AN ABSTRACT OF THE THESIS OF

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Title AN EMPIRICAL ANALYSIS OF CONSUMER SPENDING IN THE

AREA OF NEWPORT AND TOLEDO, OREGON

Abstract approved Signature redacted for privacy.

(Major professor)

The objective of this thesis was to examine the relationship be-
tween consumption and income, the consumption function, for the
Newport-Toledo economy. Other variables, however, were also
used and their relation to consumption determined.

Many have contributed their hypotheses as to the existence of a
relation between consumption and income. Keynes, who was the first
to state explicitly that consumption is a particular function of income,
asserts the hypothesis that consumption depends primarily upon real
income. All other determining factors are given and held constant.
Duesenberry states that the savings rate depends not on the level of
income but on the relative position on the income scale, in his "rela-
tive income hypothesis." Friedman, on the other hand, says that
incomes tend to fluctuate from period to period while consumption
exhibits more stability. From this he argues that consumption must
depend more closely on the average income over a number of periods,

rather than the current income in any given period.

The empirical basis of this study was furnished by the Yaquina Bay Area located in Lincoln County, Oregon. The economy was segregated into 17 sectors and information was sought concerning the relation of the household sector to the other sectors. For this reason a separate consumption function was obtained for each sector and one for the total local consumption.

The results of this analysis fall into three main categories: the income-consumption relationship, the income-expenditure relation, and the relation between several independent variables and consumption.

The income-consumption method had two variables: current disposable income as the independent variable, and household consumption as the dependent variable.

The equation computed for the total local consumption was:

$$C_t = \$620.76 + .84593 \, Y_d - .0000202 \, Y_d^2$$

where C_t is the total local consumption per household and Y_d is the current disposable income of the household. The average level of income in this area was approximately $6,224.50. At this average income the marginal propensity to consume, MPC, was .5945, and the average propensity to consume, APC, was .779. Both the MPC and the APC decrease in value as the level of income is increased.

The estimated total income in this economy for the year 1964 is

$27,319,330.50 using the definitions employed in Method I.

The independent variable for the income-expenditure method is

current disposable income exclusive of any imputed rent value. The

dependent variable is current annual expenditures for 1964. This

method was derived primarily for an input-output matrix being con-

structed of the Newport-Toledo economy. The results by using this

method were quite similar to those of the first method. The average

amount spent per household in this area in 1964 was $5,652.39, thus

giving an estimated total income of $24,808,339.71 using actual ex-

penditures for 1964.

The third method, that using additional variables in the consump-

tion function, also used current household consumption as the depen-

dent variable. The independent variables were chosen, from a list

of four, for each sector individually. The four possible variables

were: the size of the household, the number of full-time wage

earners, the age of the household head, and current disposable in-

come. This method differs from method I only in those sectors which

had an independent variable different than just current disposable in-

come. Six such sectors were found to exhibit a significantly different

relation. The equation derived for the total local consumption was:

$$C_t = \$656.70 + .695 \, X_7 - .0000134 \, X_7^2 + 36.95 \, X_1^2$$

where X_7 is current disposable income, X_1 is the size of the house-

hold, and C_t is the total local consumption per household.

AN EMPIRICAL ANALYSIS OF CONSUMER SPENDING
IN THE AREA OF NEWPORT AND TOLEDO, OREGON

by

KENNETH CHARLES GIBBS

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I. INTRODUCTION

Statement of the Problem

A study is currently under way which represents a cooperative effort among the Departments of Agricultural Economics, Fisheries and Wildlife, and Civil Engineering at Oregon State University to develop a method by which the economic consequences of a relevant range of water pollution control alternatives may be specified. The task of the economist, which is of major interest in this thesis, is the determination of the direct and indirect effects upon community incomes that result from each of the water quality control alternatives being examined. An interindustry model should realistically portray the levels of income generated within the area corresponding to each of the assumed alternatives of water pollution control. Such an input-output model consists of two elements: (1) the endogenous, or induced, factors expressing the effects of changes in the level of production in one sector upon the others in the economy; and (2) the exogenous factors or autonomous demands, the level of which is not determined as part of the system. Investment, consumption, government purchases, and exports are sometimes considered the components of autonomous demand (3, p. 14-16).

Chenery and Clark (3, p. 16), when referring to the Leontief "open" model,[1] state that the total autonomous demand has approximately the same meaning as the gross national product.

The model being constructed, however, is considered "closed" with respect to consumption, i. e. , consumption is an endogenous variable. The relationship between consumption and income plays a leading role in the determination of income and employment within the model. This relationship is known as the consumption function.

In this thesis a close look is taken at the simple, but vital, relationship: the consumption function. The thesis deals with the theory of consumer behavior as well as the determination of such a function empirically. If it were possible to establish the existence of a stable relationship between consumption, income and other important variables, it would be an invaluable tool for economic policy and forecasting within this regional economy.

Objective

The objective of this study is to determine the relationship

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[1]Wassily W. Leontief was the first to use input-output analysis as an empirical technique. A model is referred to as "open" when consumption, investment, government purchases, and exports are determined outside of the system. To "close" the model, these activities would have to be included among the endogenous sectors.

between consumption and income^2 for the Newport-Toledo economy. The economy of this area was segregated into seventeen sectors. Appendix Table I lists these sectors.

A sample of inhabitants was chosen and personally interviewed to determine their income and the corresponding amount of consumption in each of the sectors for the year of 1964. The amount consumed within the Newport-Toledo area was separated from that consumed outside of this area in order to supply data for the input-output matrix being constructed.

It had to be decided if consumption was a function of current income, permanent income, etc., before much thought could be given to the construction of a questionnaire or drawing of a sample. The following chapter is devoted to the theory of consumer behavior, at which time the writer states which hypothesis of the consumption function was adopted for use in this study.

Chapters III, IV, and V are devoted to the empirical investigation. Chapter III explains the area of study, the sampling scheme,

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^{2}This relationship is called a consumption function. Given a level of income the amount consumed can be determined from this simple relationship. It is generally agreed that consumption is a function of income - however, income certainly does not alone determine consumption. In Chapter V some of these variables usually held constant will be included in the consumption function and the relationship determined. There has been much controversy and many hypotheses as to which income determines consumption, i. e., permanent income, disposable income, relative income, etc. A few of the most widely discussed hypotheses will be reviewed in Chapter II of this thesis.

the drawing of the sample, and the sample size used. Chapter IV, shows the results of this study, as well as the construction of the various consumption functions. Chapter V presents the results when several independent variables were used and the relationship to consumption derived. Chapter VI presents the summary and conclusions.

II. A THEORETICAL FRAMEWORK

Robert Gordon, in his <u>Business</u> <u>Fluctuations</u> (14) distinguishes

among two basic kinds of consumption-income relationships: the

theoretical, and the empirical. This chapter will treat mainly the

theoretical consumption function, but in the final section the statisti-

cal function appropriate for this study will be selected.

The Theoretical Consumption Function

The theoretical consumption function exhibits the relationship

between alternative levels of income and the resulting amounts of

consumption while all other factors are assumed unchanged, i. e.,

population, price level, etc. This type of a function cannot be ob-

served directly, much as a demand curve cannot be. In a given

period there will exist a certain amount of income, and associated

with that will be an amount of consumption, but nothing can be said

about what consumption would have been, with a higher or lower level

of income.

Many conditions determine the nature of the relationship between

consumption and income. It is important to distinguish between the

long-run and the short-run consumption function. In Gordon's words:

> The distinction between short and long-run is con-
> cerned especially with the related facts that it takes
> time for people to adjust their spending habits to a
> change in income and that a standard of living once

achieved is not readily given up (14, p. 92).

Evidence suggests, Gordon asserts, that, as a long-run tendency, the percentage of the national income saved has remained fairly constant, and over long periods, standards of living rise more or less in proportion to national income. This long-run relationship is quite likely to be a poor indicator of how consumption reacts to a change in income in the short-run. The way a consumer responds to a gradual rise in income over a long period of time is different from how it would respond to rapid changes in income over relatively short time periods.

What are some factors that influence the amount of consumption in the long-run?

The theory of consumer behavior can fundamentally be broken down into three main hypotheses as follows: (1) The Absolute Income Hypothesis; (2) The Relative Income Hypothesis; and (3) The Permanent Income Hypothesis. Each of these will be considered briefly as follows.

The Absolute Income Hypothesis

The concept that consumption is a particular function of income was first formulated by J. M. Keynes, in his General Theory of Employment, Interest, and Money. It is possible, however, to find others who had come close to stating the same idea earlier than this

(1, p. 218).

Alfred Marshall recognized a relationship between aggregate income and saving in the context of long-term growth. Others have stated the association in terms of short-term fluctuations but failed to recognize its relevance. J. M. Clark, however, was quite clear as to its relevance in his Strategic Factors in Business Cycles (5).

Nevertheless, the "consumption function" is considered a Keynesian invention, as it clearly lies at the heart of Keynes' theoretical system. Had earlier economists been asked how they thought a person's consumption would behave given a change in real income, they too might have answered much as Keynes did. But, aggregate real income in the short-run period was not a variable with which they needed to be concerned.[3]

Keynes advanced the hypothesis that consumption depends primarily upon real income; he deflated the monetary values to real terms by the use of an index of wage rates. His consumption function can then be written

$$C_w = a + bY_w + cZ_w$$

where the subscript w means that consumption and income are stated in terms of wage units, C represents consumption, Y income,

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[3]The writer relied heavily on Ackley, (1, p. 218) for the preparation of this section.

Z a conglomeration of other variables, and the other letters, a, b, c, represent the appropriate coefficients.

Income is singled out as the main determinant of consumption although implicitly it is assumed that all other determining factors are given and held constant. Therefore, with these "other items," (Z), held stable, the consumption function shows what levels of consumption can be expected with various levels of income. In Keynes' words:

> The amount that the community spends on consumption obviously depends (1) partly on the amount of its income, (2) partly on the other objective attendant circumstances, and (3) partly on the subjective needs and the psychological propensities and habits of the individuals composing it and the principles on which the income is divided between them (17, p. 90).

He states that for clarification we can classify these factors, other than income, into two groups, (realizing that the motives for spending are not this clear cut but are some interaction of these items), called the subjective factors and the objective factors.

Subjective Factors. The subjective factors include those psychological characteristics of human nature and those social practices and institutions which, though not unalterable, are unlikely to undergo a material change over a short period of time except in abnormal circumstances. In general, Keynes takes the subjective factors as given; and "we shall assume that the propensity to consume depends

only on changes in the objective factors!" (17, p. 91). These subjec-tive factors are fairly stable mainly because they are deeply rooted in established behavioral patterns.

Objective Factors. Keynes states six principle objective factors which influence the propensity to consume: (15, p. 82-84) (1) wind-fall gains and losses, (2) changes in fiscal policy, (3) changes in ex-pectations, (4) substantial changes in the rate of interest, (5) changes in the wage level, and (6) changes in accounting practice.

The consumption function is a fairly stable relationship so as a rule the amount of aggregate consumption depends mainly on the amount of aggregate income, while the changes in the propensity it-self are being treated as a secondary influence. Therefore, what is the normal shape of this function? Keynes states a fundamental psy-chological law that "men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income" (17, p. 96). This is saying that the only restraint placed on the consumption function is that the marginal propensity to consume, MPC, be positive and less than unity. It might be worth noting that Keynes' psychological law applies not only to consumers but includes also business corporations and governmental bodies, because he relates consumption to national in-come rather than disposable income (as defined by the United States

Department of Commerce). Therefore, his factors include not only

psychological characteristics but also social practices and institu-

tions.

The Relative Income Hypothesis

The theory that the saving rate depends not on the level of income

but on the relative position on the income scale was postulated by

Dorothy Brady and Rose Friedman (2, p. 247-265). The work done

by Modigliani (21) and Duesenberry (11), both theoretical and empiri-

cal, has supported this hypothesis.

The Duesenberry hypothesis is the best known of the various

relative income hypotheses and will now be discussed in some detail.

Duesenberry advocates the basic relationship of the consumption

function as one of proportionality[4] between income and consumption.

He explains the observed short-run non-proportionality as reflecting

a lag in the adjustment of consumption to short-term income fluctua-

tions. In Figure 1, if income grows at a steady rate over time, rep-

resented by Y, (solid line), then consumption would also grow in the

same proportion, shown by C (solid line). But the growth of income

is not steady, it comes in "spurts", which can be illustrated by the

curve Y' (broken line). Consumption then will also come in spurts -

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[4]Proportionality in this instance is not equivalent to a "propor-
tional consumption function," i. e., the case where the consumption
function is linear and homogenous. This simply means that con-
sumption is some proportion of income.

responding to the spurts in income, shown by the curve C' (broken line). If one views one "cycle" by itself non-proportionality can be observed, losing sight of the longer-run relationship. If, however, the history is studied on a long-term basis, it can obviously be seen that consumption fluctuates in proportion to income.

The behavior of Y' and C' in any one cycle can clearly be seen in Figure 2. It can be observed that consumption falls less than income in a recession because consumers' expenditures are adjusted not only to current income but to their previous income, in particular their previous peak income. So, during the decline in income consumers are trying to maintain their consumption they had acquired during the previous boom. Therefore, consumption is reduced very little, but in order to maintain consumption, savings have to be reduced sharply. Then, when income begins rising toward its previous peak level, consumption moves up slowly because most of the increased income will go to restore the saving rate. When, and only when, income moves higher than previous peak income, will consumption respond more vigorously to current income. The fact that consumers are much more willing to increase consumption than to reduce it, is commonly called the "ratchet effect". In Figure 1 it can be observed that the curve C' rises in a stairstep fashion, thus illustrating the fact that consumers are reluctant to reduce income while having less resistance to increase it.
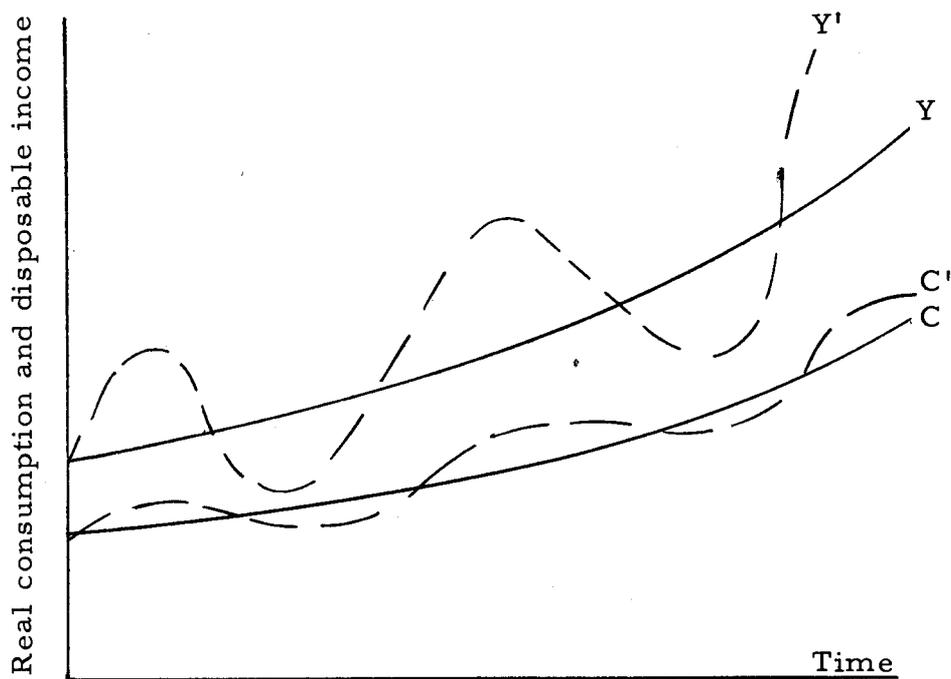
Figure 1. Relationship of income to consumption over time, given (1) a steady increase in income (Y); and (2) spurts of income increases (Y'). Source: (1, p. 242).
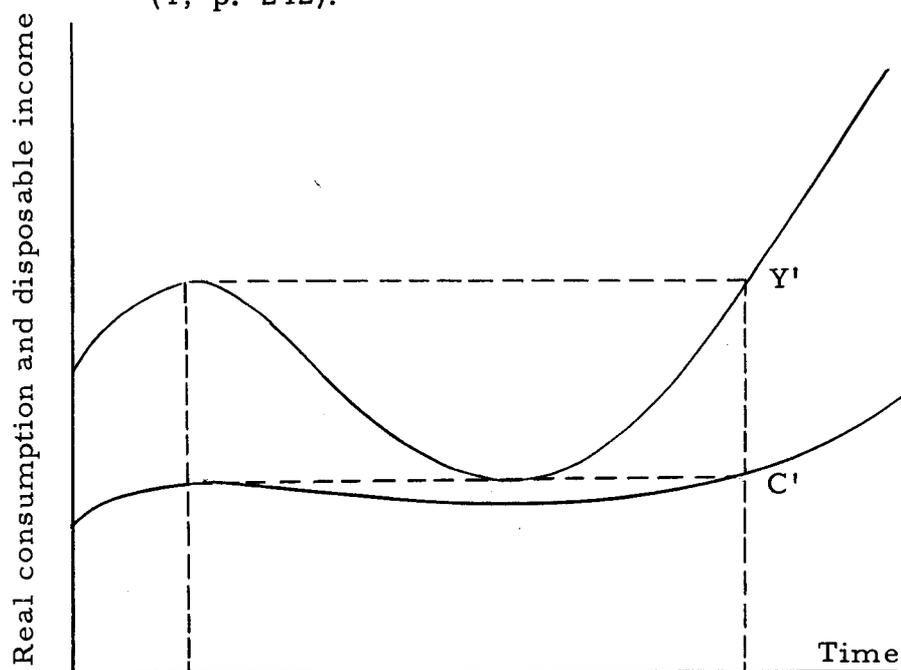
Figure 2. Behavior of C' and Y' in an idealized single cycle. Source: (1, p. 242).

Duesenberry's consumption function[5] illustrates that the average propensity to save, APS, is a function of the ratio of current to previous peak income, as follows:

$$APS = \frac{S_t}{Y_t} = a\frac{Y_t}{Y_o} + b$$

where S_t = current savings, Y_t = current disposable income, Y_o = highest disposable income ever attained, and a, b are constants. All of the variables are corrected for population and price changes (11, p. 90).

So, if the ratio of current to previous peak income is constant, the average propensity to save, S_t/Y_t, will be constant. If, however, income falls below the previous peak, the ratio Y_t/Y_o will fall, and therefore the average propensity to save will also decline.

Duesenberry, and other economists who advocate this hypothesis, argue that it is not <u>absolute</u> <u>income</u> but is rather the relative position on the income scale that determines the savings rate of a family.

Duesenberry in his "relative income" hypothesis explains the

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[5]It should be noted that up to this point the discussion was based on the concept of consumption and its relation to income. Through most of Duesenberry's book; <u>Income, Saving and the Theory of Consumer Behavior</u>, the discussion is centered around savings and its behavior relative to income. These two thoughts are basically discussing the same topic because of the simple equality: income equals consumption plus savings.

The present writer will follow Duesenberry's notation when presenting the Relative Income Hypothesis.

secular upward drift of the consumption function, but this is not the only explanation. Davis (9, p. 278), for example, suggests that previous peak consumption be substituted for previous peak income. He states that people become accustomed to a certain standard of consumption, rather than a certain level of income. He further argues that a person's current income, in a period of a year or less, will exhibit less stability and be less representative of a family's living standard than would current consumption.

Tobin (25, p. 135-156), also suggests that the difference in the savings habits between whites and negroes could be explained by the fact that even though both the negro and white family were on the same level of income, the white family is still likely to be wealthier and more secure and therefore will tend to save less. This is based on the presumption that the substantial growth in asset holdings over time may have reduced the need for saving out of current income and contributed to raising the propensity to consume as real income is increased. The evidence is rather brief for this argument as is recognized by Tobin (25, p. 154-156).

It can be shown that if one plots short-term consumption against income in a six-month period he will obtain a less steeply sloped consumption function than if he chose one year as the time period. This is due, in part anyway, to short-run variations in income and to lags in the adjustment of consumption to changes in income (10, p. 79).

This type of difficulty has led economists to take the view that consumption is not related to current income but to a long-run income level, while the short-run fluctuations in income are assumed to affect the level of savings. One of the best known hypotheses of this sort is the "permanent income hypothesis" of Milton Friedman (13). Friedman's hypothesis was formulated independent of another well known hypothesis by Franco Modigliani, R. E. Brumberg, and Albert Ando (22, p. 49-174). The latter theory is similar in principle, but different in other respects. Friedman's hypothesis has gained more extensive attention and will be discussed at this point.[6]

The Permanent Income Hypothesis

Friedman states that incomes, particularly of non-wage earners, fluctuate from period to period, while on the other hand consumption tends to be stable. From this Friedman argues that consumption must depend more closely on the average income over a number of periods, rather than the current income in any given period. He divides both income and consumption into two components; the permanent portion and the transitory part.

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[6]Ferber (12, p. 26) says this about the two hypotheses: "The two versions are similar in principle, though different in certain respects. Whether it is because of its deceptively simpler formulation or because of its more provocative interpretations and assumptions, the Friedman form has gained wider attention."

$$Y = Y_p + Y_t \quad \text{and} \quad C = C_p + C_t$$

where Y_p, C_p are the permanent components of income and consumption, and Y_t, C_t are the transitory ones. The permanent components reflect factors that consumers regard as determining their wealth, or capital value. They include such things as non-human wealth,[7] personal attributes, occupations, etc. The transitory components reflect all other factors, i.e., windfall gains and losses. He further states that permanent consumption is a proportion of permanent income, which is referred to as k:

$$C_p = k \, Y_p$$

where k is a function of the interest rate (i), ratio of non-human wealth to total wealth (w), and other miscellaneous items such as age, taste, etc. (u), i.e., $k = f(i, w, u)$. This k is defined to be independent of the level of permanent income. It should be noted that "k" would have to be less than unity and greater than zero. Permanent consumption cannot exceed permanent income, nor can consumption be negative.

Friedman further assumes there is no correlation between transitory and permanent income, transitory and permanent consumption, as well as transitory consumption and transitory income. Therefore,

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[7] An example of non-human wealth would be a house, this is contrasted to human wealth, e.g. education.

the level of expenditures made by a consumer is set by a constant proportion of permanent income, k, which varies from person to person. However, actual consumption and actual incomes will probably deviate from the permanent levels to the extent that transitory factors enter in. These transitory factors are random and independent of each other. The proportion of permanent income saved in a given period is independent of income in that period, and the transitory section of income will probably have no effect on the current level of consumption. Therefore, short-run fluctuations in income are regarded as affecting primarily the level of savings.

This hypothesis is very difficult to test since it is difficult to measure permanent income and permanent consumption. In Friedman's book A Theory of the Consumption Function (13), he deals with the consistency of his hypothesis with regard to cross-sectional and time series data.

The basic consumption function in a cross-section of the population shows permanent consumption that corresponds to the level of permanent income, $C_p = kY_p$ (See Figure 3). This function is assumed to be the same for any small sample of families.

The basic consumption function is OC; it is assumed to be linear and homogeneous which means the marginal propensity to consume equals the average propensity to consume. The average measured income of the community is OY_1. The families with this income have
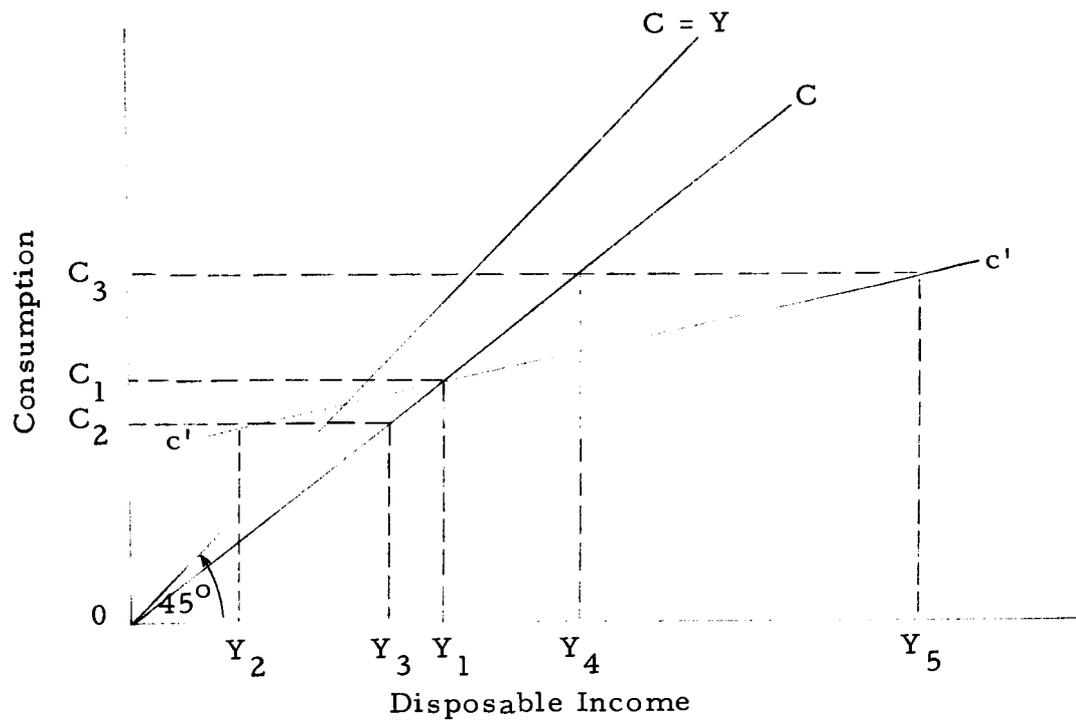
Figure 3. Friedman's income-consumption, relationship.
Source: (1, p. 244).

a zero transitory income as OY_1 is also the average permanent income. These average levels of income mean that some households have higher permanent incomes and negative transitory incomes while others have lower permanent incomes and positive transitory incomes. These families have an average permanent consumption of OC_1, where the average transitory consumption element is zero; this is also their measured consumption.

Families with measured income below the average - say OY_2, have consumption OC_2, but with this level of consumption, the permanent income is OY_3, which will be the average permanent income of these families. Similarly those with measured incomes OY_5 have OC_3 consumption and therefore must have an average permanent income of OY_4.

The apparent consumption function is c' c', which has a marginal propensity to consume less than the average propensity to consume, but the basic consumption function, which is exposed only by long-term income changes, is OC with the marginal propensity to consume equal to the average propensity to consume.

Three important results obtained by Friedman with regard to time series data are: (1) the marginal propensity to consume is always less than the average propensity to consume, (2) the ratio of permanent consumption to permanent income (k) remains constant, and (3) the income elasticity of consumption rises as the period of

observation is lengthened.

Friedman states that in general a three-year time horizon gives a good approximation of permanent income, that is, if income is observed for three years it can be considered permanent. He does qualify this by saying that this limit should not be decided upon a priori, but the data should indicate the appropriate number of years.

The previous discussion seems to indicate that the analysis of consumption is a very complex matter and that consumption spending does not stem from merely current income, but rather involves some complex average of past and expected income. The fields of economics, psychology, and sociology can all add to the explanation of consumer behavior, however, there still prevails the problem of measurement. It is very difficult to determine a person's relative income, for example, or his transitory income in a given year. The theoretical consumption function explains the long-run relationship, but tells us little about the character of the short-run consumption function.

Selection of the Statistical Consumption Function

The statistical material regarding the consumption-income relationship is of two types. There is the historical record of the relationship between income and consumption in different years, and there are also family budget studies which show how much, on the

average, is consumed and saved at different levels of family income

(14, p. 77).

The Historical Consumption Function

The historical consumption-income relationship exhibits the re-
lationship of consumption to income over a number of years. This
gives an idea of how consumption can be expected to respond to in-
come changes in the future - both the short and the long-run. This
entails the use of time-series data.

The Family Consumption Function

The family consumption function is obtained by observing house-
hold budgets, i.e., using a sample of families with different incomes
in a particular period. Thus, with a given income distribution this
relationship exhibits the fact that consumption and savings vary with
the level of family income at a given time and place. This utilizes
cross-sectional data.

Due to the problem of measuring permanent income, for example,
or relative income, this thesis used current disposable income as
the variable that determines current consumption. It was then
necessary to chose between the historical and the family consumption
function. The historical consumption function, as stated above,
deals with the relationship of income to consumption over a number

of years. Data for past years in the area under study is not available and it is not practical, in a region such as the Newport-Toledo area, to interview these consumers repeatedly for several years due to the time and resource limitations. Therefore, it would not be possible to utilize a historical consumption function for the Newport-Toledo region. The family consumption function was the appropriate relationship to work with in this particular instance. With this information, conclusions can be drawn on how consumption and saving vary with the size of the family income, with a given income distribution, and at a given time and place.

A sample of households was drawn from the Newport-Toledo area to collect data for the budget study. Details of the sampling scheme are discussed in Chapter III.

III. SELECTION OF THE SAMPLE

Area of Study

The empirical basis of this study was furnished by the Yaquina Bay Area located in Lincoln County, Oregon.[8] The area under study is approximately 220 square miles with an estimated population of 14,630.[9] Table I illustrates the breakdown of the population in this area. For example, in the Agate Beach division there are four cities with their populations recorded: Newport, South Beach, Agate Beach, and Otter Rock. These towns contain approximately 5,994 of the 7,594 people in this division. The remaining 1,600 reside in the rural areas or in towns with less than 50 inhabitants.

There is an average of three persons per household according to the 1960 census data for Lincoln County.[10] Table I shows the number

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[8]See Figure 4 for a map of the area under study.

[9]This was estimated with the use of the 1960 census data (26, p. 15).

[10]The United States Census of Population in 1960 defines a household as: ". . . all the persons who occupy a housing unit. A house, an apartment or other group of rooms, or a single room, is regarded as a housing unit when it is occupied or intended for occupancy as separate living quarters, that is, when the occupants do not live and eat with any other persons in the structure and when there is either (1) direct access from the outside or through a common hall or (2) a kitchen or cooking equipment for the exclusive use of the occupants." (27, p. XV). This estimate of three persons per household was used merely as a means to obtain an estimate of the number of households in this area. This estimate will then serve as a check for another estimate of the number of households based on voter data used later in this thesis.

TABLE I.   POPULATION OF YAQUINA BAY AREA BY UNIT
DIVISIONS, 1960.

Population Unit	Population	Households
Agate Beach division:		
Newport	5344	1781
South Beach	300	100
Agate Beach	300	100
Otter Rock	50	17
Other	1600	533
Toledo division:		
Toledo City	3053	1018
Elk City	50	17
Other	2250	750
Siletz division:		
Siletz City	583	194
Other	400	133
Waldport division:		
Seal Rock	240	80
Other	360	120
Eddyville division:		
Other	100	33
Total	14,630	4,876

Source: (28, p. 15)

Otter Rock ○

Beverly
Beach ○

Siletz ○

Agate Beach ○

Yaquina River

Newport ○

South Beach ○ Yaquina
Bay

Toledo ○

Elk City ○

Big Elk Creek

Pacific Ocean

N

Seal Rock ○

Scale:

0 1 2 3 4
Miles
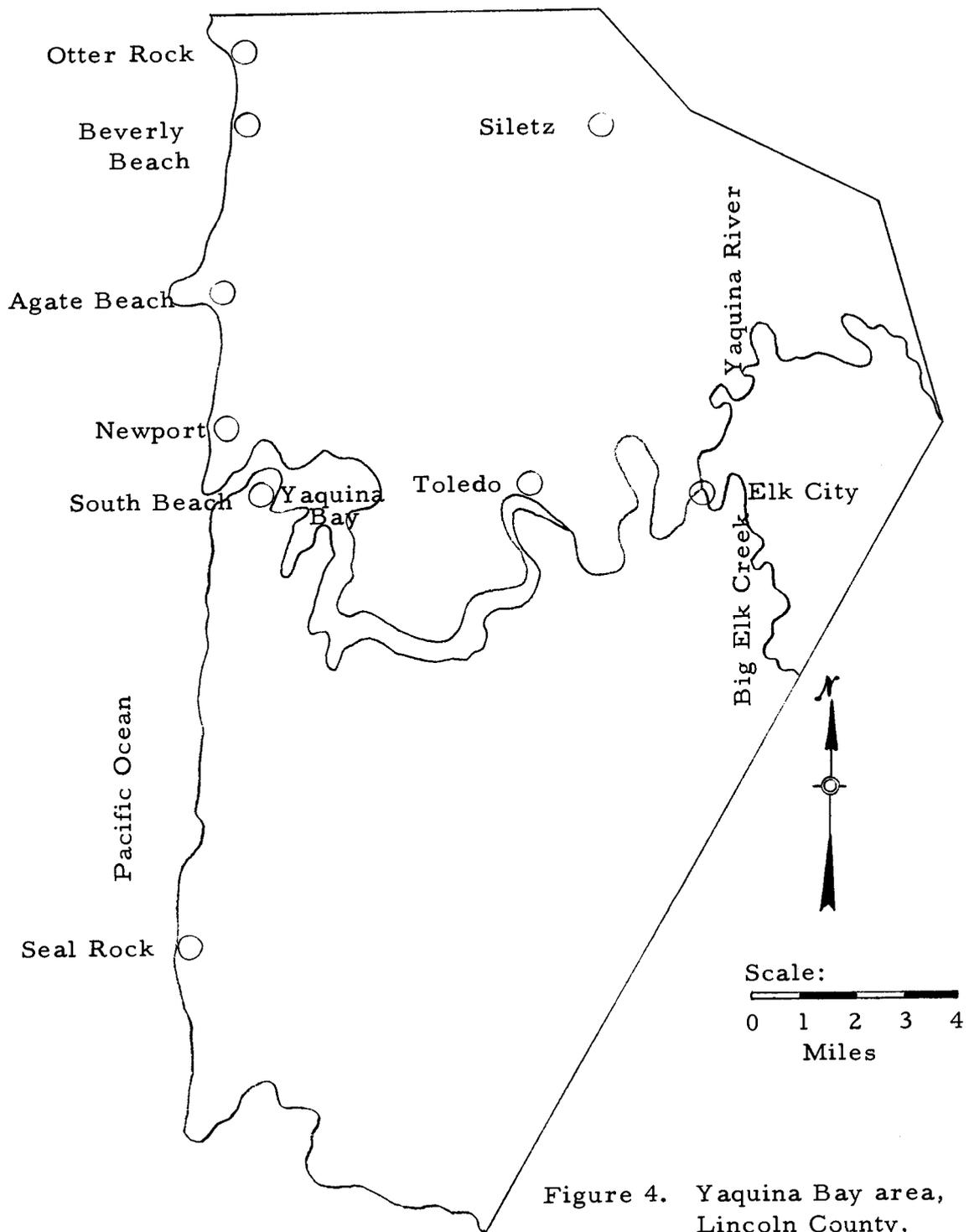
Figure 4. Yaquina Bay area,
Lincoln County,
Oregon.

of households in each of the census divisions. There is a total of about 4,876 households in the Yaquina Bay area.

The two main cities in the area are Newport and Toledo. The city of Newport is located at the mouth of the estuary and while having about 5,300 occupants is the county seat of Lincoln County. Newport has an adequate harbor for commercial fishing boats and for ocean-going vessels, and some of the commercial catch of fish is processed there. Many sports fishing boats are also based in this harbor. Because of the availability of these water-related recreational resources and the access to inland Oregon, Newport has developed the tourist trade as the prominent industry.

The other major city in this area is Toledo. Toledo, with a population of about 3,100, is located on the Bay about ten miles inland from the ocean. Unlike Newport, the lumber industry dominates this town.

The Newport-Toledo area includes several other smaller communities most of which are along the main highway through Newport. These small towns are typical tourist centers. Others, lying away from Highway 101, support the lumber industry of Toledo. This study area defines approximately the labor market for commercial establishments in Newport and Toledo. It was selected for the collection of the consumption-income data because the construction of the consumption function is but a part of the input-output analysis

mentioned earlier. The latter study is based on this geographic area.

The Sampling Scheme

"Sampling is the taking of a part of a whole or total number of individuals from which to draw inferences or conclusions in regard to the characteristics of the group from which the sample was taken" (16, p. 1). There are four basic advantages to sampling which Cochran (6, p. 2) feels are important: reduced cost, greater speed, greater scope, and greater accuracy. These need not be explained further at this time, however, it should be noted that sampling was used in this study. It is realized that if a 100 percent sample is taken a much higher degree of precision will be obtained than with a 10 percent sample. With a population as large as 4,876 households it would be very expensive and, in fact, impractical to personally interview all of these consumer units.

Due to the type of information that is sought, it is of great importance to achieve a high degree of accuracy[11] at a reasonable cost. For these two reasons - high accuracy and reasonable cost - it was

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[11]"Accuracy" should not be confused with "precision". According to Cochrane (6, p. 10) "accuracy usually refers to the size of deviations from the true mean, whereas precision refers to the size of deviations from the mean obtained by repeated application of the sampling procedure." Therefore, precision can be increased by increasing the sample size, while accuracy can be increased by increasing the reliability of the interviewers, etc. , or any time bias can be reduced.

advisable to hire a professional "marketing research analysis" firm to interview these households.

Biases, as was noted earlier, can affect the accuracy obtained in a survey. Parten (24, p. 404-424) lists several common sources of bias that can occur in a study of this sort. Some biases that are likely to be minimized by use of a professional firm are: (1) poor question framing, (2) poor assignment and office procedures, (3) faulty interviewing, (4) untruthful informants, and (5) refusals and omissions. These people are trained in this field with much valuable, practical experience, it is of course, still likely to have some bias in the results - it is impossible to eliminate bias completely.

The population for this study was the total number of consumer units in the Newport-Toledo area during 1964. This does not include visitors or tourists who do not refer to this area as their "home".

The Sampling Unit dealt with is the consumer or household unit, the definition of which is as follows: (1) A group of people usually living together who pool their incomes and draw from a common fund for their major items of expense, (2) A person living alone, and (3) A person living with others but who is financially independent; i. e. , his income and expenditures were not pooled. [12]

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[12]This definition was adopted from the Bureau of Labor Statistics (29, p. 3). It should be noted that this is a different definition of household than that used by the United States Census (see footnote 10).

It might seem that the sampling unit should be an individual

human being. It is this individual who consumes "inputs" (goods and

services) in order to produce satisfaction. This individual, then, is

called a "consumer" in both lay as well as technical language. Some

would conclude that it is this individual consumer that is the primary

decision-making unit as far as consumption is concerned. Cochrane

and Bell (7, p. 13-14) suggest that very few individuals are com-

pletely free to choose as they please among alternative goods and

services. Children clearly are not without some form of supervision,

and their parents make decisions about the family as a whole.

If the individual is not an appropriate sampling unit to use it

might seem obvious, at this point, to use the family as the consumer

unit. But what if there is more than one decision-making unit in a

family? This would certainly add confusion if one adopted the family

concept as the consumer unit. Because of this problem, - the family

unit and the decision-making unit not always coinciding, - the house-

hold, or consuming unit which was defined above, was used as the unit

of inquiry for this study.

The appropriate frame for this study would be a list of all house-

holds residing in the Yaquina Bay area during 1964.[13] A list of this

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[13]Only those households that consider this area as their full-time
residence are of interest here. (They could make their livlihood here
or they could be retired.) Families that moved into this area during
1964 are also of interest in this study as long as they call this their
home. Households that live in this area just for the summer, or
merely part-time for recreational purposes, are tourists and should
be treated as such.

sort, that would be adequate for the objective of this study, would be very expensive to obtain, if not almost impossible. In order to accomplish the desired results an area sampling scheme was used. Monroe defines an "area frame" briefly as follows:

> . . . the Master Sample of Agricultural materials have provided a solution for the Open Country portion of the United States. These materials constitute a geographic frame of area units (count units) whereby any element which has an association with a unit of area can be identified after locating a particular count unit. The count units vary in size and shape, as well as the "counts" - the number of farms and the number of dwellings . . . The one characteristic common to all is definable area. Within the count unit, sampling units can be defined and identified. The frame thus constructed is entirely adequate for probability sampling (24, p. 3).

A sampling scheme much like the one used in the Master Sample of Agriculture was used in this study, and a method known as "area sampling" was employed. This technique provides a stratified, systematic sample.

Sample Size

The sample size for this study was determined by the ratio of the total funds available to the expected unit cost per interview. This gave a sample size of approximately 200.

Drawing the Sample

The first step was to obtain a good city map of each town as well

as a county map. In the urban areas there are only two cities in

which maps are available: Newport and Toledo. The next step was

to mark on the maps the voting precincts within the towns as well as

the rural areas, as registered in the county court house, making note

of the number of voters registered in 1964. Within each of these

town precincts, "blocks" (not city blocks) were numbered and out-

lined according to some physical boundary. It made no difference

whether there appeared to be any dwelling units in the block or not,

these blocks should still have an equal chance to be drawn. Number-

ing began in each precinct and continued in a serpentine fashion.

When this was completed a random number table was used to choose

20 percent of the blocks. The 20 percent figure used is arbitrary -

any percent from one to one hundred could have been used, the lower

the percentage the smaller the interval sampled and vice versa. The

percent of voters was computed for each precinct, this was then

multiplied by 200, the sample size, to obtain the number to be inter-

viewed in each precinct.

The number of households in this area was estimated by dividing

the number of voters per household into the total number of voters.

There are about 1.6 voters per household,[14] this gives approximately

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[14]This figure was obtained through personal communications
with Mr. Roy Bardsley, co-owner in a Marketing Research Analysis
firm. His experience with voter surveys gave him basis for this
estimate.

4, 389 households[15] - because there were 7, 022 voters registered in this area.

A starting place was chosen at random for each of the city precincts - for example the third house from the northeast corner. The interviewers then began at the designated place and continued interviewing at every k^{th} household.[16]

Rural maps were also obtained for the purpose of sampling outside of the cities. These maps were non-overlapping and included all of the traveled roads in this area. Each route, or map, had several starting places. These were numbered, in serpentine fashion, and from a random number table a starting place was drawn. It

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[15]This figure was used for the computations because it came very close to the estimate obtained from the 1960 census data mentioned earlier.

[16]The sampling interval, k, was determined by the formula:

$$Pi \frac{N_i}{n_i}$$

where: P_i = the percent of the blocks chosen to sample from. In the urban areas it was 20 percent. In the rural areas it was the approximate percent of the total map that the chosen route represented. This ranged from 12 to 25 percent.

N_i = The portion of the total population that lies in the ith section. For example, the total number of households represented on a rural map. It should be noted that $\Sigma N_i = N$ (the total population in the Newport-Toledo area).

n_i = The sample size for the ith section. For example, the number of interviews required on a given rural map. It should be noted that $\Sigma n_i = n$ (the sample size for this study).

1, 2, ..., 6: the number of the maps used.

should be noted, in order to be able to do this it had to be assumed that each route had approximately an equal number of households on it. This assumption was made in drawing the rural sample. An arrow was drawn to indicate the direction chosen. When confronted with an intersection one direction was chosen at random and the arrow proceeded that way. This was done on all the maps. The interviews then began at the designated starting place and proceeded at every k^{th} dwelling unit until the designated quota was obtained. If the road was travelled completely and the quota not obtained the interviews then proceeded to an alternate route, also chosen at random.

An 80 percent completion was expected for this type of a study,[17] so if 25 percent more was attempted the quota would be obtained. This is merely oversampling by 25 percent, in order to avoid drawing substitutes and replacing them in the sampling scheme.[18]

Chapter IV will present the results of this study as well as the construction of the several consumption functions.

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[17]The 80 percent figure was obtained by personal communication with Mr. Roy Bardsley, co-owner of a Marketing Research Analysis firm. His experience in this type of study led him to recommend this figure. See appendix Table II for the actual results.

[18]The interviewers made two "call-backs" to those residences where no one was at home and contacted the first time.

IV. ESTIMATION OF EMPIRICAL CONSUMPTION FUNCTIONS

The results of the empirical work will be discussed in three

general parts. The first part deals with the consumption-income re-

lationship in the region studied, while the second part will present

the results in terms of an expenditure-income relationship. In the

third part the relationship between consumption and four independent

variables will be discussed. Methods I and II will be presented in

this chapter while Method III will appear in Chapter V.

Consumption-Income Relationship

The consumption function as defined by this method has two

variables: current disposable income and personal consumption ex-

penditures (or purchases by households). [19]

Current disposable income is defined as the gross income of

the household less income taxes paid during 1964. Gordon, when

referring to the use of current disposable income as the independent

variable in this relationship, says (14, p. 80):

> If we are interested in a 'psychological propensity to
> consume', which is related to personal spending habits,
> it is the comparison between disposable income and
> consumption which is particularly relevant. In prac-
> tice, consumers' expenditures are usually related to
> disposable income.

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[19] As was previously noted the consumption expenditures were
computed for each of the 17 sectors listed in Appendix Table I. The
relationship between income and consumption was computed for each
sector as well as the total of all sectors in the Newport-Toledo area.

The term "personal consumption expenditures" is not so easily defined. By the definition adopted here a consumer good is consumed at the moment of retail purchase. This concept is quite reasonable for purchase of services, but the more durable the good purchased the less realistic becomes the concept of instantaneous consumption. Should appliances, automobiles, or houses be considered a "consumer good"? As stated by Lewis (18, p. 25):

> Partly because of the statistical infeasibility of estimating the rates at which such goods continue to deliver services to consumers after their purchase, our national-income accountants have swallowed their common sense in these cases and have classified everything up to and including household appliances and automobiles as consumer goods.

The same convention was used in this analysis. In the case of residences it would have little meaning to regard a house as being consumed at the moment of purchase since the household will probably not only continue to use the house for, say 20 years, but will probably continue paying for it that long. Thus, since the house is not consumed at the moment of purchase, the household acts as a business rather than a consumer. As a business it then sells housing services, i.e., imputed rent, to itself as a consumer. In this study rent was imputed for all households, in the sample, that own houses, i.e., those households that have bought or are in the process of buying a residence.

The imputed rent value was estimated from interviews with real

estate men in the area. They were asked how much rent could be obtained for the houses on the market. This figure was then considered an expenditure in the household sector as well as an addition to household incomes. Thus, using these definitions, we can say that the only expenditures made by consumers are for personal-consumption items (18).

The average income in this area for 1964 was estimated to be about $6,224.50, with a standard deviation of $3,563.21. That means about 68 percent of the incomes lie between $2,560.29 and $9,787.72. The low income in the sample was $768 while the high was $27,000, giving an idea of the variability of the incomes in the Newport-Toledo area.[20]

Two regression equations were fitted to the data by the use of the method of least squares. First a linear function was considered, and then a curvilinear function, which has the same variables but in addition considered a squared term, was used. The equations were computed for each of the 17 sectors and the total economy.

In both cases it was tested if the coefficients were significantly different from zero. If it was concluded that they were not significantly different from zero at the five percent level of significance it was assumed that there was no real relationship between disposable

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[20]It should be noted that these "income" figures include an amount added in for the imputed rent wherever needed.

income and consumption in that particular sector. This was done

with the use of the t-test as follows:

$$t = \frac{a_i}{\sigma a_i}$$

where a_i is the coefficient and σa_i is the standard deviation of the

coefficient a_i.

If it was concluded that the coefficients of both functions were

different from zero, at the five percent level of significance, a choice

had to be made as to which one was most appropriate in that sector.

The choice of the functional form is not a matter of logic but is an

empirical question. The functional form was chosen by testing if

there was any significant difference between the R^2 [21] of one func-

tion compared to the R^2 of the other as follows:

$$F = \frac{\left[\left(\begin{array}{c}\text{variation explained} \\ \text{by 2nd degree curve}\end{array}\right) - \left(\begin{array}{c}\text{variation explained} \\ \text{by linear curve}\end{array}\right)\right] \div \begin{array}{c}\text{Degrees of} \\ \text{Freedom}\end{array}}{\left[\left(\text{Total variation}\right) - \left(\begin{array}{c}\text{variation explained} \\ \text{by 2nd degree curve}\end{array}\right)\right] \div \begin{array}{c}\text{Degrees of} \\ \text{Freedom}\end{array}}$$

(8, p. 728)

If the F-value computed was larger than the tabular F-value the

null hypothesis that the two functions explained the data equally well

was rejected. If on the other hand the computed F-value was less

than the tabular one, the null hypothesis, that there was no

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[21] R^2 is the coefficient of determination, i. e. , it is the percent
of the variation that is explained by the regression line.

significant difference between the two methods, was not rejected.

In this case the linear function was chosen due to its simplicity and

the fact that the addition of another variable did not significantly re-

duce the unexplained variation.

It should be mentioned here that in the case of the linear function

the marginal propensity to consume, MPC, will be constant regard-

less of the level of income since the MPC in this case is merely the

first derivative of the function $Y = a_o + a_1 x$, which is $dy/dx = a_1$, a

constant for all levels of income.

This is not the case, however, with the curvilinear function

$Y = a_o + a_1 x + a_2 x^2$. The first derivative of this becomes, $dy/dx =$

$a_1 + 2a_2 x$, where a_1 and a_2 are constants and x represents the level

of disposable income. Thus the MPC will vary according to the level

of income. If the a_2 coefficient is positive the MPC will increase as

the level of income increases, or the consumption function will in-

crease at an increasing rate. If the a_2 is negative, however, the

MPC will decline as incomes rise and the consumption function will

increase at a decreasing rate.

The various sectors will now be discussed individually and the

selected functions explained.

Consumption in the "Product Oriented Wholesale and Retail" Sector

A few examples of consumption items in the product oriented

wholesale and retail sector are groceries, clothing, shoes, home furnishings, flowers, jewelry, electricity and gas, feed and seed, etc. The average amount consumed per household for these items was $2,092.17. The average propensity to consume, APC, at an average income of $6,224.50 is .336, or 33.6 percent of an average household's income will be spent for goods and services in this sector. The estimated equation pertaining to the product oriented sector is:

$$C_p = \$968.61 + .181\ Y_d$$

where C_p is the amount of consumption per household for items in the local product oriented wholesale and retail firms during 1964, and Y_d is the household disposable income for 1964.

The slope, MPC, of the linear relationship between C_p and Y_d is .181. If, on the average, a household's income was increased by one dollar it is expected that the household will spend an additional 18.1 cents in this sector. This positive relationship between C_p and Y_d does not seem unrealistic. As the level of income increases more furniture, jewelry, shoes, clothing, etc. will be consumed.

Consumption in the "Service Oriented Wholesale and Retail" Sector

The service oriented wholesale and retail sector includes such consumption items as the services from barber shops, beauty shops,

laundry and dry cleaners, non-profit organizations, painters, plumb-
ers, hospitals, etc. The function chosen for this sector is linear
as:

$$C_s = \$22.43 + .053 Y_d$$

where C_s is the amount of consumption in the service sector by a
household in 1964. The MPC is .053, while the APC at an average
level of income is .0568. The average amount consumed in this
sector was $353.58. Thus, if a household had an income of $6,224.50
it would be expected to consume about 5.68 percent of its income, or
$353.58, in this sector.

One would expect that as a household's income increased it
would consume more in this sector, i.e., more for painters, plumb-
ers, entertainment, non-profit organizations, etc., thus the existence
of the positive correlation between C_s and Y_d.

Consumption in the "Lumber" Sector

Consumption items in the lumber sector contain such expendi-
tures as retail sales of lumber products. It was concluded that the
coefficients in the linear as well as the curvilinear function were not
significantly different from zero, at the five percent level of signifi-
cance. Based on this conclusion as well as the fact that there were
few non-zero expenditures in this sector it is difficult to make a

statement other than this: given the statistical evidence it was not possible to reject the hypothesis that a relation between consumption in the lumber sector and household current disposable income was non-existent.

It should be noted that any "repair" or "construction" item was not considered a consumption good. These items are merely capital formation that are taken into consideration in the "business account" of the household's dual personality. The "consuming" side of the household will pay only for maintenance items.[22]

Consumption in the "Local Government" Sector

The local government sector includes such expenditures as for water and sewage, real estate property taxes, and personal property taxes. The estimated equation for this sector is:

$$C_g = \$56.03 + .028 \ Y_d$$

where C_g is the amount "consumed" per household in the local government sector. The word "consumption" in this context is mis-leading. The households pay to the local government for the services provided, i. e., for police protection, fire protection, water and sewage, etc. The amount paid to the local government by the household is a

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[22]The distinction between "maintenance" and "repair" is not clear cut. It was assumed in this study that the "small" expenditures in this sector were consumption items, i. e., maintenance, while the "large" expenditures were non-consumption items.

poor measure of the amount consumed by the household, however it was used, as an approximation of the "consumption" of local government services.

The average amount consumed in this sector was $230.94, with the APC at an average income of .0371. The MPC is .028, thus if an additional dollar of disposable income was given to the household, on the average about 2.8 cents of it would be paid to the local government.

Consumption in the "Hotel, Motel, Trailer Parks" Sector

The hotel, motel, trailer park sector includes expense items for local motels, hotels, trailer parks, and apartments. Because of the fact that there were only a few non-zero expenditures for items in this sector no significant relationship between consumption in this sector and disposable income could be established.

Expenditures in this sector originated from two sources. The first source was from the renting of trailer space for those that owned trailer houses. There was a very small number of trailer houses sampled in this area.

The second source was from expenditures made to the local motels due to a flood accompanied by mud slides that occurred in the fall of 1964. Due to this disaster there were a few expenditures for this purpose.

Consumption in the "Cafes and Taverns" Sector

The cafes and taverns sector consists of local consumption in the cafes, restaurants, bars, etc. The average amount spent in this sector was $217.80 with a standard deviation of $812.91, which gives an indication of the degree of variability of the amount consumed in this sector per household.

The conclusion reached concerning this sector is that, on the average, as disposable incomes increase the amount consumed in restaurants, cafes, bars, etc. in the Newport-Toledo area will increase, but not by as much as the increase in income. The equation that best fits this data is:

$$C_e = \$100.85 + .000002276 \; Y_d^2$$

where C_e is the dollar value of consumption in the local cafes and taverns in 1964 per household.

The above equation exhibits an increasing relationship between Y_d and C_e. That is to say that given an increase in income the higher income groups will spend a higher percent of the increase, in this sector, than the lower income families, i.e., the MPC increases as Y_d increases. The MPC at an average income is .0283, while at an income of $20,000 the MPC is .09104. This result seems reasonable, the higher income households probably consume more outside of the home in the form of food consumption.

The APC at an average level of income is .035 or 3.5 percent

of a disposable income of $6224.50 was consumed in this sector.

Consumption in the "Marinas and Marine Supply" Sector

Items entered in the marinas and marine supply sector include

expenses for moorage space, charter boats, marine supplies and

repairs, and fishing supplies in the local area.

According to the sample evidence no relationship between dis-

posable income and the consumption in this sector can be assumed.

The average amount consumed in this sector per household was about

$53 during 1964. The amount consumed per household ranged from

$9 to $7,000 (excluding zero amounts) in the sample chosen. The

standard deviation of the estimate of the average amount consumed

in this sector is about $506. This high variation made it difficult to

fit a regression line since at any given level of income there was

wide dispersion in the amount consumed.

Consumption in the "Fisheries" Sector

Any consumption in the fisheries sector would have been from

fish processing in the Newport-Toledo area.

The average amount spent in this sector during 1964 was $1.37

with a standard deviation of about $5.00. The range was from $1 to

$32, other than the many zero expenditures. Even with this low

average figure and the relatively high standard deviation a relation-
ship does exist between disposable income and the amount consumed
for fish processing. As incomes increase the amount consumed in
this sector, according to the sample drawn, will also rise. The
equation for this sector is:

$$C_f = \$.31 + .0000000207\ Y_d^2$$

where C_f is the amount consumed in the fisheries sector per house-
hold in 1964.

Only about 10 percent of the sample drawn had non-zero con-
sumption in this sector, thus great reliability on this relationship
should not be assumed.

The marginal propensity to consume is an increasing function of
current disposable income. At an average income level the MPC is
.000258. The APC at the average level of income is .00022 and will
vary according to the level of income, but at higher levels of income
the APC will increase as disposable income increases. The house-
holds with the higher income will more likely have more equipment,
boats, etc., in which to have fish that need processing, thus they
would spend more of their income in this sector.

Consumption in the "Automotive" Sector

The average amount spent in this sector was about $619 with a

standard deviation of $847. This includes such expenditures for

goods and services purchased from service stations, auto sales,

auto repair, auto supplies, motor cycle sales, etc.

It was concluded that a relationship did exist between current

disposable income and household consumption in this sector. The

linear as well as the curvilinear function significantly fit the data, so

it was necessary to test if the curvilinear equation explained signifi-

cantly more variation in the data than the linear relation. With the

statistical evidence available it was not possible to reject the null

hypothesis that the two functions explained the data equally well, thus

as was stated earlier, the linear function was chosen as:

$$C_{ss} = \$213.07 + .065\ Y_d$$

where C_{ss} is the consumption for the goods and services from ser-

vice stations, auto parts, etc. per household during 1964.

The MPC for this sector is .065 for any level of income. This

indicates that if, on the average, a household's income went up by

one dollar the amount consumed in the automotive sector would in-

crease by 6.5 cents. Such a relationship can readily be explained.

As a household's income increases it will be able to maintain, for

example, two cars rather than one. In order to keep two cars, more

will be spent on gasoline, oil, repairs, tires, etc., thus the conclu-

sion that the households with higher income will spend more in the

automotive sector.

The APC at the average level of income is .099, and will decrease as the level of income is increased. Thus, a smaller percent of the disposable income will be consumed in this sector by the higher than by the lower income households.

It might be worth noting that more than 87 percent of the households in our sample had positive consumption in this sector. There was a relatively wide range in the amount spent, as can be seen by the high standard deviation noted earlier. However, a significant relationship does exist in this sector.

Consumption in the "Communication" Sector

Entries in this sector are for such consumption items as newspapers, local trucking, telegrams, T. V. cable, shipping, railroad, taxis, etc.

A relationship between these expenditures and disposable income exists with an average amount spent of about $118 and a standard deviation of $106. In this sector the linear function was used as it explained the data better statistically:

$$C_c = \$53.21 + .0104\, Y_d$$

where C_c is the amount consumed per household in the communications sector in 1964.

If, on the average, a household's income is changed by one dollar, the amount consumed in this sector would be expected to change by about one cent. The APC at an average income was computed to be about .01896 and is a decreasing function of disposable income.

These conclusions seem logical since the households with the higher income will likely use the T. V. cable, subscribe to more newspapers, use the taxi more, etc., than the household with a mere subsistence income. There were very few zero entries in this sector indicating that most people paid for some of these services during 1964.

Consumption in the "Professional Service" Sector

The equation that fits the data for the professional sector best is the linear one:

$$C_{ps} = \$28.64 + .0129 \ Y_d$$

where C_{ps} is the consumption per household in the professional sector during 1964. These include such consumption items as services from physicians, dentists, attorneys, optometrists, veterinarians, accountants, architects, etc.

The average amount consumed for services in this sector was about \$109 with a standard deviation of approximately \$141. It is

expected that as the income of a household increases the amount appropriated for professional services will increase, e. g. such services as from architects, accountants, and attorneys.

The MPC at any income level is .0129, while the APC at an average level of income is .0175. The MPC is constant regardless of the income level while the APC declines as disposable income increases.

Consumption in the "Banks and Loan Agencies" Sector

Interest and other miscellaneous charges paid to banks, finance companies, credit and adjustment companies, etc. , will be accounted for in this sector. There was an average of approximately $185 spent for these purposes in 1964 with a standard deviation of $411.

The relationship of current disposable income to consumption in this area is explained by a curvilinear regression line:

$$C_b = -\$191.85 + .086 \, Y_d - .00000311 \, Y_d^2$$

where C_b is the amount consumed in the bank and loan agencies sector per household in 1964.

Since the sign of the Y_d^2 coefficient is negative the slope of this function will decrease as incomes rise. The MPC is merely the first derivative of this function as $dC_b/dY_d = .086 - .00000622 \, Y_d$. This indicates that the MPC will vary according to the level of income.

At an average level of income the MPC is approximately .047, while at an income level of $20,000 the MPC is -.038. Thus, since the MPC decreases as incomes increase and went from a positive to a negative value, there must be a level of Y_d which is associated with an MPC equal to zero, i.e., the function will have a relative maximum at this income level. The slope of this function is zero at an income level of $13,826.37. Up to this point the MPC is positive while after this level of Y_d the MPC is negative, i.e., given an additional dollar of income consumption will be reduced by less than one dollar. The result of the negative slope of the consumption function at high levels of income seems consistent. As a household's income increases it will have to borrow less money at banks and loan agencies, and also smaller charges will be due on checking account balances. At lower income levels there is a positive relation between Y_d and C_b since it is necessary for a household to have some current income in order to utilize the services from banks or loan agencies.

The APC at an average income level is .0297 and is a decreasing function of disposable income.

Consumption in the "Construction" Sector

It was concluded that no statistical relationship existed between disposable income and such consumption items as for contractor's services and the like. As was mentioned earlier, large purchases

for residence repair were not considered consumption goods, but were rather investment items. Consumption goods were considered the small expenditure items which were merely for maintenance.

There were only two households that consumed these services, so no statistical relation could be projected.

Consumption in the "Agriculture" Sector

Household purchases of shrubbery, plants, butter, milk, eggs, or meat from farms or nurseries were considered consumption goods in the agricultural sector.

It was concluded, at the five percent level of significance, that there was no relationship between disposable income and the consumption in this sector. It seems that personal preference relating to differences in product quality might have more effect on the consumption in this sector than income does. If a household prefers these items purchased from farms it will continue to purchase them irrespective of the income level it maintains, thus it is not surprising that no relationship exists between disposable income and the consumption in the agricultural sector.

Consumption in the "Household" Sector

Any payment from one household to another was included as a consumption item in this sector. For example if one household

purchased an appliance from another household, this would be entered in this sector. Another item that frequently occurred in this sector was the imputed rent, mentioned earlier. The estimated equation is:

$$C_h = \$394.92 + .063\ Y_d$$

where C_h is the amount consumed in the household sector per household in 1964.

The MPC is .063 and constant for all levels of income, while the APC is .1265 at an average income level and decreases as income increases. The average amount spent in this sector was $788.

Consumption in the "Pulp and Paper" Sector

This includes only those consumption items paid to Georgia Pacific's Pulp and Paper Mill by a household. None of the household's had purchased any consumption items from Georgia Pacific in 1964, thus no relationship between disposable income and consumption in this sector exists.

Consumption in "All Other Manufacturing" Sector

Sheet metal and dairy processing are two of the firms indicated in this sector. These firms had no sales to the household sector, thus no relationship can exist.

Total Local Consumption

This includes all consumption items previously mentioned, it is the sum of the 17 local sectors. The average amount spent per household in 1964, in the Newport-Toledo area, was \$4,849.30.

The curvilinear function was chosen as the one that best explained the data:

$$C_t = \$620.76 + .846\ Y_d - .0000202\ Y_d^2$$

where C_t is the total amount of consumption per household in the Newport-Toledo area during 1964.

The APC is .779 for an average income level, i.e., a household with a disposable income of \$6,224.50 would be expected to consume approximately 77.9 percent of its income in the Newport-Toledo area. The remaining 22.1 percent would either be saved, or consumed outside of the area. As the level of income increases the APC decreases.

The slope of the C_t function, MPC, declines as the level of income rises, as indicated by the negative coefficient of the Y_d^2 term. The value of the MPC depends on the level of income associated with it:

$$MPC = \frac{dC_t}{dY_d} = .846 - .0000404\ Y_d$$

At an average income level the MPC is .5945. This function is concave from below thus there must be a level of income associated with a relative maximum of the function. To find this point one needs to

set the first derivative to zero and solve for Y_d. The relative maximum of this function, i.e., where the MPC is zero, is at an income of $20,940.59.

At incomes larger than $20,940.59 it is expected that when given an incremental increase in income that a household would end up spending less in this area, but not as much less as the increase in income.

Three possible explanations exist for these results: First as a household has more and more income at its disposal it is likely to go to a larger city, such as Portland, Oregon, where the variety is greater, thus goods can be bought which are not available in this area. Even if the same goods are purchased the consumer has a greater choice in its selection. As a household has more money it is quite likely that more would be spent for higher education which is also a non-local expense. Second as the income level increases more is likely to be spent for insurance, which is a non-local expense. Third, as incomes ascend, more of this income might also be used for investment purposes.

Figure 5 illustrates the general form of the regression line fit to the Newport-Toledo area consumption - income relationship. The maximum, as was noted, appears at a Y_d of $20,940.59 and C_t of $9,478.63. It should be noted however, that the number of observations past an income of $20,000 is very sparse, thus not much
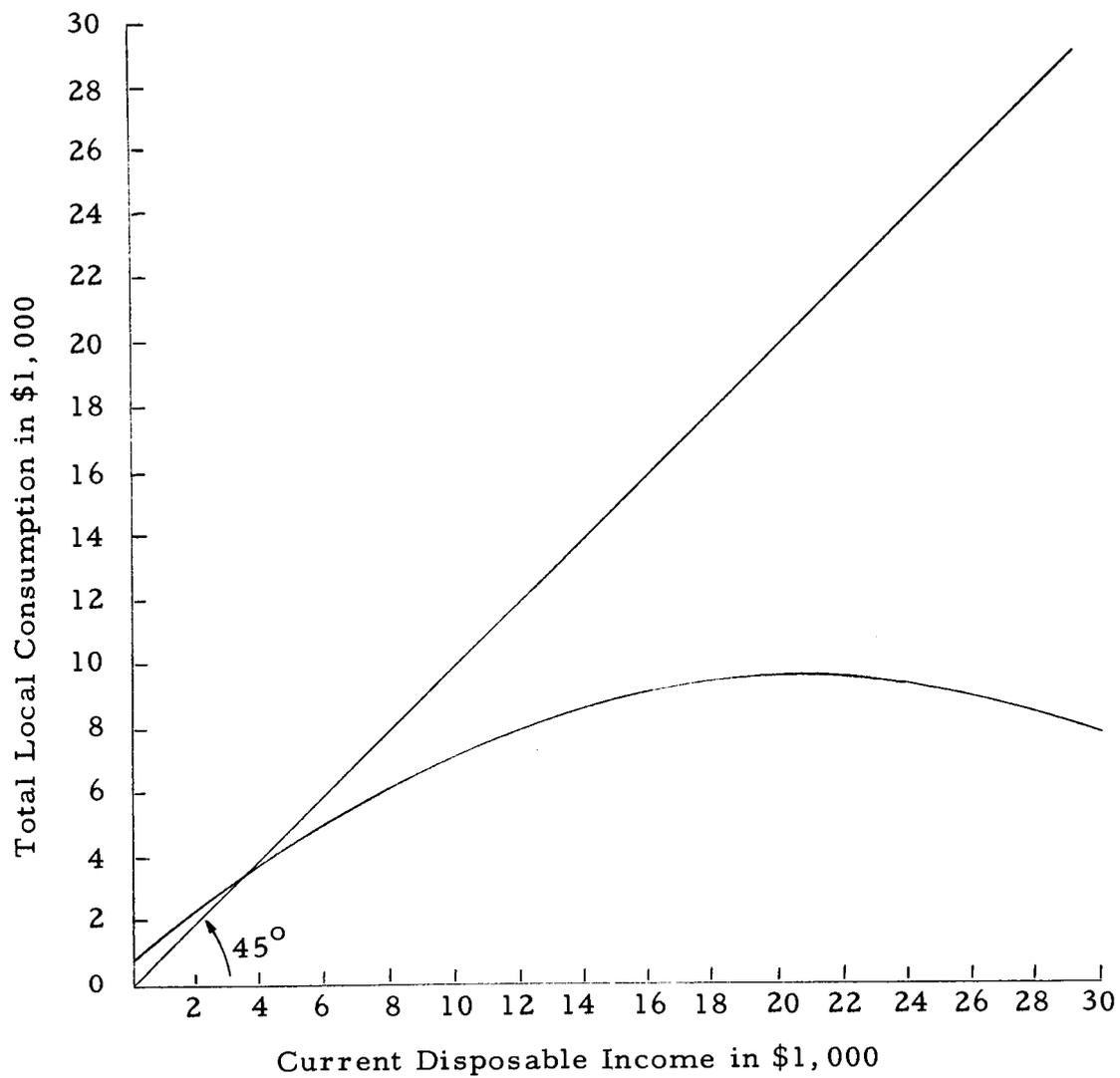
Figure 5. Relationship of current disposable income to total
local consumption in the Newport-Toledo area, 1964,
using Method I.

reliability can be placed on the relationship past this point.

The results previously discussed are summarized in Table II.

Expenditure-Income Relationship

The second relationship derived was the expenditure-income relation. This utilizes current disposable income as the independent variable, as did the consumption-income relation. But unlike the previous method this model makes use of the actual household expenditures as the dependent variable rather than only household consumption items. The imputed rent figure used in the previous model was not employed in this method. Expenditures for repair, remodeling and maintenance of the household dwelling was included in the second approach, while as was pointed out earlier only the maintenance items were considered in the consumption-income model.

The second approach was used primarily for the input-output study mentioned in the early portion of this thesis. It was of interest in that study to see the actual relation between the various sectors and the expenditures of households in the sectors. A summarization of the results is tabulated in Table III.

The results are similar to those obtained in the consumption-income method, so it will not be of benefit here to go into the same detail as before. The coefficients have different values, as would be expected using two different independent variables, but the

TABLE II. REGRESSION RESULTS, MPC, APC OF METHOD I, NEWPORT-TOLEDO, 1964.

Sector	Constant Term	Current Disposable Income Y_d	Y_d^2	Average Consumption	MPC*	APC*	Functional Form	R^2
1 Product	968.61	$.180506^{1}$ (.0236758)	--	2,092.17 (1,347.48)	.18056	.3361	linear	$.227835^{1}$
2 Service	22.4255	$.0532021^{1}$ (.00679523)		353.58 (389.14)	.0532021	.0568	linear	$.237316^{1}$
3 Lumber	--	--	--	--	--	--	no relation	--
4 Government	56.0321	$.0280998^{1}$ (.00395578)		230.94 (221.73)	.0280998	.0371	linear	$.20391^{1}$
5 Hotel, motel, etc.	--	--	--	--	--	--	no relation	--
6 Cafes & Taverns	100.845		$.0000022764^{2}$ (.0000089898)	217.80 (812.91)	.0283	.0350	curvilinear	$.0315241^{2}$
7 Marinas & Supply	--	--	--	--	--	--	no relation	--
8 Fisheries	.31069		$.00000002065^{1}$ (.00000000544)	1.37 (5.02)	.000258	.0002	curvilinear	$.0681471^{1}$
9 Automotive	213.074	$.06521^{1}$ (.0162873)		618.97 (847.06)	.06521	.0994	linear	$.0752469^{1}$
10 Communication	53.2126	$.0103825^{1}$ (.00198827)		117.84 (106.10)	.0103825	.0189	linear	$.121587^{1}$
11 Professional	28.6353	$.0128908^{1}$ (.00265871)		108.87 (140.68)	.0128908	.0175	linear	$.106608^{1}$
12 Banks & Loan	-191.849	$.0862007^{1}$ (.02084)	-.00000311195 (.000001171)	184.82 (411.22)	.047	.0297	curvilinear	$.122386^{1}$
13 Construction	--	--	--	--	--	--	no relation	--
14 Agriculture	--	--	--	--	--	--	no relation	--

TABLE II. (cont.)

Sector	Constant Term	Current Disposable Income Y_d	Y_d^2	Average Consumption	MPC*	APC*	Functional Form	R^2
15 Household	394.918	.0630885[1] (.0086835)		787.61 (489.01)	.0630885	.1265	linear	.211321[1]
16 Pulp & Paper	--	--	--	--	--	--	no relation	--
17 All other mfg.	--	--	--	--	--	--	no relation	--
Total Local	620.764	.84593[1] (.104365)	-.0000201832 (.0000058654)	4,849.30 (2,698.11)	.5945	.7791	curvilinear	.488744[1]

(Figures in parentheses are std. deviations)

*Computed at the average income of $6,224.50.

[1]Significant at the 1% level.

[2]Significant at the 5% level.

TABLE III. REGRESSION RESULTS, MPC, APC OF METHOD II, NEWPORT-TOLEDO, 1964.

Sector	Constant Term	Current Disposable Income Y_d	Y_d^2	Average Amount Spent	MPC*	APC*	Functional Form	R^2
1 Product	1,015.13	.190546[1] (.0255012)	--	2,092.17 (1,347.48)	.190546	.3701	linear	.220824[1]
2 Service	48.4689	.05753[1] (.0094006)		373.68 (484.31)	.05753	.0661	linear	.155855[1]
3 Lumber	--	--	--	--	--	--	no relation	--
4 Government	74.7196	.027638[1] (.00432684)		230.94 (221.73)	.027638	.0409	linear	.171574[1]
5 Hotel, motel	--	--	--	--	--	--	no relation	--
6 Cafes & Taverns	-25.1952	.0429904[2] (.0171571)		217.80 (812.91)	.0429904	.0385	linear	.0308859[2]
7 Marinas & Supply	--	--	--	--	--	--	no relation	--
8 Fisheries	.2534		.000000026049[1] (.000000006329)	1.37 (5.02)	.0002945	.0002	curvilinear	.0791854[1]
9 Automotive	.0002	.0716123[1] (.0174291)		618.97 (847.06)	.0716123	.1095	linear	.0789311[1]
10 Communication	53.4688	.013881[1] (.00212506)		117.84 (106.10)	.013881	.0208	linear	.127231[1]
11 Professional	28.1095	.0142885[1] (.00283909)		108.87 (140.68)	.0142885	.0193	linear	.113925[1]
12 Banks & Loan	-164.3550	.0880622[2] (.0221789)	-.00000346045 (.0000013601)	184.82 (411.22)	.048	.0327	curvilinear	.112809[1]
13 Construction	--	--	--	--	--	--	no relation	--

TABLE III. (cont.)

Sector	Constant Term	Current Disposable Income Y_d	Y_d^2	Average Amount Spent	MPC*	APC*	Functional Form	R^2
14 Agriculture	--	--	--	--	--	--	no relation	--
15 Households	--	--	--	--	--	--	no relation	--
16 Pulp & Paper	--	--	--	--	--	--	norelation	--
17 All other Mfg.	--	--	--	--	--	--	no relation	--
Total Local	699.572	.820281[1] (.110931)	-.000023046 (.0000068027)	4,346.58 (2,536.24)	.5603	.7690	curvilinear	.41655[1]

(Figures in parentheses are std. deviations)

*Computed at an average income of $5,652.39.

[1] Significant at the 1% level.

[2] Significant at the 5% level.

interpretation is still the same.

No significant relation between expenditures in the household sector and current disposable income exists while a positive relation existed in method I, between consumption in the household sector and disposable income. This is due, in part at least, to the fact that in the first method a large share of the consumption in this sector was from the imputed rent, while in the second relation no imputed rent was used.

Using the expenditure-income approach the average current disposable income in the Newport-Toledo area was $5,652.39 with a standard deviation of $3,323.13. That is to say that approximately 68 percent of the households had a disposable income between $2,329.26 and $8,975.52.

Again, functions of two forms were fitted to the data and the appropriate one chosen by the statistical method previously discussed.

V. ADDITIONAL VARIABLES IN THE CONSUMPTION FUNCTION

The third approach utilizes consumption, as defined in the first
method, as the dependent variable and allows up to four independent
variables to enter the regression equation. Table IV lists the in-
dependent variables, their means and standard deviations.

TABLE IV. INDEPENDENT VARIABLES USED IN METHOD III,
THEIR MEANS, AND STANDARD DEVIATIONS.

Symbol	Variable	Average value of variable (standard deviation of variable)
x_1	Number living in the household during 1964	3.58 (1.77)
x_3	Number of full-time wage earners in the household in 1964	.899 (.560)
x_5	Age of the head of the household in 1964	42.06 (18.04)
x_7	Current disposable income per household in 1964	$6,244.50 ($3,563.21)

The choice of the independent variable is the main difference be-
tween this method and the first approach. In Chapter II of this thesis
several theories of consumer behavior were discussed and in every
case income, in one form or another, was the variable that was cor-
related with consumption. All other factors were "held constant".
In this chapter some of these "other factors" are considered as in-
dependent variables. These are listed in Table IV. Each sector was

analyzed separately and in each case the independent variables were chosen as the ones thought to have a relationship with consumption in that particular sector. The regression equations were computed using those variables thought to be relevant.

In some of the sectors the independent variables were entered as squared terms, merely indicating that the relationship was curvilinear rather than linear. The form of the function was not determined a priori but was left to the data to dictate. The statistical procedure used in the first method was used here to determine which form explained the data better.

The remainder of the chapter is devoted to a description, on a sector by sector basis, of the variables chosen and the conclusions drawn on those sectors which utilized variables different than those used in the first method. The average amount consumed in each sector was the same as method one so will be excluded from this discussion.

Consumption in the "Product Oriented Wholesale and Retail" Sector

The two independent variables chosen in this sector were X_1, the number in the household; and X_7, the current disposable income. The regression equation is:

$$C_p = \$320.08 + .134X_7 + 263.01X_1$$

where C_p is the consumption in the product oriented sector. The

two independent variables chosen can readily be justified. It is ar-

gued that as the size of the family increases more will be spent for

food, clothing, shoes, and other household items, thus the existence

of a positive relationship between X_1 and C_p. The relationship of

X_7 to C_p has already been established.

The equation for this sector represents a linear relation between

C_p and both X_1 and X_7. If, holding X_1 constant, the level of income

of a household was changed by one dollar it is expected that it would

consume approximately 13.4 cents additional in this sector. On the

other hand if X_1 is held constant while the number of the household

is changed by one it is expected that an additional \$263 will be con-

sumed in this sector.

Consumption in the
"Service Oriented Wholesale and Retail" Sector

The same independent variables that were assumed to be signifi-

cant in the products sector were chosen in this sector, i. e. , the

number in the household and disposable income. It appears reason-

able that as the size of the household increased, more would be con-

sumed in this sector for such items as baby sitters, nurse's services,

hospital services, etc. The data from the sample supports this hy-

pothesis and the resulting equation is:

$$C_s = -\$5.099 + .049\ X_7 + 3.18\ X_1^2$$

where C_s is the amount consumed in the service sector per household.

This relationship is linear with respect to the level of income but curvilinear with respect to the size of the household. If the size of the household is held constant and the level of income is increased by one dollar then 4.9 cents additional will be consumed in this sector. If, on the other hand, the level of income is held constant and the size of the household is changed from two to three, then it can be expected that an additional \$15.90 will be consumed in this sector.

In the "product" sector the relation of consumption to household size was linear while in the "service" sector the functional relation increases at an increasing rate. This can easily be explained since as the household size increases a higher percentage of the income will be consumed for hospital services, baby sitters, etc., than would be for products.

Consumption in the "Automotive" Sector

In this sector disposable income and the number of full-time wage earners were chosen as the independent variables. If the number of wage earners increased it was thought that either more cars would be used by a household, and thus increase the expenses for gasoline, oil, auto repairs, etc., or that the same number of cars would prevail but driven more often as well as more miles. In either

case the consumption in this sector would increase.[23]

The data gives rise to the following equation, supporting the above argument:

$$C_{ss} = \$104.93 + .0499\ X_7 + 226.207\ X_3$$

where C_{ss} is the consumption in the automotive sector per household. If, on the average, the level of income is held constant and the number of full-time wage earners increases by one, then an additional $226 should be consumed in this sector.

Consumption in the "Professional Services" Sector

The main expense items in this sector are for services from doctors and dentists, thus it was thought that the level of income, the size of the household,[24] and the age of the household head were the appropriate independent variables. The equation that exhibits the relationship of these items is:

$$C_{ps} = -\$6.43 + .010\ X_7 + 14.22\ X_1$$

where C_{ps} is the consumption in the professional service sector.

It should be noted that the age variable, X_5, did not enter into the solution. This can be attributed, in part at least, to the fairly high correlation between the variables X_1 and X_5. When X_1 is

[23] This is substantiated by (28, p. 5).

[24] This is substantiated by (28, p. 6).

entered into the solution most of the variation is explained, i. e. ,
when X_5 is also included very little additional unexplained variation
is accounted for.

If the level of income is held constant and the size of the house-
hold is allowed to vary by one person, then on the average it is ex-
pected that consumption in this sector will change by $14.22.

Consumption in the "Agriculture" Sector

The independent variable chosen in this case was the size of the
household. It was observed in Method I that disposable income had no
significant relationship to consumption in this sector. A positive re-
lationship was assumed between consumption in this sector, C_{ag}, and
X_1.

The sample data supports this positive relationship and is illus-
trated in the following equation:

$$C_{ag} = \$11.05 + 1.11 \ X_1^2$$

If the household size were increased from three to four, while
the level of income held constant, then it can be expected that con-
sumption in this sector, on the average, would increase by $7.77.

Consumption in the "Household" Sector

The imputed rent discussed in Method I is the largest single con-
sumption item in the household sector category. As the size of the

household increases it will require a larger house, which can generally be assumed to rent at a higher rate, other things being equal. Thus it can be expected that a relationship between the size of the household and consumption in this sector would exist. The other independent variable chosen was current disposable income. The following equation represents this relationship:

$$C_h = \$320.25 + .0557 \, X_7 + 6.316 \, X_1^2$$

where C_h is the consumption in the household sector.

If the level of income was held constant and the household size was decreased from five to three, \$101.06 less can be expected to be consumed in this sector, on the average. If the size of the household was fixed at any level and the household's income increased by \$100, on the average it can be assumed that \$5.57 more will be consumed in this sector.

Total Local Consumption

Two independent variables were chosen as relevant for the Newport-Toledo area; the household size, and disposable income. It was believed that the consumption in the Newport-Toledo area was a function of the household size. As the size of the household increases more will be consumed in the product sector, the service sector, etc., thus there would be a positive relationship between

consumption and the household size. The computed equation is:

$$C_t = \$656.70 + .695\ X_7 - .000013\ X_7^2 + 36.95\ X_1^2$$

where C_t is the total amount consumed in the Newport-Toledo area

per household.

If the level of income were held constant and the size of the house-

hold increased from two to three then an additional $184.75 would be

expected to be consumed in this area per household, while if it

changed from four to five $332.55 additional could be expected to be

consumed. Thus, total local consumption is a function, increasing

at an increasing rate, of the household size. Now, if the size of the

household were fixed and the level of income increased from $2000.00

to $3000.00 then, on the average, $630.00 additional could be ex-

pected to be consumed in the area. If, however, the income level

changed from $10,000 to $11,000 one could expect only $422 more to

be consumed in this area. That is to say that total local consumption

is a function, increasing at a decreasing rate, of disposable income.

In Table V are summarized the results of method III and also the

R^2 of the functions. Method III illustrates that there are other "per-

tinent" variables besides current disposable income that influence

consumption. These other variables, of course, have a much smaller

effect on consumption than does disposable income. It is of interest

to have some idea of the effect of, say, the household size, on

TABLE V. REGRESSION RESULTS OF METHOD III, NEWPORT-TOLEDO, 1964.

Sector No.	Sector	Constant Term	Household Size X_1	X_1^2	No. of Wage Earners X_3	Current Disp. Income X_7	X_7^2	R^2
1	Product	320.08	263.01[1] (47.53)			.133515[1] (.02365)		.332178[1]
2	Service	-5.099		3.18[3] (1.792)		.0494858[1] (.0070756)		.249373[1]
9	Automotive	104.93			226.21[2] (114.106)	.0498955[1] (.0179183)		.0934245[1]
11	Professional	-6.43		14.22[2] (5.64837)		.0103501[1] (.00281082)		.134593[1]
14	Agriculture	11.05		1.11[1] (.346774)				.049517[1]
15	Household	340.25		6.316[1] (2.26410)		.0557073[1] (.008938)		.24144[1]
	Total Local	656.70		36.9538[1] (10.3541)		.694572[1] (.108623)	-.0000134[2] (.0000059218)	.523653[1]

(Figures in parentheses are std. deviations)

[1] Significant at the 1% level.

[2] Significant at the 5% level.

[3] Significant at approximately the 15% level.

consumption.

Does the inclusion of additional variables, in the consumption function significantly reduce the unexplained variation in consumption? Method I was compared to Method III and tested if the R^2 of Method III was significantly larger than the R^2 of Method I, by the use of the F-test:

$$F = \frac{\left[\left(\begin{array}{l}\text{Regression Sum of}\\\text{Squares of Method III}\end{array}\right) - \left(\begin{array}{l}\text{Regression Sum of}\\\text{Squares of Method I}\end{array}\right)\right] \div \begin{array}{l}\text{Degrees of}\\\text{Freedom}\end{array}}{\left[\left(\text{Total Variation}\right) - \left(\begin{array}{l}\text{Regression Sum of}\\\text{Squares of Method III}\end{array}\right)\right] \div \begin{array}{l}\text{Degrees of}\\\text{Freedom}\end{array}}$$

(8, p. 728)

The results of the above test are presented in Table VI with the level of significance indicated. It was concluded, in every case, that Method III significantly reduced the unexplained variation in consumption when compared to Method I, at the level of significance indicated.

TABLE VI. METHOD III COMPARED TO METHOD I, THE R^2, AND LEVEL OF SIGNIFICANCE, NEWPORT-TOLEDO, 1964.

Sector	R^2 Method I	R^2 Method III	Level of Significance
Product	.227835	.332178	1%
Service	.237316	.249373	8%
Automotive	.0752469	.0934245	5%
Professional	.106608	.134593	5%
Agriculture	no relation	.049517	-
Household	.211321	.24144	1%
Total Local	.488744	.523653	1%

VI. SUMMARY AND CONCLUSIONS

Summary

The objective of this thesis was to examine the relationship between consumption and income, the consumption function,[25] for the Newport-Toledo economy. Other variables, however, were also used and their relation to consumption determined.[26]

Many have contributed their hypotheses as to the existence of a relation between consumption and income. Keynes (17), who was the first to state explicitly that consumption is a particular function of income, asserts the hypothesis that consumption depends primarily upon real income. All other determining factors are given and held constant. Keynes states a fundamental "psychological law" that "men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income" (17, p. 96).

Duesenberry (11) states that the savings rate depends not on the level of income but on the relative position on the income scale, in his "relative income hypothesis." Friedman (13), on the other hand, says that incomes tend to fluctuate from period to period while

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[25]The consumption variables in this function may have several definitions, as shown in Chapter IV of this thesis, but will still be referred to here as a consumption function.

[26]This was computed in Chapter V.

consumption exhibits more stability. From this he argues that consumption must depend more closely on the average income over a number of periods, rather than the current income in any given period.

In this thesis current disposable income was used as the independent variable in the consumption-income relationship.[27] This study used family consumption data.

The empirical basis of this study was furnished by the Yaquina Bay Area located in Lincoln County, Oregon. The economy was segregated into 17 sectors and information was sought concerning the relation of the household sector to the other sectors. For this reason a separate consumption function was obtained for each sector and one for the total local consumption.

A sample of inhabitants was chosen and personally interviewed to determine their income and the corresponding amount of consumption in each of the sectors for the year of 1964.

Conclusions

The results of this analysis fall into three main categories: the income-consumption relationship, the income-expenditure relation, and the relation between several independent variables and consumption. .

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[27]Except in Chapter V where three other variables were used along with disposable income.

Income-Consumption Relation

The regression in this method had two variables: current disposable income as the independent variable, and household consumption as the dependent variable.

Of the 17 sectors three exhibited a curvilinear relation between income and consumption, seven had a linear relation while another seven were assumed to have no relation. These are listed in Table IV.

The equation computed for total local consumption was:

$$C_t = \$620.76 + .84593\ Y_d - .0000202\ Y_d^2$$

where C_t is the total local consumption per household. The average level of income in this area was approximately \$6,224.50. At this average income the marginal propensity to consume, MPC, was .5945, and the average propensity to consume, APC, was .779. Both the MPC and the APC decrease in value as the level of income is increased.

The estimated total income in this economy for the year 1964 is \$27,319,330.50,[28] using the definitions employed in Method I.

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[28]This was obtained by the formula: $\hat{Y} = \bar{y} \cdot N$, where: $\hat{Y}$ is the predicted value of the total income in the Newport-Toledo economy for 1964; $\bar{y}$ is the average disposable income per household estimated from sample data; and N is the estimated number of households in the Newport-Toledo area.

Income-Expenditure Relation

The independent variable for this method is current disposable income exclusive of any imputed rent value. The dependent variable is current annual expenditures for 1964. This is the only difference between the two methods. This method was derived primarily for the input-output matrix being constructed.

The results by using this method were quite similar to those of the first method, these are summarized in Table V. The average amount spent per household in this area in 1964 was $5,652.39, thus giving an estimated total income of $24,808,339.71 using actual expenditures for 1964.

Additional Variables in the Consumption Function

The third method used current household consumption as the dependent variable. The independent variable was chosen, from a list of four, for each sector individually. The four possible variables were: the size of the household, the number of full-time wage earners, the age of the household head, and current disposable income.

This method differs from Method I only in those sectors which had an independent variable different than just current disposable income. Six such sectors were found to exhibit a significantly different relation. The equation derived for the total local consumption was:

$$C_t = \$656.70 + .695 \, X_7 - .0000134 \, X_7^2 + 36.95 \, X_1^2$$

where X_7 is current disposable income and X_1 is the size of the household.

In all three methods the variables were related by the method of least squares to fit the regression line.

Limitations

Some limitations of the type of the study done in this thesis might be in order at this time. The use of cross-sectional data, as was stated earlier, may tend to underestimate the marginal propensity to consume (10, p. 79). It has been shown that if families are divided according to income groups, the lower income groups will contain a large portion of families whose incomes have recently fallen, while the higher income groups contain a large portion of families whose incomes have recently risen. Since it takes time to adjust to these income changes, and some of these changes are only temporary, the measured level of consumption for the low income groups would be higher than would exist in the long-run, while the measured consumption levels of the higher income groups will be lower than would be true in the long-run. Thus, a cross-sectional consumption function using a relative short period of time will tend to make the observed consumption function less steeply sloped than the "true" consumption function. This problem might be eliminated by using

time-series data, or even a combination of time-series and cross-sectional data. Future studies in this field might well draw a sample of inhabitants from a cross-section of the population and re-interview every year for a number of years, thus eliminating the problems associated with cross-sectional data while at the same time testing the hypothesis that consumption is primarily related to some measure of long-run income or wealth rather than to current income, as used in this thesis.

Another limitation that might be associated with the consumption study in this thesis is the use of the small area of Newport and Toledo. Conclusions based on this area don't take into consideration the surrounding areas which are certainly affected by the household decisions in the Newport-Toledo area. It would be of interest for future work in regional consumption analysis to compare results in small areas that have different population characteristics to the results computed in the Yaquina Bay area. Also it might be of benefit to compute the household "consumption" outside the regional area, in this way one could then estimate the effects on the remaining areas.

Several biases may have occurred in the results of this thesis due to non-responses, refusals, incompleteness of the questionnaire, inability of respondents to estimate the expense items in the desired detail, etc. As with any questionnaire the one used in this study had some weak points. Two expense categories were excluded, that for

appliance repair and that for trailer space rental. The questionnaire failed to specify where the amount was spent for the house payments and miscellaneous rent items. More detail was needed in four questions; the medicine and drugs should be separated from the hospital services, house repair and improvements should be separated from mere maintenance items, the processing of fish and game should be separated, and car sales should be specified as to where made. Most of these difficulties were overcome either at the time of the interview or by calling the respondents at a later date.

As far as biases occurring from respondents not being able to estimate their actual behavior are concerned, Ferber has this to say:

> As a rule, expenditures tend to be understated somewhat, income tends to be understated more, and saving tends to be understated most of all. Such errors are not uniform among different households or among population groups, . . . their influence on estimates of expenditures for population groups is essentially an unknown quantity (12, p. 54).

It should be noted that the results of this study undoubtedly contain the biases listed above, to some degree, but it is thought that their presence is not too serious on the conclusions that can be drawn. The use of the professional marketing research firm for the collection of the data has kept these biases to a minimum.

One more suggestion might be in order at this time. In Chapter V of this thesis additional variables were entered into the consumption function and their significance computed. The list of variables

used is by no means exhausted, many other variables could be con-

sidered in this relationship especially if time-series data was utilized.

Further studies in this field should consider many other variables,

as well as those stated, and determine their effect.

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APPENDIX

Appendix TABLE I.   SEVENTEEN SECTORS, NEWPORT-TOLEDO, 1964.

1. Other product oriented wholesale and retail

2. Other service oriented wholesale and retail

3. Lumber

4. Government

5. Hotel, motel, trailer parks

6. Cafes and taverns

7. Marinas and marine supply

8. Fisheries

9. Automotive

10. Communication, transportation, including shipping

11. Professional services

12. Banks and loan agencies

13. Construction

14. Agriculture

15. Household

16. Pulp and paper industry

17. All other manufacturing

Appendix TABLE II.   INTERVIEWS ATTEMPTED, COMPLETED,
REFUSED, AND NON-RESPONSES FOR THE
NEWPORT-TOLEDO AREA, 1964.

Area	Attempted*	Completed*	Refused	Non-responses
Newport precinct #1	20	14	4	2
" " #2	17	13	0	4
" " #3	19	17	1	1
" " #4	15	13	2	0
" " #5	13	8	4	1
" " #6	11	9	0	2
Toledo precinct #1	10	9	1	0
" " #2	10	8	1	1
" " #3	10	10	0	0
" " #4	18	14	0	4
Rural map #1	52	47	2	3
" " #2	22	18	2	2
" " #3	23	19	2	2
Totals	240	199	19	22
Percent of total	100	83	8	9

*Three questionnaires were not used in the analysis because
business expenses could not be separated from consumption.   These
columns do not include those questionnaires.

(Field Survey Questionnaire)

OREGON STATE UNIVERSITY   9/24/65

Hello, I'm _____ from Oregon State University. We're work-
ing on an interesting public opinion survey about household items and
would like to ask you a few questions if you don't mind. Promise I'm
not selling a thing. All information is confidential and we don't even
take names.

1- _____ Number	The first question is: Including yourself, how many persons are now living in this household? (Thank you)
2- _____ Number	Next, may I ask how many full-time wage earners there are in this household?
2a _____ Type _____ Industry _____ Type _____ Industry _____ Type _____ Industry	What type of work does the chief breadwinner in the family do? (INTERVIEWER: If there are other full-time wage earners in household, record occupations on second and third set of lines.)
3- _____ Years/Mos.	How long have you, yourself, lived in the general Newport-Toledo area? (INTERVIEWER: Label clearly in terms of years and/or months)
4- _____ Income group (INT: Record letter and income)	Now, I have some questions about household budgets and expenses. This, of course, involves income, too. Will you please look at this card and tell me which bracket best fits the total gross income of all persons in this household in 1964. Just call your answer by letter, please. (USE WHITE CARD)

Will you please give us your best estimate of how much of your 1964 income was spent for various things, and whether it was a local or non-local expense. On this card is a definition of what we mean by local and non-local (HAND BLUE CARD). Please include any expenditures you made for gifts, but not business expenditures - just those for the household.

5- 1 Own (Skip to 5c)   Before we get started, let me ask
   2 Rent (Continue with 5a)   you whether you own or rent the
                                 place in which you are now living?

        Local   Non-Local   What was your monthly rent in 1964?
                                 If you rented a garage, please in-
5a _____ _____   clude that, too.

5b _____ _____   Did you pay this rent to an individual,
                                 a bank, a company, or someone
                                 else?

_____To Whom Pd.   (INTERVIEWER: Identify to
                                 whom rent paid)

_____

(INTERVIEWER: On all of the following items, make sure you have
               a notation opposite each question. If no amount was
               paid, write in "none" and make explanation if you
               think it will clarify the situation.

_____

       ASK QUESTIONS 5c, d, e, and f of HOME OWNERS ONLY

       Local   Non-Local   What were your monthly payments
                                 in 1964 for your house (house trail-
5c _____ _____   er)? Please do not include any in-
   House___ ___Trailer   surance or taxes that might have
                                 been included in the amount you sent
                                 in. Just give us the (principal)
                                 payment on your house alone. (INT:
                                 Indicate whether house or house
                                 trailer)

5d _____ _____   What was the average interest
                                 charge on your monthly house pay-
                                 ments in 1964? (Just your best
                                 estimate?)

5e _____ _____   About how much did you pay per
                                 month in 1964 for insurance cover-
                                 age on your house?

	Local	Non-Local	
5f	_____	_____	What were the approximate monthly taxes on your home in 1964. (Include license fee if trailer)

ASK REMAINING QUESTIONS OF EVERYONE

6- _____ _____   Did you pay any rent for a food locker or storage space in 1964? (If YES) What was monthly amount?

7- _____ _____   What was your average monthly expenditure for heat and electricity in 1964?

8- _____ _____   What about telephone and telegraph - what was your average monthly expenditure in 1964?

9- _____ _____   What did you pay per month in 1964 for garbage removal or collection? (INT: If paid on other than monthly basis, break down into monthly)

10- _____ _____   What about your monthly payments in 1964 for water and sewage? (INT: Break down into monthly payments if necessary)

11- _____ _____   What was your average monthly expenditure in 1964 for gas and oil for your car(s)? Do not include any business expenses - just gas and oil expenses for your personal use.

12- _____ _____   About how much did you spend per month in 1964 in food and grocery stores - for food, drinks and tobacco? Please include any store purchases you might have made while on vacation or recreation trips.

13- _____ _____   How much did you spend per month in 1964 for food and drink which you consumed in cafes, taverns, bars and restaurants. Again, include expenditures at these places while on vacation or recreation trips.

	Local	Non-Local	
14-	_____	_____	How much, if any, did you spend per month in 1964 for bottle liquor purchases?
15-	_____	_____	Not counting interest, did you have any bank charges in 1964, such as for a safety deposit box, on checking account, etc. - any monthly amount you paid for these things to a bank?

Now, for the next items, will you please give me your approximate YEARLY expenditures.

	Local	Non-Local	
16-	_____	_____	About how much, if any, did you spend in 1964 for hospital bills? Include any medicines or drugs which you used in the hospital.
17-	_____	_____	How much did you spend last year for medicines and drugs used by your household outside of the hospital?
18-	_____	_____	How much did your household pay in 1964 to doctors, surgeons, dentists and optometrists?
19-	_____	_____	How much did your household pay in 1964 for other professional services, such as to an attorney, architect, accountant, veterinarian, etc. ?
20-	_____	_____	How much, if any, did you pay in 1964 to such people as carpenters, painters, plumbers and the like for home repairs and improvements. Do not include any amounts made directly to a general contractor.
21-	_____	_____	How much, if any, did you pay to a contractor in 1964 for home repairs or improvements?

	Local	Non-Local	
22-	_____	_____	How much, if any, did you spend for materials used in home improvements or repairs in 1964 - any materials your household bought directly from a hardware store, lumber yard or similar place. Please include materials only - not any amount for your own labor.
23-	_____	_____	Did you happen to make any contributions in 1964 to churches, charities, the United Fund or similar drives? (If YES) What was the total amount?
24-	_____	_____	How much, if any, did you pay in 1964 for dues to fraternal or social clubs - clubs such as Elks, Masons, Kiwanis, etc.?
25-	_____	_____	Did you make any interest payments in 1964 to any bank or loan agency? (If YES) What was the total amount of such interest?
26-	_____	_____ _____To whom made	Did you make any other interest payments in 1964? (If YES) How much, and to whom were they made?
27-	_____	_____	How much did you pay in 1964 for licenses for cars or other motor vehicles, which were for the private use of your family? (Do not include any licenses for business purposes)
28-	_____	_____	Did you pay anything in 1964 for other licenses, such as hunting, fishing or a driver's license? (If YES) What was the total amount?
29-	_____	_____	Not counting house or car insurance, how much did you pay in 1964 for such things as life insurance and health insurance? (Those insurance payments which continue year after year)

	Local	Non-Local
30-	_____	_____

How much did you spend in 1964 for insurance on car(s), motor vehicles, boats, or similar things? Do not count insurance paid for business purposes)

31-	_____	_____

How much, if any, did you pay in personal property taxes in 1964 for something other than your house? This could be a boat or other personal belongings.

32-		_____

What was the approximate total amount which your household paid in 1964 for federal and state income taxes?

33-	_____	_____

How much did you pay in 1964 for clothing and shoes for all those in your immediate household? The approximate total amount.

34-	_____	_____

About how much did you pay in 1964 for laundry and dry cleaning?

35-	_____	_____

How much did you spend in 1964 for services by a barber, beautician, tailor or shoe repairman - the total amount for all members of your household? (Include beauty shop expenses)

36-	_____	_____

How much did your household spend in 1964 for such recreational items as bowling, motion pictures, swimming and so on?

37-	_____	_____

How much, if any, did your household spend in 1964 for such things as boat moorage, marine supplies and repairs, or for chartering boats?

38-	_____	_____

How much, if any, did your household spend last year for hunting, fishing, camping or similar equipment?

	Local	Non-Local
39-	_____	_____

39- Did your household spend anything in 1964 for fish or game processing? (If YES) About how much?

40- (Non-Local: _____) How much, if any, did your household spend in 1964 for hotels, motels, or rental or apartments or house trailers away from home? Do not include business expenditures.

41- Did you make any expenditures for vacation, travel or other recreational items in 1964, which you haven't already given us? (If YES) What would be the total amount?

42- How much, if any, did you spend in 1964 for baby sitters?

43- How much did you spend in 1964 on communications and transportation items, such as newspapers, magazines, TV cable, taxis, railroads, airlines, busses, etc? Again, do not include business expenditures.

44- What amount, if any, did your household spend on jewelry and flowers in 1964?

45- Payments for stationery in 1964?

46- What about postage stamps and mailing expenditures in 1964. No business expenses, please.

47- Any payments in 1964 for personal services, such as a maid, nurse or house cleaner?

48- How much, if any, did you spend in 1964 for such items as shrubbery or plants, or for purchases from farms of such things as butter, milk, eggs or meat? For such purchases from nurseries, farms or farm stores?

Local   Non-Local

49- _____   _____

On the next three items, I'd like to get the <u>purchase</u> price of the item - not the amount paid in 1964. First, let's take home furnishings and appliances. What was the total <u>pur</u>chase price of such items in 1964, less any allowance or trade-in you might have gotten?

50- _____   _____

Less any allowance or trade-in, what was the total purchase price of cars or other motor vehicles bought in 1964. Just those for your private use.

51- _____   _____

What was the total amount of any repairs or maintenance on your car or other motor vehicles, which you had done in 1964?

52- _____   _____

Earlier in the questionnaire we talked about renting a home, food locker or, possibly, a garage. Can you think of anything else you paid rent for in 1964? (If YES) What was the approximate total rent for these items in 1964?

_____ _____ (Total only)

_____

_____

_____

_____

_____

_____

_____

Just one more item - this time on education. How much educational expenditure, if any, did you make in 1964. This would include expenditures for such things as tuition, board and room, books, allowances and school equipment? For this one, will you please tell me about how much you spent for each item? (INTERVIEWER: Write in amount and item. This breakdown need not be made for non-local expenditures.)

Now, are there any other expenditures you made in 1964 that you can think of for items we may not have mentioned? (If YES, list item below at right, with expenditure at left.)

Local	Non-Local		Item
_____	_____		_____
_____	_____		_____
_____	_____		_____
_____	_____		_____
_____	_____		_____

_____Phone number of respondent (for verification only)

X I hereby certify this interview was actually taken with the person
described below and represents a true and accurate account of the
interview.

1 Male   1 Under 30 years age
2 Female   2 30 - 39
                 3 40 - 49
                 4 50 - 59
                 5 60 or over

_____
Address or RFD #

_____
City or Town

Date of Interview: Sept. ___, 1965

FOR OFFICE USE ONLY: Interview verified by:_____

Date of verification: _____, 1965

INSTRUCTIONS FOR INTERVIEWING WITH RURAL ROUTE MAPS

_____ Route

_____ Quota (Check off each interview as
                                            taken on line)
_____ Listing

Instructions for Interviewing

Obtain your first interview in the house nearest to the blue circle on
the map. In some cases, it will not be possible to pinpoint the exact
location. That is, there may not be a house in that general location.
In this case, just follow the route of the red arrow and obtain your
first interview in the first house on the route to be followed.

Now, follow the red arrow and make an interview at _every_ fourth
dwelling unit you come to until you have completed your quota of in-
terviews (the number of interviews specified at the top of the sheet).
If no one is at home in a household, you should list it and make two
call-backs, continuing in this fashion until your quota has been filled.
Some houses or farms, of course, will not be on the main road and
you may have to drive (or walk) up a sideroad to get to the house. It
is important that you do not miss any houses or farms on the route
you are following. If a house is set back from the road, interview
there, just as you would in a house by the side of the road or high-
way. When you have the required number of interviews, discontinue
interviewing whether you have traveled the entire course, or not.

If, by some chance, you have covered the entire red-marked route
and do not have the specified number of interviews, contact your
supervisor and another route will be given to you.

Note: In an isolated case, it may be that the red-marked route is
        not a road, even though the map shows it to be. If this should
        occur, stay on the same road, interviewing at every fourth
        D. U. , until you come to a junction that will take you on the
        prescribed route.

INSTRUCTIONS FOR INTERVIEWING - PRECINCT AREA METHOD

As an interviewer in an impartial, objective survey conducted by an independent research organization, you have the responsibility of obtaining your interviews in a manner that will guarantee complete absence of interviewer bias. Each block and dwelling unit where you are assigned interviews is part of a scientific cross-section of the city's or town's population. You <u>must</u> interview in those places. Each interviewer's questionnaires are tabulated separately, and call-backs made to addresses listed on the completed forms. Please give us 100% accuracy. Thank you.

Where to Interview

You have been given a map or a map cutout of a certain area. Notice that some blocks have been shaded in red. You will interview only in those blocks that are red-shaded. An arrow points to the block in which you will start interviewing. Obtain your first interview in the

_____. You will then work your way clockwise around the block or segment, interviewing at every _____ dwelling unit.

If no one is at home in a household, you are to list it and then make up to two call-backs if necessary. If, after two call-backs they are still not available, you may forget them and fill your quota by continuing on the prescribed route.

<u>IMPORTANT!</u> There may be alleys or other small side streets in a block or segment which are not shown on the map. In this case, count the houses in the alley(s) just as you would the houses or apartments on the main streets.

Now, work your way from one red-colored block or segment to another, following a logical sequence through the area. Do not start counting over again in each block, but <u>maintain your counting interval from one red-colored block to another.</u> Thus, if the last house in one red block were the fourth, the first house in the next red-colored block would be the fifth.

Follow these instructions until you have obtained the number of interviews specified on your quota sheet. If, by some chance, you have gone around all red-colored blocks or areas and do not have the required number of interviews, continue as before on the blue-colored

blocks or areas taking these blocks as they are numbered, i. e. , start with blue block #1 and then if needed go to #2.

Vacant Blocks

There may not be dwelling units in one or two of the blocks which have been assigned. This is perfectly all right. Simply skip them and mark on the map the blocks which contain no dwelling units. Such blocks could be entirely vacant or they could contain a school, a factory or individual business concerns. If part of a block contains a business district and dwelling units, you must include the residential area in your counting and sampling.

All interviews must be taken in the home.

NOTE: A dwelling unit is a place of residence. Each house - or each apartment or room - which has an individual entrance, a name card, mail box or doorbell, is one dwelling unit. In other words, each place where one or more persons live together as one household is one dwelling unit. But, stores, offices, places of business and transient hotels or motels are not dwelling units - unless it looks as though someone also lives there permanently. Once in awhile, you will find a dwelling unit attached to a store, tailor shop, or other business.

Whom to Interview

You may interview either the man of the house or the woman - whichever one can give the best answers.

DO NOT INTERVIEW:

1. Transients and visitors in the home,

2. Persons under 21 years of age (unless married and have own household)

3. Domestic servants,

4. More than one person in a family.