household background data such as the consumers' geographic location, household size, income level, occupation of the main income earner, etc.. These extra information can be very helpful to assist the marketing manager in making distribution and promotion decisions.

A central issue in any marketing decision is to know who the customers are. After this the marketer needs also to know where the customers are located in order to design the right promotional champion to reach them, and distribute the tailored product where they are accustomed to do their shopping. A hypothetic example may be that by analyzing the survey data, a marketing researcher for a sugar producer may find out that people located in north of Norway with bigger family size have consumed sugar much more heavily during the last 10 years. This finding may result in that the producer decides to take the large family segment as its target market, and invest more to develop the distribution network in northern part of the country.

6.3 Indirect use

The continuity of Norwegian consumption data makes it possible to explore certain relationships between the consumption level and many other indicators of the economy. And this relationship can be used along with the other indicators to forecaste future consumption for certain product.

6.3.1 Demand forcasting

To make use of the national consumption statistics is not an innovative idea at all. The same set of consumption statistics has

long been used by economists in econometric research of household behavior. Some of their work can be "borrowed" or have already been introduced to assist marketing decision making (Refer Parsons & Schultz, 1978, and Kotler, 1963). Among them, perhaps the most important and relevant research topic is about income elasticities and Engel Elasticities (refer Parsons, L.J. and Schultz. R.L. 1978).

Since there is always a budget limit, the consumer has to distribute his income among all the items he wants to consume. Principally every individual has his own consumption pattern, but when aggregating the data into district or country or region level, there may be a common consumption pattern, for example, if the elasticity of income for travel expenses in Norway is 1.5, while it is forcasted that the income level will grow 20 percent in the next 5 years, the marketing researcher can use these results and forecast the demand trend for travel service.

6.3.2 Multi-country research

The consumption pattern model can also be extrapolated across countries which is called lead-lag analysis in marketing literature. This is based on the time series data from one country to project consumption in other similar countries. It is assumed that the consumption determinants are identical in the two countries, and the only factor that separates them is time. For example, the consumption trend in Finland can be predicted on the basis of consumption trend in Norway with a lag of 2 years reference. This method is not widely used because of the difficulties in identifying the time lag. For a more complex application of lead-lag analysis, see Lindberg (1982).

As early as in 50's, L.Jureen of Stockholm, Sweden has used econometric method in multi-country research on the topic of long term trends in food consumption (Jureen (1956)), which is interesting and valuable for marketing purpose.

6.4 Limitations of the consumption data

Even though the consumption data can be utilized for many marketing purposes, there are three vital shortcomings that have restricted their applications in the business field.

- The first is the level of aggregation for commodity groups for both national accounts and household expenditure surveys;

- The second is lacking of correspondent background and attitude data. In this respect, the survey data is more attractive because of the additional cross section information.

- The third problem is low publication currency which can restrict the use of many official statistics since time is often a competitive weapon in marketing. Which may not be fully realized by economists who are more interested in studying time-series data.

6.5 Suggestions

Given the fixed cost of carrying out the annual household expenditure surveys, I assume that there would be only a negligible marginal cost if some more questions are added to the present questionnaire concerning consumers' attitude or more detailed information about the product brand etc.. By doing this, the consumption statistics would be more interesting to marketing researchers, thus contribute to the Norwegian business infrastructure. It also enriches the research ground of the economists in the CBS and elsewhere who have been using the consumption statistics as an empirical basis.

REFERENCES

Adler, Hans J. and Michael Wolfson (1988):
A Prototype Micro-Macro Link For the Canadian Household Sector. Review of Income and Wealth, Series 34, No.4, December 1988, pp371-392.

Boyd, Harper W.; Ralph Westfall and Stanley F. Stasch (1981):
Marketing research, Irwin, Illinois.

Churchill, Gilbert A. Jr. (1983):
Marketing Research- Methodological foundations, The Dryden Press.

Cramer, J.S. (1971):
Empirical Econometrics, N.Y.

Cateora, Philip R. (1987):
International Marketing, Irwin, Homewood, Illinoiis, pp9.

Crisp, Richard D. (1957):
Marketing Research, McGraw-Hill Book Company Inc. N.Y. pp173-177.

Douglas, Susan P. and Samuel C. Craig (1983):
International Marketing Research, Englewood Cliffs, New Jersey.

Ferber, Robert; Donald F. Blankertz etc. (1964):
Marketing Research, The Ronald Press Company, N.Y.

Frank, Ronald E.; Alfred A. Kuehn and William F. Massy (1962):
Quantitative Techniques in Marketing Analysis, Irwin, Illinois, pp280-302.

ÆFløttum, Erling J. (1975):
Det private konsum i nasjonalregnskapet. Arbeidsnotater 75/35, The Central Bureau of Statistics of Norway, Oslo.

Fløttum, Erling J. (1981):
National Accounts of Norway - system and method of estimation, Rapporter 81/1, The Central Bureau of Statistics of Norway, Oslo.

Herigstad, Helge (1979):
Forbruksundersøkinga samanlikna med nasjonalrekneskapen, Rapporter 79/13, Central Bureau of Statistics of Norway, Oslo.

Kotler, Philip (1963):
The Use of Mathematical Models in Marketing, The Journal of Marketing, Vol.27, No.4, October, pp.33-41.

Nygård, Tor & Ib Thomsen (1989):
The Central Register of Establishments and Enterprises And Its Use In Statistics Production, Meeting on the use of business registers in national statistical office, Conference of European Statisticians, Economic and Social Council, United Nations, 17 November.

Parsons, Leonard J. and Randall L. Schultz (1978):
Marketing Models and Econometric Research, North Holland, N.Y.

Skjerpen, Terje and Jørgen Aasness (1989):
Litteraturliste over analyser av SSB's forbruksundersøkelser, Central Bureau of Statistics of Norway, Oslo.

Thomsen, Ib (1977):
Sampling Methods Applied by The Central Bureau of Statistics of Norway, Social Economic Studies 33, Central Bureau of Statistics of Norway, Oslo.

The Central Bureau of Statistics of Norway (1984):
National Accounts 1972-1983, Norwegian Official Statistics B485, Central Bureau of Statistics of Norway, Oslo-Kongsvinger, pp40-47.

The Central Bureau of Statistics of Norway (1987):
National Accounts 1976-1986, Norwegian Official Statistics B715, Central Bureau of Statistics of Norway, Oslo-Kongsvinger, pp42-47.

Uhl, Kenneth P. and Bertram Schoner (1969):
Marketing Research - information system and decision making, John Wiley and Sons Inc. N.Y. 1969, pp396-339.

APPENDIX 1

HOUSEHOLD EXPENDITURE SURVEY

1. Sampling Method

1.1 Special sampling (started from 1976)

a) Target population : general sample of previous year
b) Sampling unit : private household
c) Sampling method : simple random sampling
d) Sample size : 300 (1976-1983); 500 (1983-now)

Table A1.1 The sample size of special sampling

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984-1989
Size	300	300	299	300	300	300	300	300	500

1.2 General sampling

a) Target population : the Norwegian population
b) Sampling unit : private household
c) Sampling method : three stage stratified sampling

stage 1: draw sample area from strata

From each stratum one sample area has been drawn with 100 probability. more sample areas from the same strata are selected with a probability proportional to the number of inhabitants in the area.

stage 2: draw sub-sample area

Each sample area is divided into 3 sub areas, and one of the three sub areas was selected by random for each individual sample area.

stage 3: draw sample units

The final sample was drawn from the subareas at random based on the index of names and address of the population in the subarea. For more details see Thomsen (1977).

d) Bases for stratification:

* types of municipality (industrial stucture and centrality)
* number of inhabitants

e) Sampling frame: The Index of Names and Addresses of the Population

f) Sample size:

Table A1.2 sample size of the general sampling

Year	1973	1974	1975	1976	1977	1978	1979	1980	1981
Size	4707	1388	1648	1407	1120	1292	2085	1590	2050
Year	1982	1983	1984	1985	1986	1987	1988	1989	
Size	2040	2060	2040	2040	2067	2056	2071	1589	

2. Data collection procedures

(1) Introductory interview

In this interview background data was collected such as the household members' data of birth, marital status, occupation etc.

(2) Accounting books

The households were asked to keep accounts of their private consumption expenses during a 14 days' period. In order to eliminate the seasonal effects, the total sample was divided into 24(?) groups, each group was assigned to keep account of certain period of the year. data has been collected for the whole year.

* main account book (H-book)

Each household was responsible for one main account book, all actual payment along with the quantity and value of the purchases during the 14 days were registered. the consumption of own produced products were accounted by quantity, and estimated according to producers' price. Payments in kind were also registered by quantity and the values were estimated according to retail price.

* secondary account book (B-book)

Apart from the main account book, each household member who was more than 15 years of age kept her/his own account.

(3) Concluding interview

Expenses for commodities and services with a low purchase frequency were registered in the concluding interview. these items include,for example, certainexpenses for dwelling, purchase of private transport equipment, household machines and other electric apparatus etc.. the value of free dwelling, light and fuel was registered in accordance with the amount assessed by the tax authorities at the last tax assessment. Other free contributions have been accessed at the market price.

3. Precision of the estimation for two digit groups

Table A1.3 precisions of the estimation for two digit commodity groups

H/Annual consumption per household (%)

	0	00	01	02	03	04	05	06	07	08	09
1973	3.13	4.45	5.62	4.19	2.97	3.80	4.85	7.0	9.2	3.25	6.41
1974	4.21	5.62	7.61	8.10	4.31	5.79	6.26	12.9	16.5	7.11	7.22
1975	4.10	5.07	9.53	7.00	3.89	5.39	5.69	13.6	14.8	5.64	8.27
1976	4.05	4.56	9.32	8.32	3.73	5.97	5.28	15.2	10.6	5.81	5.97
1977	3.98	4.50	8.41	6.82	4.00	15.30	5.34	12.5	12.6	6.45	6.41
1978	4.22	4.53	9.88	7.15	3.84	6.17	5.04	14.6	12.5	6.15	6.99
1979	3.72	4.49	8.00	6.04	3.43	5.04	5.23	12.1	11.0	4.92	6.43
1980	4.46	4.90	10.60	7.79	4.09	6.56	6.05	11.9	16.0	6.59	6.80
1981	3.49	4.19	7.46	7.43	3.33	5.24	4.65	10.9	12.3	4.77	5.93
1982	3.48	4.22	7.12	6.33	3.57	5.50	4.61	11.3	11.7	5.40	5.09
1983	3.46	4.39	7.18	6.02	3.45	5.62	5.03	9.2	12.3	4.98	6.49
1984	3.84	4.40	8.80	7.20	3.59	5.46	4.79	8.4	11.2	5.41	8.24
1985	3.54	4.02	7.42	6.05	3.44	5.47	4.84	9.4	11.2	5.22	8.47

	1	11	12	2	21	22	23	3	31	32	4
1973	6.27	9.0	4.57	5.61	5.79	13.7	12.1	12.30	16.50	3.32	5.97
1974	11.00	13.9	8.82	10.70	11.10	14.2	24.1	9.53	12.50	4.66	12.20
1975	8.80	11.3	8.88	7.82	8.72	15.1	15.0	7.21	9.25	3.59	8.59
1976	8.08	10.0	8.51	7.44	8.09	14.3	14.0	5.37	6.80	3.32	7.39
1977	9.10	11.1	9.65	8.01	8.89	14.6	15.2	7.05	8.96	3.56	9.38
1978	8.94	10.9	9.79	8.08	9.02	18.9	15.1	6.21	7.81	4.48	7.85
1979	7.71	9.7	8.59	7.61	8.17	17.2	13.4	5.70	7.43	2.93	11.10
1980	8.55	10.8	9.30	8.13	8.91	16.6	14.1	10.00	12.90	3.82	10.50
1981	7.11	9.1	7.98	7.17	7.70	18.1	13.5	6.25	8.05	3.30	7.46
1982	7.88	10.4	8.40	7.29	7.84	18.6	13.9	4.71	6.13	3.30	7.40
1983	7.52	9.94	8.15	7.35	8.07	17.1	12.4	4.69	6.00	3.31	8.50
1984	7.48	8.89	9.34	7.54	8.22	17.1	12.8	4.58	5.75	3.02	7.33
1985	7.40	9.36	8.19	7.84	8.61	15.0	13.4	4.90	6.09	3.00	9.30

	41	42	43	44	45	46	5	6	61	62	63
1973	7.4	13.1	13.2	20.4	10.0	25.5	13.6	7.1	13.4	9.3	12.4
1974	15.1	34.8	25.4	35.4	14.1	43.0	21.5	9.0	22.2	11.5	16.2
1975	13.7	23.9	13.8	18.4	8.9	35.2	14.7	9.2	19.5	12.8	12.8
1976	12.3	21.0	14.8	15.1	8.7	31.5	21.4	9.3	20.2	12.1	17.8
1977	14.0	24.4	12.4	29.7	8.5	43.5	21.4	10.8	18.0	14.0	31.6
1978	12.5	22.6	13.1	25.0	8.8	39.9	22.2	10.8	21.7	13.6	24.3
1979	11.9	34.5	10.2	40.2	8.6	30.1	28.6	8.2	19.1	8.9	16.3
1980	12.7	21.9	14.0	22.3	34.9	31.1	18.4	9.0	19.6	10.1	14.6
1981	11.1	19.6	13.2	27.4	7.8	28.7	33.1	7.9	17.0	9.4	12.4
1982	10.6	21.1	13.2	23.2	6.1	35.4	15.4	7.6	16.6	9.1	13.1
1983	14.8	21.8	27.3	17.4	6.6	28.9	21.9	6.7	14.7	8.2	14.6
1984	12.4	19.2	13.8	20.1	7.6	30.3	17.5	7.5	17.1	9.0	12.6
1985	11.5	20.5	12.2	36.0	7.8	28.0	17.0	7.2	14.3	7.9	14.6

	64	7	71	72	73	74	8	81	82	83	84	85
1973	14.2	5.2	8.1	5.9	6.6	28.0	8.8	5.86	14.1	10.0	126	89
1974	21.4	11.1	16.8	13.5	9.1	84.0	13.1	7.60	32.6	16.3	95	125
1975	19.0	9.1	13.7	9.8	17.5	57.3	10.6	7.96	25.4	13.3	131	101
1976	18.5	13.1	22.2	10.1	11.1	55.6	14.0	7.09	35.1	11.9	223	84
1977	25.9	15.3	24.7	11.9	16.9	64.6	10.8	7.65	29.8	10.8	98	47
1978	24.9	11.0	17.9	10.5	11.4	62.6	8.9	8.25	23.6	11.7	98	44
1979	21.2	6.9	9.7	8.7	8.9	86.3	8.3	7.20	26.2	9.5	92	75
1980	23.7	8.9	14.9	9.9	9.5	61.1	11.2	7.57	10.1	11.8	106	122
1981	21.2	8.4	13.8	8.7	10.1	62.4	8.9	7.20	24.0	10.3	69	103
1982	17.3	8.9	15.0	9.3	10.9	55.5	8.6	7.07	22.5	10.2	73	81
1983	70.8	235	12.0	41.7	55.2	99.0	222		210.0	214.0	223	
1984	15.5	7.7	11.9	9.4	9.2	77.4	9.7	7.16	20.6	13.8	92	76
1985	15.6	8.5	15.4	8.7	8.8	74.3	8.3	7.86	17.5	11.4	77	42

4. Important definitions

Total consumption expenditure: the total consumption expenditure includes the payments by the household during the accounting period (converted to figures for the whole year). some expenses are registered by means of interview. As for durable consumer goods the consumption expenditure corresponds to the difference between expense in connection with purchase of "new" goods and sale of "old" goods. For this reason certain table present negative figures, for instance for the commodity group " prchase of transport equipment". The total consumption expenditure does not include expenses for direct taxes, social pensions, gift given away, real investments (for instance purchase of dwelling and expenses for buiding and extension of existing building), contractual savings (e.g. pension contribution, loan instalments, life insurance premium, etc.). In addition to the payments the total consumption expenditure includes the value of consumption of own produced commodities and gifts received. Own produced commodities are estimated according to producer prices, and received gifts according to retail prices.

APPENDIX 2

THE NORWEGIAN NATIONAL ACCOUNTS SYSTEM

1. The methods of estimation

There are three ways available to calculate the consumption figures:

* Direct method which bases statistics collected directly from the consumers. The household expenditure survey is one of the direct method to collect private consumption data.

* Indirect method which uses producers' statistics as well as information collected from other organizations such as tax authorities, Post office and insurance companies, through mathematical transformation and assumptions, to estimate the consumption.

* Intermediate method which uses retail sales statistics, through mathematical transformation and assumptions, to estimate the consumption.

In the national accounts, the private final consumptions are estimated for the majority of commodity groups, by using the intermediate method; While for some 18 commodity and all the service groups, the indirect method is employed.

2.4a. Intermediate method

For most categories of consumer goods, the intermediate method is employed to calculate the private consumption. The annual wholesale and retail trade statistics are the data source used, via a consumption matrix, in the final accounts.

How the consumption matrix has been used to transfer the retail sales figures into private consumptions is described by the following example.

The retail trade statistics gives information about the value of sales from each type of retail outlay in certain period of time:

Table A2.1a the use of consumption matrix

Store	Type 1	Type 2	Type 3	Type 4	Type 5
Sales	X1	X2	X3	X4	X5

If there are 4 types of commodity groups, the consumption matrix gives how many percent of the value of sales in each type of store corresponding to certain commodity group:

Table A2.1b the use of consumption matrix

		commodity groups			
Store	value of sales	01	02	03	04
type 1	x1	10%		40%	90%
type 2	x2	60%			
type 3	x3		20%		
type 4	x4	20%	30%	60%	
type 5	x5	10%	50%		10%

According to this matrix, the consumption for commodity group 01, 02, 03, 04 can be calculated:

Consumption (01) = 0.1*(x1) + 0.6*(x2) + 0.2*(x4) + 0.1*(x5)
Consumption (02) = 0.2*(x3) + 0.3*(x4) + 0.5*(x5)
Consumption (03) = 0.4*(x1) + 0.6*(x4)
Consumption (04) = 0.9*(x1) + 0.1*(x5)

The consumption matrix was constructed in 1979 through a national survey and has been used in the calculation since then. No major revision has been made.

In the preliminary accounts, when the annual wholesale and retail trade statistics has not yet been available, the statistics from "the monthly index of retail sale" are used for the calculation with the same consumption matrix.

2.4b. Indirect method

For the some 18 commodity and 2 service groups, The volume information on producers' sales has been collected from producers, tax authorities or other producers' organizations, then the consumption is calculated by using the price index (usually a sub-index of the consumer price index).

The formula used to calculate from the sales volume input to consumption is:

Consumption(t) = C.Volume(t) * Price(t)
C.Volume(t) = C.Volume(t-1) * Volume index(t)
Volume index(t) = Sales volume(t)/Sales Volume(t-1)

The commodity and service groups included in this category are:

Potatoes	Smoking tobacco
Margarine	Other tobacco goods
Soft drinks	Cars
Beer	Motorcycles and bicycles
Cigars	Television
Cigarettes	Radio
Liguid fuels	fuel and oil
Electricity	fire wood
coal and coke	district heating
repair of furniture	repair of footwear

With regard to rest of the service groups, gross outputs in the service sector are computed based preliminarily on budget data, employment figures. In the final accounts, accounting figures play a greater role.

2. Data sources

The major sources of the final private consumption data in the National Accounts are summarized in table A2.2.

Table A2.2 The Chain of Data Sources for private consumption in the National Accounts

NA →	SOURCES →	SOURCES →	SOURCES →	SOURCES
National Accounts	The monthly index of retail sales	SURVEY @		
	The annual wholesale and retail statistics	The Central Register of Establishments & Enterprises	REGISTRATION @	
			local social insurance offices	REGISTRATION @
			county tax offices	REGISTRATION @
		Tax authority	REGISTRATION @	
	Resource Accounts			
	Directorate of Excise Taxes			
	Directorate of Road			
	Health statistics Education statistics			

@ Primary source reached.

Since the monthly index of retail sales and the annual wholesale and retail statistics are the sources for estimaing the majority of the commodity groups, this section is devoted to discuss these two sources. The other sources will be studied in chapter 5 if necessary when comparing the consumption figures with that of the Household Expenditure Survey.

2.1 The Monthly Index of Retail Sales

The Monthly Index of Retail Sales are used for estimating the consumption of majority of the commodity groups in the preliminary accounts. This index has been prepared on the basis of sales data from a sample of some 1200-1500 establishments in retail trade with periodic rotation of the sample.

sampling plan

-- Population: All establishments in retail trade (42000-45000 in 1990)

-- Sampling unit: establishment, defined in accordance with UN's recommendations in the International Standard of Industrial Classification (ISIC)

-- Sampling method: two stage stratified quata sampling with periodic rotation

stage 1: the population has been statified into three exclusive groups:

Table A2.3 sampling method for the monthly retail trade

Group	Sales 2 years ago (t-2)	Sales at obser--vation period t	Change of Business Code from t-2 to t
Identical	>0	>0	No
Movers	>0	>0	Yes
New entry /exit	=0 >0	>0 =0	

stage 2: the identical establishments are further stratified based on industrial class, annual sales and type of unit in the base period; Movers are divided by industrial class in base period and at the observation point; New entrys/exits are divided by industrial class and districts at the observation point.

Sampling: certain percentage of each category are drawn to

form the final sample with 100% probability.

Table A2.4 Stratification variables and calculation

Stage 1	stage 2	Calculation
Identical	Industry class (t-2) Annual sales (t-2) Type of unit (t-2)	$C_{i,t} = \sum_{\text{strata}}^{3} C_{t,t-2} \frac{S_{i,t}}{S_{i,t-2}}$
Movers	Industry class (t-2) Industry class (t)	$C_{m,t} = \sum_{\text{strata}}^{2} C_{t,t-2} \frac{S_{m,t}}{S_{m,t-2}}$
New entry /exit	Industry class (t) District (t)	$C_{n,t} = N \sum_{\text{strata}}^{2} p_i * S_{n,t}$
		$C_{tot,t} = C_{i,t} + C_{m,t} + C_{n,t}$

Where

$C_{i,t}$ - Sales of identical strata in the population at t

$S_{i,t}$ - Sales of identical strata in the sample at time t

$C_{m,t}$ - Sales of mover strata in the population at t

$S_{m,t}$ - Sales of mover strata in the sample at time t

$C_{n,t}$ - Sales of newer strata in the population at t

$S_{n,t}$ - Sales of newer strata in the sample at time t

$C_{tot,t}$ - Total sales of the population at time t

p - The proportion of sales of the establishments in this strata relative to that of the population at time t-2

$$\emptyset \sum_{i}^{2} p = 1$$

N - Total number of new establishments at t

-- Sampling frame: "The central register of establishments and enterprises" at the Central Bureau of Statistics of Norway which comprised of all the units obliged to pay value added tax except within forestry, farming and fishing.

-- Saple size: 3000 establishments.

-- Rotation: Between Feb and March each year, the elements which are elder than 6 years in the sample will be replaced by new elements of the same category. The scale of relacement is about 20-25% of the total sample.

Data collection procedures

Registration form by mail.

2.2 The annual wholesale and retail trade statistics

The annual wholesale and retail trade statistics is used to estimate the consumption of the majority of commodity groups in the final accounts, it also serves as the basis in estimating the monthly retail index.

This annual sales statistics are prepared on the registered sales in "The Central Register of Establishments and Enterprises".

The Central Register of Establishments and Enterprises

* purpose

The primary purpose of the central register of establishments and enterprises is to serve as a common frame for the surveys that have been carrying out in the Central Bureau of Statistics.

* coverage

The register comprises all units obliged to pay value-added-tax(VAT), except within forestry, farming and fishing. It also includes units that employ wage-eaners in all kinds of activities except domestic services. In total, the register consists of about 240000 active establishments, and 200000 enterprises.

* maintainance

The register has been continuously maintained by updating informations for the on-goning establishmentsts, adding in units that newly started business and subtracting exited units.

See Nygård, Tor & Thomsen,Ib (1989).

2.3 Other sources

The margarine sales figures collected from the Norwegian Dairies Sales Association is the source for estimating Margarine consumption.

The resource accounts is the source for calculating consumption of

electricity, fuel & oil, fire wood, coal & coke.

The consumptions for repairs of footwear, repairs of furniture and furnishings are based on the production index.

The consumptions for commodity group Cigars, Cigarettes, Smoking tobacco, other tobacco goods, Television and radio are based on information from the Directorate of Excise Taxes.

Purchase of cars is estimated according to the figure from Directorate of Road.

Employment data is the source for estimating consumptions for the majority of service groups such as: Cleaning, dyeing, laundering, insurance of furniture and household property, domestic services, theatre attendance and other entertainment, servicec of photographers, hairdressing and beauty care, life insurance, services of buiness, professional and labour associations, services of religious and cultural organizations.

Accounting data is also used in calculating some of the service groups like: moving expenses and freight, postage and telephone and telegram, television and radio licences and lotteries

3. Importance definitions

Private final consumption expenditure: in a period comprises the value of goods and services used by resident households or by consumer organizations, i.e. private associations and institutions of a non-profit character. Durables and semi-durables such as cars, funiture and chothing, are treated as having been consumed at the time of purchase. However, purchases of new dwellings are treated as gross investments, and an imputed rental value is included as a private final consumption expenditure (1972 - 1983).

APPENDIX 3

Table A3.1
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3]

Clothing and footwear

Code	Names	RATIO[1]	Regression $X_{fbu}=a+bAdjX_{na}$[4]				Regression Ratio=a1+b1AdjYear[5]			
			a	b	R^2 [6]	p [2]	a1	b1	R^2	p
21	Clothing	0.8656 (0.013)	7835 (262)	0.67 (0.09)	0.83	0.0001	0.86 (0.011)	-.007 (0.003)	0.30	0.0298
211	Shirts and nightwear	0.83 (0.03)	448 (18)	0.55 (0.10)	0.71	0.0002	0.82 (0.03)	-.016 (0.008)	0.20	0.0682
212	Coats,dresses,suits, jackets,underwear	0.85 (0.01)	6156 (212)	0.70 (0.09)	0.84	0.0001	0.85 (0.012)	-.004 (0.003)	0.09	0.1679
215	Stockings and socks	1.04 (0.03)	418 (11)	0.73 (0.10)	0.82	0.0001	1.02 (0.02)	-.015 (0.006)	0.30	0.0306
218	Fur & leather products	1.08 (0.04)	688 (30)	0.54 (0.126)	0.59	0.0013	1.04 (0.023)	-.036 (0.006)	0.74	0.0001
219	Hats,caps and gloves	0.46 (0.02)	114 (6)	0.31 (0.09)	0.46	0.0064	0.46 (0.023)	-.002 (0.006)	-0.08	0.7682
22	Fabrics and yarn	0.898 (0.025)	806 (26)	0.69 (0.098)	0.80	0.0001	0.88 (0.02)	-.015 (0.005)	0.39	0.0138
221	Fabrics	0.61 (0.07)	201 (12)	0.12 (0.09)	0.08	0.1869	0.55 (0.04)	-.059 (0.01)	0.72	0.0002
222	Yarn & sewing thread	1.13 (0.05)	315 (15)	1.48 (0.20)	0.82	0.0001	1.16 (0.04)	.031 (0.009)	0.45	0.0069
223	Other textile fabrics	1.11 (0.04)	289 (11)	0.92 (0.20)	0.44	0.0001	1.12 (0.04)	.010 (0.010)	0.002	0.3183

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis: b=0
3 standard errors in parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.1 (Continue)
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3]

Clothing and footwear

Code	Names	RATIO[1]	Regression $X_{fbu}=a+bAdjX_{na}$[4]				Regression Ratio=a1+b1AdjYear[5]			
			a	b	R^2 [6]	p [2]	a1	b1	R^2	p
23	Footwear and repairs to footwear	0.9633 (0.023)	1947 (88)	0.60 (0.13)	0.64	0.0006	0.95 (0.02)	-.010 (0.006)	0.14	0.1157
231	Leather footwear	1.08 (0.03)	1721 (82)	0.70 (0.14)	0.66	0.0004	1.07 (0.02)	-.011 (0.006)	0.15	0.1058
232	Rubber footwear	0.60 (0.05)	109 (7)	0.08 (0.11)	-0.03	0.4469	0.57 (0.03)	-.035 (0.009)	0.57	0.0018
233	Other footwear	0.50 (0.05)	76 (6)	0.03 (0.12)	-0.08	0.7821	0.48 (0.05)	-.016 (0.012)	0.07	0.2008
234	Repair of footwear	0.75 (0.06)	55 (6)	0.63 (0.54)	0.03	0.2711	0.79 (0.05)	-.034 (0.012)	0.39	0.0128

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis: b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.2
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Furniture, furnishings & household equipment

Code	Names	RATIO[1]	Regression $X_{fbu}=a+bAdjX_{na}$[4)]				Regression Ratio=a1+b1AdjYear[5)]			
			a	b	R^2 [6)]	p[2)]	a1	b1	R^2	p
41	Furniture, carpets	0.79 (0.02)	3188 (138)	0.56 (0.10)	0.73	0.0001	0.79 (0.014)	-.008 (0.004)	0.26	0.0450
411	Furniture	0.83 (0.07)	2461 (122)	0.61 (0.11)	0.70	0.002	0.82 (0.02)	-.008 (0.005)	0.09	0.1736
412	Carpets, mats, and rugs	0.64 (0.04)	289 (6.6)	0.15 (0.04)	0.49	0.0045	0.6 (0.02)	-.037 (0.004)	0.86	0.0001
413	Lamps, bracket lamps	0.75 (0.04)	442 (33)	0.60 (0.17)	0.49	0.0044	0.76 (0.04)	.010 (0.01)	-0.009	0.3658
42	Household textiles & other furnishings	0.83 (0.04)	1592 (63)	0.49 (0.10)	0.68	0.0003	0.81 (0.031)	-.022 (0.008)	0.35	0.0203
421	Household textiles & other furnishings	0.81 (0.05)	1117 (40)	0.36 (0.08)	0.64	0.0007	0.77 (0.03)	-.036 (0.009)	0.57	0.0018
422	Decorative articles	0.92 (0.04)	480 (27)	0.99 (0.2)	0.65	0.0005	0.94 (0.036)	.022 (0.009)	0.27	0.0388
43	Cooking appliances, refrigerators & electric appliances	1.11 (0.03)	1473 (56)	1.10 (0.16)	0.79	0.0001	1.11 (0.034)	.006 (0.009)	-0.05	0.5026
431	Cooking appliances	1.22 (0.06)	284 (15)	1.07 (0.22)	0.64	0.0006	1.22 (0.07)	-.004 (0.02)	-0.09	0.8233
432	Vacuum cleaners	1.38 (0.05)	126 (5.3)	0.91 (0.18)	0.66	0.0004	1.37 (0.05)	-.016 (0.01)	0.04	0.2393
433	Washing machines	1.01 (0.05)	290 (16)	0.89 (0.2)	0.59	0.0013	1.00 (0.05)	-.001 (0.01)	-0.09	0.9487

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis: b=0
3 standard errors in parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.2 (Continued)
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Furniture, furnishings and household equipment

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bAdjX_{na}$[4)]				Regression Ratio=a1+b1AdjYear[5)]			
			a	b	R^2 [6)]	p[2)]	a1	b1	R^2	p
434	Refrigerator	0.85 (0.03)	309 (12)	0.53 (0.12)	0.62	0.0008	0.84 (0.03)	-.010 (0.009)	0.02	0.2796
435	Sewing and knitting machines	1.56 (0.14)	91 (6)	0.22 (0.5)	-0.07	0.6876	1.50 (0.13)	-.061 (0.03)	0.16	0.0991
436	Electric heatings and other electric appliance	1.35 (0.13)	403 (44)	1.78 (0.6)	0.42	0.0095	1.44 (0.09)	.087 (0.02)	0.50	0.0043
44	Kitchen utensils, glassware,tableware	0.81 (0.03)	1387 (79)	0.87 (0.14)	0.76	0.0001	0.82 (0.013)	.015 (0.008)	0.16	0.0953
441	Porcelain, China, pottery and glassware	0.74 (0.04)	306 (19)	0.62 (0.13)	0.65	0.0005	0.74 (0.04)	-.005 (0.01)	-0.07	0.6453
442	Cutlery	0.80 (0.19)	186 (39)	2.03 (0.9)	0.24	0.0527	0.86 (0.19)	.058 (0.05)	0.03	0.2647
443	Other kitchen utensils	0.37 (0.02)	210 (11)	0.26 (0.05)	0.65	0.0005	0.37 (0.02)	-.006 (0.004)	0.10	0.1524
444	Electric bulbs etc.	0.74 (0.04)	172 (9.9)	0.60 (0.12)	0.65	0.0005	0.74 (0.04)	-.002 (0.01)	-0.09	0.8581
445	Other household equipment	2.20 (0.15)	563 (41)	2.51 (0.44	0.72	0.0001	2.26 (0.15)	.059 (0.04)	0.11	0.1483
45	Other household goods and services	1.24 (0.03)	2023 (108)	0.92 (0.18)	0.67	0.0004	1.23 (0.025)	-.008 (0.007)	0.05	0.2250
451	Washing power and other cleaning material	0.97 (0.04)	629 (18)	0.56 (0.07)	0.84	0.0001	0.93 (0.02)	-.036 (0.005)	0.82	0.0001

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis: b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.3
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Medical care and health services

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bAdjX_{na}$[4)]				Regression Ratio=a1+b1AdjYear[5)]			
			a	b	R^2 [6)]	p[2)]	a1	b1	R^2	p
453	Other household goods	2.25 (0.04)	766 (33)	2.0 (0.25)	0.84	0.0001	2.25 (0.04)	.0002 (0.01)	-0.09	0.9873
454	Laundering, cleaning and dyeing	0.21 (0.02)	75 (5)	0.13 (0.04)	0.52	0.0031	0.20 (0.02)	-.009 (0.004)	0.24	0.0508
455	Repair of furniture and household goods	0.81 (0.06)	149 (11)	0.24 (0.2)	0.06	0.2079	0.78 (0.05)	-.031 (0.01)	0.25	0.0485
456	Insurance of household property	3.44 (0.57)	392 (95)	1.11 (2.2)	-0.07	0.625	3.85 (0.38)	.414 (0.1)	0.58	0.0014
46	Domestic services	0.55 (0.04)	809 (59)	0.69 (0.12)	0.71	0.0002	0.56 (0.04)	.015 (0.01)	0.09	0.1693
51	Medical care and health expenses	0.41 (0.01)	2367 (97)	0.36 (0.05)	0.83	0.0001	0.40 (0.01)	-.000 (0.003)	-0.09	0.9095
511	Medicines and medical goods	0.60 (0.02)	562 (22)	0.51 (0.06)	0.85	0.0001	0.60 (0.02)	-.009 (0.005)	0.21	0.0643
512	Spectacles and orthopedic equipments	1.38 (0.12)	323 (24)	0.75 (0.27)	0.36	0.0173	1.35 (0.13)	-.026 (0.03)	-0.03	0.4483
513	Dental services	1.34 (0.05)	1130 (56)	1.34 (0.24)	0.72	0.0001	1.35 (0.05)	.017 (0.01)	0.04	0.2466
514	Physicians services	0.12 (0.01)	249 (27)	0.14 (0.03)	0.62	0.0008	0.12 (0.013)	.003 (0.003)	0.01	0.3125
516	Physiotherapists' services	0.36 (0.03)	138 (14)	0.46 (0.09)	0.67	0.0004	0.38 (0.03)	.019 (0.007)	0.30	0.0298

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.4
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts [3]

Transport and communication

Code	Names	RATIO[1]	Regression $X_{fbu}=a+bAdjX_{na}$[4]				Regression Ratio=a1+b1AdjYear[5]			
			a	b	R^2 [6]	p	a1	b1	R^2	p [2]
61	Personal transport equipment	0.94 (0.04)	7046 (361)	0.86 (0.09)	0.89	0.0001	0.93 (0.037)	-.010 (0.01)	0.02	0.3003
611	Motor cars etc.	0.92 (0.04)	6700 (351)	0.85 (0.09)	0.88	0.0001	0.91 (0.04)	-.011 (0.01)	0.02	0.2808
612	Motor cycles and bicycles	1.27 (0.06)	332 (18)	1.22 (0.14)	0.87	0.0001	1.28 (0.06)	.012 (0.02)	-0.04	0.4667
62	Operation of personal transport equipment	1.53 (0.04)	10951 (481)	1.23 (0.15)	0.84	0.0001	1.51 (0.038)	-.021 (0.01)	0.23	0.0577
621	Petrol and oils	1.19 (0.02)	5573 (270)	1.13 (0.13)	0.85	0.0001	1.19 (0.024)	.003 (0.006)	-0.065	0.6155
622	Spareparts, tyres, tubes	1.19 (0.08)	1550 (84)	0.70 (0.11)	0.75	0.0001	1.13 (0.06)	-.051 (0.02)	0.47	0.006
623	Insurance of personal transport equipment	1.25 (0.10)	1241 (78)	0.56 (0.2)	0.35	0.0189	1.20 (0.09)	-.048 (0.02)	0.21	0.067
624	Workshop repairs	8.46 (0.77)	1804 (144)	7.39 (1.54)	0.65	0.0005	8.55 (0.82)	.087 (0.21)	-0.07	0.6887
63	Public transport service	0.80 (0.02)	3069 (119)	0.64 (0.08)	0.84	0.0001	0.78 (0.02)	-.012 (0.005)	0.26	0.0449
631	Railway transport	0.71 (0.03)	439 (22)	0.52 (0.1)	0.65	0.0005	0.71 (0.03)	-.002 (0.008)	-0.09	0.9300
632	Tramway and subway transport	0.72 (0.09)	119 (7.3)	0.02 (0.09)	-0.09	0.8352	0.64 (0.04)	-.075 (0.01)	0.83	0.0001

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.4(continued)
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Transport and communication

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bAdjX_{na}$[4)]				Regression Ratio=a1+b1AdjYear[5)]			
			a	b	R^2 [6)]	p	a1	b1	R^2	p [2)]
633	Transport by boat and ferry	0.825 (0.05)	416 (27)	0.66 (0.13)	0.68	0.0003	0.82 (0.05)	-.008 (0.01)	-0.06	0.5748
634	Air transport	0.55 (0.06)	445 (35)	0.57 (0.09)	0.76	0.0001	0.55 (0.06)	.001 (0.02)	-0.09	0.9333
635	Bus transport	0.97 (0.03)	959 (46)	0.96 (0.14)	0.80	0.0001	0.97 (0.03)	.005 (0.008)	-0.06	0.5607
636	Transport by taxi	0.64 (0.04)	328 (18)	0.5 (0.09)	0.72	0.0001	0.62 (0.04)	-.02 (0.01)	0.22	0.0609
637	Moving expenses and freights	0.19 (0.03)	41 (3.6)	-0.04 (0.03)	0.03	0.2679	0.17 (0.02)	-.022 (0.004)	0.68	0.0003
64	Postal, telephone and telgraph services	1.01 (0.02)	1960 (96)	0.98 (0.08)	0.92	0.0001	1.01 (0.016)	.003 (0.004)	-0.03	0.4383
641	Postage	0.62 (0.04)	125 (5.4)	0.41 (0.04)	0.90	0.0001	0.59 (0.03)	-.027 (0.007)	0.50	0.0043
642	Telepone and telegraph	1.06 (0.02)	1843 (91))	1.05 (0.09)	0.92	0.0001	1.07 (0.02)	.007 (0.005)	0.08	0.1794
71	Equipment and accessories & repairs	1.03 (0.03)	6276 (232)	0.68 (0.10)	0.79	0.0001	1.01 (0.028)	-.015 (0.007)	0.22	0.0593
710	Television sets	1.10 (0.06)	930 (59)	0.67 (0.4)	0.14	0.1162	1.14 (0.05)	.041 (0.01)	0.45	0.0069
711	Radio receivers, record players etc.	0.82 (0.06)	656 (32)	0.28 (0.07)	0.53	0.0029	0.79 (0.05)	-.035 (0.01)	0.38	0.0151

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.5
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3]

Recreation, education and cultural services

Code	Names	RATIO[1]	Regression $X_{fbu}=a+bAdjX_{na}$[4]				Regression Ratio=a1+b1AdjYear[5]			
			a	b	R^2 [6]	p[2]	a1	b1	R^2	p
712	Musical instruments	1.20 (0.17)	266 (32)	0.006 (0.32)	-0.09	0.9866	1.14 (0.17)	-.057 (0.04)	0.05	0.2247
714	Boat, boat engines and weapons	1.44 (0.17)	1265 (120)	0.81 (0.3)	0.34	0.0222	1.38 (0.17)	-.062 (0.04)	0.07	0.1884
715	Sports equipment	0.70 (0.05)	586 (33)	0.26 (0.1)	0.34	0.0210	0.67 (0.04)	-.030 (0.01)	0.39	0.0139
713	Photographic equipment film, records, toys	1.13 (0.04)	1373 (58)	1.01 (0.12)	0.85	0.0001	1.13 (0.04)	.006 (0.01)	-0.05	0.5437
718	Flower and decorative shrubs	0.71 (0.02)	800 (39)	0.49 (0.08)	0.77	0.0001	0.69 (0.01)	-.014 (0.004)	0.54	0.0027
719	Repairs and supplies for recreation activities	5.47 (0.49)	428 (38)	8.58 (1.6)	0.71	0.0002	5.69 (0.46)	.222 (0.12)	0.17	0.0898
72	Public entertainment and other services	1.38 (0.03)	3121 (152)	1.06 (0.15)	0.79	0.0001	1.37 (0.03)	-.011 (0.008)	0.08	0.1829
721	Cinemas	0.76 (0.01)	164 (7.4)	0.66 (0.11)	0.73	0.0001	0.76 (0.01)	.006 (0.003)	0.16	0.0965
722	Theatres	1.21 (0.08)	44 (3.7)	1.36 (0.2)	0.78	0.0001	1.25 (0.07)	.041 (0.02)	0.23	0.0568
723	Other entertainment	1.26 (0.07)	558 (28)	1.23 (0.15)	0.86	0.0001	1.30 (0.06)	.036 (0.02)	0.26	0.0417
724	Television and ratio licences	1.39 (0.05)	771 (30)	1.19 (0.13)	0.87	0.0001	1.37 (0.04)	-.018 (0.01)	0.11	0.1387

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.5(continue)
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3)]

Recreation,education and cultural services
Other goods and services

Code	Names	RATIO[1)]	Regression $X_{fbu}=a+bAdjX_{na}$[4)]				Regression Ratio=a1+b1AdjYear[5)]			
			a	b	R^2 [6)]	p	a1	b1	R^2	p
725	Lotteries etc	1.26 (0.04)	1079 (58)	0.99 (0.14)	0.81	0.0001	1.24 (0.03)	-.020 (0.009)	0.26	0.0428
726	Photographing etc.	3.48 (0.16)	618 (34)	3.45 (0.5)	0.80	0.0001	3.57 (0.15)	.084 (0.04)	0.25	0.0479
73	Books, newapapers and magazines etc.	0.86 (0.02)	2434 (102)	0.72 (0.09)	0.85	0.0001	0.86 (0.016)	-.004 (0.004)	0.01	0.03235
731	Books	0.70 (0.02)	837 (33)	0.57 (0.06)	0.87	0.0001	0.70 (0.02)	-.005 (0.006)	-0.03	0.4500
732	Newspapers	1.04 (0.03)	976 (47)	1.07 (0.14)	0.82	0.0001	1.05 (0.02)	.014 (0.006)	0.28	0.0362
733	Magazine and periodics	0.92 (0.03)	628 (30)	0.59 (0.1)	0.75	0.0001	0.89 (0.02)	-.025 (0.004)	0.72	0.0002
74	Education	0.66 (0.08)	463 (59)	0.75 (0.29)	0.31	0.0276	0.69 (0.075)	.034 (0.019)	0.15	0.1063
81	Personal care and effects	0.88 (0.01)	2106 (86)	0.75 (0.08)	0.88	0.0001	0.87 (0.01)	-.007 (0.003)	0.23	0.0536
811	Hairdressing and beauty treatment	0.87 (0.02)	697 (33)	0.67 (0.06)	0.90	0.0001	0.85 (0.02)	-.016 (0.005)	0.47	0.0061
812	Cosmetic articles, toothpaste	0.88 (0.02)	698 (26)	0.93 (0.1)	0.88	0.0001	0.89 (0.02)	.0006 (0.006)	-0.09	0.9183
813	Toilet soap and shaving soap	0.90 (0.02)	119 (4.7)	0.77 (0.12)	0.77	0.0001	0.90 (0.02)	-.0007 (0.005)	-0.09	0.9003

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

Table A3.6
Comparison of Norwegian consumption statistics from household expenditure surveys and national accounts[3]

Other goods and services

Code	Names	RATIO[1]	Regression $X_{fbu}=a+bAdjX_{na}$[4]				Regression Ratio=a1+b1AdjYear[5]			
			a	b	R^2 [6]	p	a1	b1	R^2	p[2]
814	Other toilet articles	0.88 (0.01)	592 (28)	0.69 (0.1)	0.77	0.0001	0.88 (0.01)	-.005 (0.004)	0.04	0.2418
82	Other goods	0.69 (0.02)	1486 (59)	0.43 (0.08)	0.72	0.0002	0.68 (0.02)	-.013 (0.004)	0.41	0.0106
821	Travel goods	0.57 (0.02)	268 (12)	0.41 (0.08)	0.69	0.0003	0.57 (0.02)	-.005 (0.006)	-0.02	0.4062
822	Watches	0.94 (0.05)	265 (21)	0.23 (0.2)	-0.01	0.3665	0.92 (0.05)	-.025 (0.01)	0.17	0.0915
823	Jewellery	0.75 (0.03)	394 (23)	0.59 (0.12)	0.65	0.0005	0.75 (0.04)	-.001 (0.01)	-0.09	0.8940
824	Stationery and other goods	0.62 (0.03)	548 (31)	0.43 (0.09)	0.65	0.0006	0.61 (0.03)	-.012 (0.007)	0.15	0.1089
83	Services of hotel, boarding & restaurants	0.81 (0.02)	4510 (262)	0.79 (0.10)	0.83	0.0001	0.82 (0.02)	.012 (0.005)	0.30	0.0304
831	Restaurants, cafes	0.62 (0.02)	2730 (154)	0.58 (0.08)	0.82	0.0001	0.62 (0.02)	.002 (0.005)	-0.07	0.6374
833	Hotel, boarding houses	0.42 (0.04)	417 (42)	0.22 (0.08)	0.37	0.0161	0.40 (0.04)	-.012 (0.01)	0.02	0.3002
84	Life insurance services	0.18 (0.04)	101 (21)	0.13 (0.08)	0.15	0.1082	0.17 (0.05)	-.009 (0.012)	-0.04	0.4833
85	Other services	0.09 (0.01)	278 (49)	0.03 (0.04)	-0.03	0.4273	0.09 (0.015)	-.003 (0.004)	-0.05	0.5279

1 Ratio = X_{fbu}/X_{na}
2 the significant probability level of the hypothesis b=0
3 standard errors in the parenthesis
4 $AdjX_{na} = X_{na} - X_{na}(1980)$
5 AdjYear = Year - 1980
6 R square of the model adjusted to the degree of freedom

APPENDIX 4

DATA SOURCES OF THIS THESIS

1) Sources for household expenditure survey statistics

CBS, 1975:
Survey of Consumer Expenditure 1973, Norwegian Official Statistics A705, The Central Bureau of Statistics of Norway, Oslo.

Grete Dahl, 1976:
Resultater fra forbruksundersøkelsen 1974, Arbeidesnotater, the Central Bureau of Statistics of Norway.

Helge Herigstad, 1977:
Forbruksundersøkinga 1975, Arbeidsnotater, the Central Bureau of Statistics of Norway.

Grete Dahl, 1978:
Resultater fra Forbruksundersøkelsen 1976, Arbeidsnotater, the Central Bureau of Statistics of Norway.

Helge herigstad, 1979:
Forbruksundersøkinga 1977, Interne Notater, the Central Bureau of Statistics of Norway.

Grete Dahl, 1980:
Forbruksundersøkelsen 1978, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm & Odd Skarstad, 1981:
Forbruksundersøkelsen 1979, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm & Grete Dahl, 1982:
Forbruksundersøkelsen 1980, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm & Odd Skarstad, 1982:
Forbruksundersøkelsen 1981, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm & Odd Skarstad, 1983:
Forbruksundersøkelsen 1982, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm, 1984:
Forbruksundersøkelsen 1983, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm, 1986:
Forbruksundersøkelsen 1984, Interne Notater, the Central Bureau of Statistics of Norway.

Anne Lodberg-Holm, 1986:
Forbruksundersøkelsen 1985, Interne Notater, the Central Bureau of Statistics of Norway.

2) Sources for national accounts statistics

1973 -1975 consumption figures are taken from:
National Accounts 1972-1983, Norwegian official statistics B485, Central Bureau of Statistics, Oslo-Kongsvinger 1984, Table 6, P40-46.

1976 -1985 consumption figures are taken from:
National Accounts 1976-1986, Norwegian official statistics B715, Central Bureau of Statistics, Oslo-Kongsvinger 1987, Table 8, P42-p49.

3) Source for the product characteristic test in chapter 5

The variables 'The percentage of households having this expenditure in the accounting period' and 'average annual consumption per household $X_{fbu}(1980)$' are taken from:

Survey of consumer expenditure (1983-1985) , Norwegian Official Statistics B674, CBS, Oslo-Kongsvinger 1987, Table 3, p33-p53

APPENDIX 5

TESTING PRODUCT CHARACTERISTICS WITH SUBJECTIVE VALUES

Table A5.1 value assignments for product property and methods

V1 - Purchasing size (small) 1 2 3 4 5 6 7 (large)
V2 - Purchasing frequency (seldom) 1 2 3 4 5 (every day)
V3 - Consumption pattern (personal) 1 2 3 4 5 (group)
V4 - Status product (negative) 1 2 3 4 5 (status)
V5 - Social opinion (negative) 1 2 3 4 5 (positive)
V6 - National accounts method (intermediate method) 1, (indirect method) 2, (services) 3
V7 - Survey method (two-week's consumption)0, (last 12 months' consumption)1

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
00	Bread and cereals	0.80							
001	Flour and grits	1.15	1	4	4	3	3	1	0
002	Biscuits, crispbread	0.62	1	5	4	3	3	1	0
003[1]	Bread and cakes	0.78	1	5	4	3	3	1	0
005	Macaroni, cornflakes	0.68	1	5	4	3	3	1	0
01	Meat, meat products and pork	0.77	.	.	.	.	.		
011[2]	Fresh, salted and dried Meat and meat products	0.78	2	5	4	3	3	1	0
013	Canned meat	0.58	2	5	4	3	3	1	0
02	Fish and fish products	0.83	.	.	.	.	.		
021	Fresh fish	0.53	2	3	4	3	3	1	0
022	Frozen fish	1.75	2	4	4	3	3	1	0
023	Salted, dried & smoked	1.56	2	3	4	3	3	1	0
024	Canned dinner food	0.79	2	3	4	3	3	1	0
025	Other canned fish	0.90	2	3	4	3	3	1	0
026	Other fish products	0.73	2	3	4	3	3	1	0
03	Milk, cheese and eggs	0.89	.	.	.	.	.		
031[3]	Milk	0.88	1	5	4	3	3	1	0
034	Cheese	0.82	1	4	4	3	3	1	0
035	Eggs	1.05	1	4	4	3	3	1	0
04	Edible fats and oils	1.02	.	.	.	.	.		
041	Butter	0.72	1	4	4	3	3	1	0

[1] sum (003,004)
[2] sum (011,012,014,015)
[3] sum (031,032)

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
042	Margarine, edible oil	1.23	1	4	4	3	3	2	0
05	Vegetables and fruits	0.76	.	.	.	.	.		
051[1]	Fresh vegetables	1.03	1	5	4	3	4	1	0
053	Apples, Pears, Plums	0.59	1	5	2	3	3	1	0
054	Citrus fruits, bananas, grapes, etc	0.84	1	3	2	3	3	1	0
055	Dried fruits and nuts	1.13	1	4	2	3	3	1	0
056	Fresh berries	0.48	1	2	2	3	3	1	0
057[2]	Preserved fruits and vegetables,jams & juice	0.74	1	3	2	3	3	1	0
06	Potatoes and potato products	1.79	.	.	.	.	.	.	.
061	Potatoes	1.38	1	4	4	3	3	2	0
062	Potato products	4.77	1	4	4	3	3	1	0
07	Sugar	0.89	1	3	4	3	3	1	0
08	Coffee,tea, cocoa	0.80	.	.	.	.	.	.	.
081	Coffee	0.77	1	3	4	3	3	1	0
082	Tea	1.43	1	3	4	3	3	1	0
083	Cocoa etc.	0.84	1	3	4	3	3	1	0
09	Other goods	0.60	.	.	.	.	.		
091	Chocolate, sugar confectionary etc.	0.41	1	3	4	3	3	1	0
092	Icecream	0.69	1	5	1	3	3	1	0
093	Other foods	0.88	1	4	3	3	3	1	0
11	Beverages	0.45	.	.	.	.	.		
111	Soft drinks, carbonated water etc.	0.57	1	5	1	3	3	2	0
112	Beer	0.44	2	4	1	4	1	2	0
113	Wine and spirits	0.41	2	3	2	4	1	1	0
12	Tobacco	0.54	.	.	.	.	.		
121	Cigars and cheroots	0.46	2	3	1	4	1	2	0
122	Cigaretter	0.38	1	4	1	4	1	2	0
123	Smoking tobacco	0.72	1	4	1	4	1	2	0
124	Other tobacco	0.73	1	4	1	4	1	2	0

[1] sum (051,052)
[2] sum (057,058)

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
21	Clothing	0.87	.	.	.	.	.		
211	Shirts and nightwear	0.83	2	3	1	3	3	1	0
212[1]	Coats,dresses,suits, jackets,underwear	0.85	5	2	1	3	3	1	1
215	Stockings and socks	1.04	1	3	1	3	3	1	0
218	Fur & leather products	1.08	6	1	1	5	3	1	1
219	Hats,caps and gloves	0.46	2	2	1	3	3	1	0
22	Fabrics and yarn	0.90	.	.	.	.	.		
221	Fabrics	0.61	3	2	2	3	3	1	0
222	Yarn & sewing thread	1.13	3	2	2	3	3	1	0
223	Other textile fabrics	1.11	3	2	2	3	3	1	0
23	Footwear and repairs to footwear	0.96	.	.	.	.	.		
231	Leather footwear	1.08	3	2	1	4	3	1	0
232	Rubber footwear	0.60	2	2	1	3	3	1	0
233	Other footwear	0.50	2	2	1	3	3	1	0
234	Repair of footwear	0.75	1	2	1	3	3	2	0
31	Gross rents	0.99	6	3	5	4	3	1	0
32	Power and fuel	0.67	.	.	.	.	.		
321	Electricity	0.64	3	3	5	3	3	2	0
322	Liquid fuels	0.74	2	3	5	3	3	2	0
323	Firewood and peat	0.95	2	3	5	3	3	2	0
324	Coal and coke	0.66	2	3	5	3	3	2	0
41	Furniture, carpets	0.79	.	.	.	.	.		
411	Furniture	0.83	6	1	5	3	3	1	1
412	Carpets, mats, and rugs	0.64	3	2	5	3	3	1	1
413	Lamps, bracket lamps	0.75	2	2	5	3	3	1	1
42	Household textiles & other furnishings	0.83	.	.	.	.	.		
421	Household textiles & other furnishings	0.81	3	2	5	3	3	1	0
422	Decorative articles	0.92	3	2	5	3	3	1	0

[1] sum (212,213,214,216,217)

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
43	Cooking appliances, refrigerators & electric appliances	1.11	.	.	.	.	.		
431	Cooking appliances	1.22	5	1	5	3	3	1	1
432	Vacuum cleaners	1.38	5	1	5	3	3	1	1
433	Washing machines	1.01	6	1	5	3	3	1	1
434	Refrigerator	0.85	6	1	5	3	3	1	1
435	Sewing and knitting machines	1.56	6	1	5	3	3	1	1
436	Electric heatings and other electric appliance	1.35	5	1	5	3	3	1	1
44	Kitchen utensils, glassware,tableware	0.81	.	.	.	.	.		
441	Porcelain, China, pottery and glassware	0.74	4	2	5	3	3	1	0
442	Cutlery	0.80	3	2	5	3	3	1	0
443	Other kitchen utensils	0.37	3	2	5	3	3	1	0
444	Electric bulbs etc.	0.74	2	3	5	3	3	1	0
445	Other household equipment	2.20	4	2	5	3	3	1	0
45	Other household goods and services	1.24	.	.	.	.	.		
451[1]	Washing powder and other cleaning material	0.97	2	3	5	3	3	1	0
453	Other household goods	2.25	2	3	5	3	3	1	0
454	Laundering, cleaning and dyeing	0.21	2	4	5	3	3	3	0
455	Repair of furniture and household goods	0.81	2	2	5	3	3	2	0
456	Insurance of household property	3.44	4	3	5	4	4	3	0

[1] sum (451,452)

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
46	Domestic services	0.55	.	.	.	.	.	3	0
51	Medical care and health expenses	0.41	.	.	.	.	.		
511	Medicines and medical goods	0.60	4	1	1	3	3	1	0
512	Spectacles and orthopedic equipments	1.38	5	1	1	3	3	1	0
513	Dental services	1.34	4	2	1	3	3	3	0
514	Physicians services	0.12	4	2	1	3	3	3	0
516	Physiotherapists' services	0.36	4	2	1	3	3	3	0
61	Personal transport equipment	0.94	.	.	.	.	.		
611	Motor cars etc.	0.92	7	1	3	4	3	2	1
612	Motor cycles and bicycles	1.27	7	1	3	4	3	2	1
62	Operation of personal transport equipment	1.53	.	.	.	.	.		
621	Petrol and oils	1.19	3	4	3	3	3	2	0
622	Spareparts, tyres, tubes	1.19	5	2	3	3	3	1	0
623	Insurance of personal transport equipment	1.25	5	3	3	4	4	3	0
624	Workshop repairs	8.46	4	2	3	3	3	3	0
63	Public transport service	0.80	.	.	.	.	.		
631	Railway transport	0.71	3	2	1	3	3	3	0
632	Tramway and subway transport	0.72	1	5	1	3	4	3	0
633	Transport by boat and ferry	0.83	2	4	1	3	3	3	0
634	Air transport	0.55	6	2	1	3	3	3	0
635	Bus transport	0.97	1	1	1	3	4	3	0
636	Transport by taxi	0.64	2	4	3	3	3	3	0
637	Moving expenses and freights	0.19	6	2	3	3	3	3	0

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
64	Postal, telephone and telgraph services	1.01	.	.	.	.	.		
641	Postage	0.62	1	3	3	3	3	3	0
642	Telepone and telegraph	1.06	2	4	3	3	3	3	0
71	Equipment and accessories & repairs	1.03	.	.	.	.	.		
710	Television sets	1.10	6	1	5	3	3	2	1
711	Radio receivers, record players etc.	0.82	5	1	5	3	3	2	1
712	Musical instruments	1.20	6	1	2	3	3	1	1
714	Boat, boat engines and weapons	1.44	7	1	5	3	3	1	1
715	Sports equipment	0.70	6	1	4	3	3	1	0
713[1]	Photographic equipment film, records, toys	1.13	6	1	3	3	3	1	0
718	Flower and decorative shrubs	0.71	3	4	5	3	3	1	0
719	Repairs and supplies for recreation activities	5.47	4	2	3	3	3	3	0
72	Public entertainment and other services	1.38	.	.	.	.	.		
721	Cinemas	0.76	2	2	1	3	3	3	0
722	Theatres	1.21	2	3	1	3	3	3	0
723	Other entertainment	1.26	2	3	1	3	3	3	0
724	Television and ratio licences	1.39	3	2	5	3	3	3	0
725	Lotteries etc	1.26	1	3	1	3	3	3	0
726	Photographing etc.	3.48	2	3	1	3	3	3	0

[1] sum (713,716,717)

Code	Name	X_{fbu}/X_{na}	V1	V2	V3	V4	V5	V6	V7
73	Books, newapapers and magazines etc.	0.86							
731	Books	0.70	3	3	1	3	3	1	0
732	Newspapers	1.04	1	5	5	3	3	1	0
733	Magazine and periodics	0.92	1	3	5	3	3	1	0
74	Education	0.66	4	2	1	3	4	3	0
81	Personal care and effects	0.88	.	.	.	.	.		
811	Hairdressing and beauty treatment	0.87	3	3	1	3	3	3	0
812	Cosmetic articles, toothpaste	0.88	3	3	1	3	3	1	0
813	Toilet soap and shaving soap	0.90	2	3	4	3	3	1	0
814	Other toilet articles	0.88	2	3	5	3	3	1	0
82	Other goods	0.69	.	.	.	.	.		
821	Travel goods	0.57	4	2	3	3	3	1	0
822	Watches	0.94	3	2	1	3	3	1	0
823	Jewellery	0.75	6	2	1	5	3	1	0
824	Stationery and other goods	0.62	2	2	1	3	3	1	0
83	Services of hotel, boarding & restaurants	0.81	.	.	.	.	.		
831	Restaurants, cafes	0.62	3	3	3	3	3	3	0
833	Hotel, boarding houses	0.42	4	2	3	3	3	3	0
84	Life insurance services	0.18	6	2	1	4	4	3	0
85	Other services	0.09	4	2	3	3	3	3	0

Five variables representing product characteristics are figured out as most important. They are:

V1 - purchasing size which refers the value of one time consumption
V2 - purchasing frequency
V3 - consumption pattern which means how the product is typically consumed (by a single person or the whole family)
V4 - the extent to be considered as status product
V5 - sensitivity to social opinion

In order to filter out the effect of extreme values, those commodity / service groups that have extremely small (<0.3) or large (>1.5) ratio are excluded from the main analysis, and will be studied separately.

Group	lower Ratio upper	number of groups
Group 1	0.3 <= Ratio <= 1.5	113
Group 2	1.5 < Ratio	10
Group 3	Ratio < 0.3	5

1. Analysis for Group 1

Analysis of Variance

Table 5.1 presents the results of analysis of variance for Group 1. the dependent variable is ratio (X_{fbu}/X_{na}). The model counts the effects of the five variables (V1, V2, V3, V4, V5) and the interacting effects of V1 vs. V3 and V4 vs. V5. As the the values of R^2 and F in the table show, the model is significant at the probability level of 0.007. When coming to the individual variable effect, purchasing size (V1) has most significant effect on the independent variable. Status (V4) and Social opinion (V5) have moderate effects with significant probability level of 0.0357 and 0.0209 respectively. None of the other variables has a significant effect on the ratio at the acceptable probability level.

Table A6.2 Analysis of variance for ratio (X_{fbu}/X_{na})

Model1a: Ratio=f(V1,V2,V3,V4,V5,V1*V3,V4*V5)

General linear models procedure
Dependent variable: RATIO

Source	DF	SS	MS	F-value	Prob.>F	R-Square
Model	35	3.83	0.11	1.97	0.007	0.472

Source	DF	TypeI-SS	F-value	Prob.>F
V1	6	1.9	5.64	0.0001
V2	4	0.3	1.4	0.2412
V3	4	0.04	0.22	0.9274
V4	3	0.5	3.0	0.0357
V5	2	0.45	4.07	0.0209
V1*V3	15	0.64	0.76	0.712
V4*V5	1	0.00	0.06	0.8045

Table A6.3 presents the results of analysis of variance for the the variable Rate which measures the deviation of the ratio from the ideal value 1.

Even though the significant level of the model stays at the same level as model 1a, the effects of the variables has shifted. Purchasing size (V1) has a weaker effects than in model 1a., while Social opinion (V5) becomes the most significant effect with a F-value of 10.25 and significant probability level of 0.0001. The interacting of V4 and V5 has a very moderate effects on the independent variable rate.

Table A6.3 Analysis of variance for ABS(ratio-1)

Model1b: Rate=f(V1,V2,V3,V4,V5,V1*V3,V4*V5)

General linear models procedure
Dependent variable: RATE

Source	DF	SS	MS	F-value	Prob.>F	R-Square
Model	35	1.29	0.04	1.99	0.0064	0.475

Source	DF	TypeI-SS	F-value	Prob.>F
V1	6	0.337	3.01	0.0107
V2	4	0.057	0.76	0.5529
V3	4	0.058	0.77	0.5463
V4	3	0.074	1.33	0.2719
V5	2	0.382	10.25	0.0001
V1*V3	15	0.042	2.25	0.1379
V4*V5	1	0.347	1.24	0.2607

Three conclusions can be drawn from the analysis of variance for group 1:

(1) Both Model-1a and Model-1b are significant at moderate level.
(2) The purchasing size has a significant impact on ratio. The direction of influence is shown by the resulted estimate for V1:

Table A6.4 Estimates for purchasing size in Model-1a
-- independent variable: Ratio

	V1						
Intercept[1)]	1	2[4)]	3[3)]	4[2)]	5	6[5)]	7
1.412	-0.337	-0.547	-0.545	-0.737	-0.248	-0.492	0.000

1) significant at the level of 0.0187
2) significant at the level of 0.0239
3) significant at the level of 0.0599
4) significant at the level of 0.0601
5) significant at the level of 0.0632

From table A6.4, we may find that those product groups with medium purchasing size tend to have the lowest ratio; While the product

groups with large purchasing size have the highest ratio. The product groups with small purchasing size lie in between.

Table A6.5 shows the estimates for the same variable in Model-1b. The results tells us that those product groups with medium purchasing size have the largest discrepancy; While extremely small or large purchasing size tend to have smaller discrepancy between the two sets of consumption statistics.

Table A6.5 Estimates for purchasing size in Model-1b
-- independent variable: Rate

	V1						
Intercept	1[2)]	2[3)]	3	4	5	6[1)]	7
0.3482	-0.395	-0.258	-0.143	-0.089	-0.158	-0.344	0.000

1) significant at the level of 0.0255
2) significant at the level of 0.0381
3) significant at the level of 0.1243

(3) Social opinion has significant effect on both ratio and rate. The product groups with negative social image tend to have lower ratio and higher rate. But none of the estimates are significant at the level of 0.15 as shown in table A6.6 and Table A6.7

Table A6.6 Estimates for Social opinion
-- independent variable: Ratio

	V5				
Intercept	1*	2*	3*	4*	5*
1.412	-0.446	0.000	0.128	0.000	0.000

* not significant at the level of 0.15

Table A6.7 Estimates for Social opinion
-- independent variable: Rate

Intercept	V5				
	1*	2*	3*	4*	5*
0.348	0.2023	0.000	-0.135	0.000	0.000

* not significant at the level of 0.15

2. Analysis for group 2 and group 3

We may see, from the table, that most of the product groups that contained in group 2 are group consumed products with ambiguious boundary of classification, such as, other household equipment, other household goods, photographing etc., ... There exists no clear sign on the possible one way influence of other variables.

Group 3 includes the product groups that have higher than average purchasing size, lower purchasing frequency. There is no clear evidence on the impact of consumption pattern (V3), status (V4) and Social opinion (V5).

Table A6.8 Facts for group 2 & 3

Name	Code	Ratio	V1	V2	V3	V4	V5
	GROUP 2						
Salted,Dried,smoked fish	023	1.56	2	3	4	3	3
Sewing & knitting machine	435	1.56	6	1	5	3	3
Frozen fish	022	1.75	2	4	4	3	3
Other household equipment	445	2.20	4	2	5	3	3
Other household goods	453	2.25	2	3	5	3	3
Insur. of househ. property	456	3.44	4	3	5	4	4
Photographing etc.	726	3.48	2	3	1	3	3
Potato products	062	4.77	1	4	4	3	3
Repairs & supplies for rec.	719	5.47	4	2	3	3	3
Workshop repairs	624	8.46	4	2	3	3	3
	GROUP 3						
Other services	851	0.090	4	2	3	3	3
Physicians Services	514	0.120	4	2	1	3	3
Life insurance	841	0.180	6	2	1	4	4
Moving expenses & freights	637	0.187	6	2	3	3	3
Laundering,cleaning &dyeing	454	0.210	2	4	5	3	3

3. Conclusion on the impact of product characteristics

In the preassumption that the values of the five variables (V1,V2,V3,V4,V5) assigned to the three digit groups (Table A6.1) are acceptable, following conclusions are drawn from this analysis:

(1) Purchasing size

Those commodity / service groups with extremely large or small purchasing size tend to have higher ratio and larger discrepancies between the survey and national accounts consumption data; These two sets of statistics are closer for product groups with medium purchasing size.

(2) Purchasing frequency

Purchasing frequency has significant effect on neither ratio nor rate;

(3) Consumption pattern (V3)

Consumption pattern has no effect on the variable ratio and rate. the joint effect of consumption pattern and purchasing size is significant at the level of 0.1379. The direction of influence is not clear.

(4) Status products (V4)

The variable V4 has stronger effect on ratio than rate. Product group scored higher has lower ratio. But none of the estimates are significant (see table A6.9).

Table 6.9 Estimates for Status in Model-1a
-- independent variable: Ratio

	V4				
Intercept	1	2*	3*	4*	5*
1.412	.	0.067	-0.097	-0.196	0.000

* not significant at the level of 0.15

(5) Social opinion (V5)

Social opinion has impact on both ratio and rate. product groups with negative social image tend to have lower ratio and larger discrepancy.