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HOUSEHOLD DEMAND FOR LEISURE ACTIVITIES: READING AND TV-WATCHING

by

LIH YING H. YOUNG

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1977

This manuscript has been read and accepted for the Graduate Faculty in Economics in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

6/2/77
date

Michael Grossman
Chairman of Examining Committee

6/2/77
date

Herbert Peyer
Executive Officer

Malcolm Galatin

Michael Grossman

Elliot Zupnick
Supervisory Committee

The City University of New York

ABSTRACT

HOUSEHOLD DEMAND FOR LEISURE ACTIVITIES:
READING AND TV-WATCHING

by

Lih Ying H. Young

Adviser: Professor Michael Grossman

This study attempts to analyze household demand for leisure activities, particularly reading and TV-watching. A household demand model has been constructed by combining the traditional demand theory and recently developed economic theories on consumer behavior. The household is considered as a consumption and production unit. The value of time and its efficient allocation have been emphasized. To maximize utility, a household will seek the optimal allocation of both time and money income. It has been demonstrated that neglecting the time element in consumption will result in bias of estimates such as income elasticity.

The empirical data are mainly from a national survey of reading activities conducted by Response Analysis Corporation in 1971. The data on the activities of reading newspapers, magazines, books and mail, as well as TV-watching, are available. We have focused our study on married families, using a total of 2,300 observations

with complete data sets. Regressions have been estimated for each of the reading activities, as well as total reading, and TV-watching for each group, categorized by race, sex, employment status and activity period. The distributions of the amounts of time spent in each reading activity and TV-watching have been discussed.

The factors affecting the demand for reading and TV-watching are analyzed. Generally speaking, a negative price effect of wage or time value has been found, especially for males on weekends. Judging from the estimated effects of nonwage income, reading is found to be a normal good, while TV-watching is an inferior good. The demand elasticities with respect to wage rate and nonwage income for reading and TV-watching have been found to be not very elastic, or even inelastic.

Other factors are also found to have significant effects on the demand for reading and TV-watching. They include education, life cycle represented by age and age-square, family structure such as family size and children's ages, regional factors such as urbanization and unemployment rates, and housing factors such as dwelling unit, house and neighborhood conditions and dwelling type. Their actual effects vary with categories. In general, education plays an important role in household behavior for all groups under this study. Among the factors chosen for family structure, number of preschool children has the most impact on the demand under this study, especially for females.

Regional factors have less impact on TV-watching than on reading. Finally, it has been found that household behavior depends also on life cycle and housing factors.

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Finally, I would like to acknowledge the patience and understanding of my husband, Kan Hua. My two children, Albert and Janice, also made my graduate study possible, due to their excellent cooperation.

CONTENTS

LIST OF TABLES

Regression Results of Demand for Reading and TV-watching, by Category, Cross Section, USA, 1971 (I_o = Family Income)

I. INTRODUCTION

The Household As a Production and Consumption Unit

There have been many economic studies about labor force participation and the allocation and efficiency of labor in the market (e.g. 17, 33).[1] In most of these studies, leisure in general was regarded as the residual of total time available minus market work time. But recently, housework has been emphasized as nonmarket production in the economy (20, 32). The family constitutes a unit of household decision among choices of market work, household production and leisure. Consequently, household activities have received more attention from economists.

Leisure Activities and the Scarcity of Time

Professor Becker advocated the full income consumption theory (5). Professor Linder pointed out the increasing scarcity of time relative to market goods in the economy (29). They implied that individual consumption shifts toward goods-intensive commodities and away from time-intensive commodities as wage rate and income increase. However, we frequently observe that individuals in the high income class spend more time than the poor in activities such as golfing, which are very time consuming. Educated women, supposedly with higher wage rates than the less

1. All references are cited by the numbers in bibliography.

educated, spend more time in rearing their young children, which is also time consuming (27). In order to better understand the demand for various household activities, the factors affecting these activities have to be studied closely. Some economists have analyzed the time allocated by parents to market work, some housework and child-related activities, for example laundry (20, 24) or outdoor recreation (1). In this paper, leisure activities will be analyzed by applying economic theories. Because of the availability of survey data, we will limit our study to the activities of reading and TV-watching.

Leisure Activities and the Use of Mass Media

The marginal monetary costs of these two leisure activities, that is reading and TV-watching, are low, compared with many other activities, especially since television ownership has reached such a high saturation rate.[2] But they are very time intensive. It was observed that television changed the allocation of people's leisure time. In particular, it had the effect of keeping families at home, instead of outside the home, for leisure activities. Educated people are expected to read more than the less educated, but other leisure activities may be good

2. Virtually all inhabited parts of the United States are within reception range of a television signal, and 96% of all homes have a television set (7, 9).

substitutes for reading.[3] To what extent reading and TV-watching are influenced by economic factors, such as wage rate and nonwage income, as well as other factors, will be examined in this study.

Scope of Study

The present study employs an economic approach to analyze factors affecting the demand for two important leisure activities, reading and TV-watching. The economic approach combines the traditional theory of consumer behavior, Lancaster's new approach to consumer theory and Becker's theory of the allocation of time. The household is considered as both a consumption and production unit. Time value and the efficient allocation of time will be emphasized. This approach is more general than the traditional theory. No longer is the individual's choice determined solely by relative prices of market goods. To maximize utility, a household will seek the optimal allocation of both time and income. With increased income, substitution may occur by shifting from market work to leisure activities, and from household production to leisure activities. If the increase of income is associated with a wage increase, the shift may be from leisure activities and

3. It was found that generally TV-watching had been substituted for some reading by all people, regardless of levels of education (7, 8, 9).

household production to market work.[4]

This study attempts to identify the factors which influence the demand for leisure activities. A household demand model will be constructed. In addition to socio-economic variables such as wage rates, nonwage income and education, other variables will also be considered. They include demographic variables such as life cycle, race and sex; family structure[5] including family size and ages of children, regional factors represented by urbanization and unemployment rates and housing factors. Since time values may vary with market work hours and employment status, we attempt to analyze separately the leisure activities on weekdays and weekends for people who are employed and those who are not employed in the market. Finally, each activity (reading magazines, newspapers, books and mail, as well as their total, and TV-watching) will be investigated separately.

Data and Methodology

The data for our empirical study are mainly from a national reading survey conducted by Response Analysis Corporation in 1971 (36, 37). The data on the activities of reading newspapers, magazines, books and mail and on TV-watching, are available. We shall concentrate our study

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4. The negative income elasticities often observed for family size can be partly attributed to higher time costs in rearing children, due to wage increases (5).
5. Some economists suggested that the factor of children raises the shadow price of time of mothers and their efficiency of household production (27, 32).

only on married families. Since the survey does not provide complete data for our study, some variables will be imputed, and some will be obtained from other sources.

Multivariate regressions will be estimated with the use of computer programs. We will utilize the SPSS statistical package which incorporates simple multiple regressions and stepwise regressions, using raw data or a correlation matrix. It allows users to specify some statistical criteria for variables to enter the regressions (34).

This thesis consists of five chapters, with three appendices and a bibliography. After the introduction in Chapter I, Chapter II will be devoted to a theoretical discussion of the demand for leisure activities. It incorporates the traditional demand theory and the new economic theories. A theoretical economic model will be presented. The factors of household decision making will be discussed. Chapter III will present an empirical model and statistical procedures. The available data and the imputed variables for our estimation will be described. Chapter IV provides the findings of our empirical analysis. The distributions of the amounts of time spent on reading and TV-watching by different groups and the empirical estimation results on various factor effects will be investigated. The results for different groups will be compared. Chapter V provides a summary of our study and some conclusions and remarks. Finally, the bias of traditional estimate resulting from neglecting the time element will be provided

in Appendix A. Supplementary empirical results of regressions and matrices of simple correlation coefficients among independent variables will be provided in Appendices B and C, followed by a bibliography.

II. THEORETICAL DISCUSSION

Traditional Demand and New Economic Theories

Traditional economics states that a consumer's demand for a commodity is a function of prices and money income. Since tastes and preferences differ among consumers, the shapes of indifference curves and consumer's preference maps for the same commodities may vary. A rational consumer is assumed to maximize his utility when he allocates his income on goods. Utility maximization is characterized by the condition that the marginal rates of substitution between goods equal the price ratios. The optimal commodity basket allows the consumer to maximize his utility subject to his income, or budget constraint, as it is traditionally called, and the prices of the commodities.

Income elasticity of demand is defined as the percentage change in quantity demanded relative to the percentage change in income. Income elasticity of demand may be positive or negative. If positive, the commodity in question is called a normal good ;if negative, an inferior good. If its absolute value is greater than unity, the demand is defined as elastic; if less than unity, it is inelastic. The effect of price change can be decomposed into substitution effect and income effect. If good X is a normal good, its income effect will increase the purchase of X when its price falls, and hence reinforce the substitution effect. If X is an inferior good, the income effect will take the

direction opposite to the substitution effect.

Following Professor Lancaster's new approach to consumer theory, a consumer may derive utility from various activities he has engaged in, which we also call commodities, instead of market goods themselves (26). Hence, his utility function should be defined over those commodities instead of market goods. The equilibrium condition in this case implies that the marginal rates of substitution among commodities equal the ratios of the monetary costs of the commodities. The demand functions for various commodities depend on not only the prices of market goods, but also consumption technology.

Traditionally, consumption was considered as a consumer's behavior without a time constraint, while leisure is defined as nonwork (versus labor work in the market). Professor Becker's theory on the allocation of time suggests that the time spent in consumption should be introduced into a consumer's decision. The time and money costs of consumption vary with commodities. Some commodities with low money costs may have high time costs, and vice versa. With both money income and time constraints, an individual's response to a given change in money price or income will be different from his response when time was a free good . Individuals feel differently regarding their time and money income constraints. People with high income may feel that the real constraint is time; while to the low income class, money income is the constraint. In this situation, a

consumer's utility is maximized when the marginal rates of substitution equal the ratios of costs on real constraint. In other words, if money is the real constraint, the equilibrium will be at the point where marginal rates of substitution among commodities equal price ratios of goods for those commodities. Otherwise, if time is the real constraint, the equilibrium point will be where marginal rates of substitution equal the ratios of time costs of those commodities.

Alternative to this approach, consumption can be regarded as a process in which time and goods are combined. The traditional concepts of leisure and consumption are special cases in which leisure consists entirely of time, while the consumption of commodities consists entirely of goods. Professor Becker's concept of "full income" suggests meaningful resource constraints. It incorporates the substitution of market goods for time, and the substitution of monetary income for nonmonetary commodities. The full income is disposed of either by spending money income on market goods or by spending time on commodities through foregone earnings. The theory can be applied to various activities, work or nonwork. The equilibrium is at the point where marginal rates of substitution equal the cost ratios among commodities. It should be pointed out that the cost of each commodity now consists of both time cost and money price of goods for consumption. The demand functions for consumption now depend on the time cost and

consumption technology, in addition to money prices of goods and income.

According to the full income approach, the composition of full income (i.e. wage income, nonwage income and non-market work hours) has a significant effect on consumption patterns. Demand depends on the compositions of full income. If total income were constant, an increase in earnings would have only substitution effect. Unemployed people have more incentive than the employed to consume time-intensive commodities, such as TV-watching. This is because unemployed people not only have lower money incomes, but also have lower foregone earnings, which implies a relatively low value of time and low full cost of time-intensive commodities.

Traditional study of consumption, which disregards the time costs of commodities, will result in biased estimates of various measures such as income elasticity, as demonstrated in Appendix A. The direction and magnitude of the bias depend on the cross price elasticities or the substitutabilities or complementarities among commodities, the relative shares of commodities in total consumption, share of household member's time in full costs of commodities and the share of earnings in full income.

Traditional consumption theory refers to the individual consumer. Recently, the household has been recognized as a unit of consumption as well as production in the economy. The utility function of a household should be defined over

all the commodities which household members consume. These commodities consist of the consumption of goods with varying degrees of time intensities. The full income and time costs now involve all household members. With the extension of the theory of consumer behavior to the household, it may be stated that a household will allocate its time and money income among commodities so that the household obtains maximum utility. The equilibrium will be at the point where marginal rates of substitution among commodities equal their cost ratios. Now the costs of commodities include time costs of all household members, as well as money costs of goods. For simplicity, we consider only the time spent by husband and wife, and income earned by them.

Let the household utility function and production function be

$$U = U(Z_1, Z_2, \ldots, Z_n) \tag{1}$$

and

$$Z_i = F_i(X_i, T_{iM}, T_{iF}, Y_i), \quad i=1,2,\ldots,n \tag{2}$$

where Z_i= quantity demanded for commodity i

X_i= market goods input for Z_i

T_{iM}, T_{iF}= time inputs of husband (male) and wife(female)

Y_i= level of technology, which affects the productivity or efficiency of production

$F_i(.)$= production function of Z_i, to be distinguished from the demand function.

Total time available for a household member is

$$T = T_k = \sum_{i=1}^{n} T_{ik} + N_k, \qquad k=M,F \tag{3}$$

where T = total time available for any household member, husband or wife

N_k = market work hours of member k

k = M or F for husband (male) or wife(female), respectively.

All $Z_i, X_i, Y_i, T_{ik}, N_k \geq 0.$ (4)

The full income constraint can be expressed as

$$I^* = \sum_{i=1}^{n} (p_i X_i + w_M T_{iM} + w_F T_{iF})$$

$$= w_M T + w_F T + I_o \quad (5)$$

where p_i = price of a unit of X_i

w_M, w_F = wage rates of husband and wife, respectively

I_o = nonwage income of the household

I^* = full income of the household.

Thus the Lagrangian equation for the household utility maximization can be written as

$$U^* = U(Z_1,\ldots,Z_n) + \lambda(w_M T + w_F T + I_o - \sum_{i=1}^{n} (p_i X_i + w_M T_{iM} + w_F T_{iF})) \quad (6)$$

where λ = Lagrangian multiplier.

The necessary first order conditions for maximizing the household utility are

$$\partial U^*/\partial Z_i = u_i - \lambda \pi_i = 0, \qquad i=1,2,\ldots,n \quad (7)$$

where $u_i = \partial U/\partial Z_i$

$\pi_i = p_i(dX_i/dZ_i) + w_M(dT_{iM}/dZ_i) + w_F(dT_{iF}/dZ_i)$,

= the shadow price or marginal cost of Z_i.

and $\partial U^*/\partial \lambda = w_M T + w_F T + I_o - \sum_{i=1}^{n} (p_i X_i + w_M T_{iM} + w_F T_{iF}) = 0$ (7b)

= full income constraint.

Eq. (7a) implies that the marginal utility of any Z_i for a unit of expenditure (in full income or full cost sense) equals the marginal utility of income:[6]

$$\lambda = u_i/\pi_i = u_j/\pi_j, \qquad i,j=1,2,\ldots,n. \tag{8}$$

The marginal rates of substitution among commodities are

$$u_i/u_j = \pi_i/\pi_j, \qquad i,j=1,2,\ldots,n. \tag{9}$$

It should be pointed out that, by definition, the full income constraint can also be expressed as

$$\begin{aligned} I^* &= \sum_{i=1}^{n} Z_i (p_i(X_i/Z_i) + w_M(T_{iM}/Z_i) + w_F(T_{iF}/Z_i)) \\ &= \sum_{i=1}^{n} Z_i (p_i x_i + w_M t_{iM} + w_F t_{iF}) \\ &= \sum_{i=1}^{n} c_i Z_i \end{aligned} \tag{10}$$

where $x_i = X_i/Z_i$

$t_{iM} = T_{iM}/Z_i$

---

6. $\partial U^*/\partial X_i = (\partial U^*/\partial Z_i)(\partial Z_i/\partial X_i) = 0.$

$\partial U^*/\partial T_{ik} = (\partial U^*/\partial Z_i)(\partial Z_i/\partial T_{ik}) = 0.$

Since $(\partial Z_i/\partial X_i), (\partial Z_i/\partial T_{ik}) > 0,$

hence $\partial U^*/\partial Z_i = 0.$

This is consistent with our necessary conditions represented by Eq. (7a).

$$t_{iF} = T_{iF}/Z_i$$

$$c_i = p_i x_i + w_M t_{iM} + w_F t_{iF}$$

= the average cost per unit of Z_i.

If the production function is linear homogeneous in X_i, T_{iM} and T_{iF}, the shadow price or marginal cost of Z_i equals its average cost, that is:

$$\pi_i = c_i. \tag{11}$$

From equilibrium conditions, the demands for various commodities, Z_i, can be expressed as functions of the elements in the equilibrium equations, that is, nonwage income, wage rates of husband and wife, prices of X's and technologies of consumption and household production:

$$Z_i = Z_i(I_o, w_M, w_F, Y_i, p_i\text{'s}). \tag{12}$$

When prices of market goods are assumed to be constant, the functions become

$$Z_i = Z_i(I_o, w_M, w_F, Y_i). \tag{13}$$

This model will be the basis for our empirical study.

Note that in this model, Z_i can be the consumption of goods purchased from the market directly for consumption or goods produced by the household. Although X_i, T_{iM}, T_{iF} and Y_i are interpreted as scalers for simplicity in the text, they can be vectors of goods, time and other relevant variables respectively.[7]

---

7. Assume that there are n commodities and m market goods. For each unit of commodity Z_i, it requires inputs of a (cont.)

Variables

The selection of variables for our empirical study was based on economic theories: that is, based on a relationship between the quantity demanded for various leisure activities and income, costs of commodities, factors affecting the productivity or efficiency of production or consumption, such as human capital stocks, and the substitutes of commodities. The variables finally chosen are: nonwage income, wage rates representing time cost, human capital stocks including levels of education, life cycle measured by age and age-square, family structure including family size and children's ages, regional factors such as urbanization and unemployment rates, and housing factors. Race and sex will be given appropriate attention by analyzing their cross-classified subgroups separately.

---

7. (cont.)
column vector of market goods, x_i^m, with a row vector of prices, p^m, such that

$$x_i^m = [x_{i1}, x_{i2}, \ldots, x_{im}]$$

$$x_{ij} \geq 0, \qquad i=1,2,\ldots,n; \quad j=1,2,\ldots,m$$

$$p^m = (p_1, p_2, \ldots, p_m).$$

The average cost of a unit of Z_i equals

$$c_i = p^m x_i^m + w_M t_{iM} + w_F t_{iF}.$$

A consumer's full income constraint becomes

$$I^* = \sum_{i=1}^{n} Z_i (p^m x_i^m + w_M t_{iM} + w_F t_{iF}).$$

The equilibrium conditions can be expressed similarly as those shown in the text.

Since market workers may work on different schedules and the values of time vary, we will pay some attention to this on our empirical study. In practice, we will study the leisure activities of reading and TV-watching separately on weekdays and weekends for whites and blacks, males and females, and for those employed and not employed in the market.

Socio-economic Variables

Nonwage Income

Income is expected to be an important factor influencing leisure activities and other consumer behavior. This is simply due to various expenses for purchasing goods and for participating in leisure activities. Traditional economic theory considers leisure time as a normal good. Thus an increase in income will increase the individual's demand for leisure time. If leisure activities under our study are normal goods, the income effects will be positive. Otherwise, if they are inferior goods, the income effects will be negative.

Income consists of two parts: wage income and nonwage income. Wage income is based on wage rate, which will be discussed in the next section, while nonwage income will be considered here. When nonwage income increases, a family is able to enjoy more market goods and leisure activities, if they are noninferior goods, and spend less time in market work and household services, because of the disutility involved in work. Activities with consumption

of final goods will be increased with the increase of nonwage income. Although an increase in income may allow the household to purchase more intermediate goods from the market for household production, the household members would spend less time in certain household services. For the consumption of commodities related to certain household production, the effect of nonwage income can be negative. On the whole, in symbols, we have

$$\partial Z_{ik}/\partial I_o \gtrless 0, \qquad i=1,2,\ldots,n, \quad k=M,F. \qquad (14)$$

Wage and Time Costs

A large amount of time is used by a household in preparation, travel and actual participation in various activities. Low monetary costs of the market goods required for some leisure activities should increase the relative importance of their time costs, all other things being equal. Ignoring time costs in these activities may lead to biases in various estimates, such as income elasticity.

In addition to the money price of market goods for a commodity, wage rate can be used as a measure of time cost. The higher the wage rate, the more expensive the time spent on that commodity. Thus, with higher wage rate, a consumer tends to substitute goods-intensive commodities for time-intensive commodities. He will adjust his allocation of time to various commodities so that the value of his time

for all uses is equal to his wage rate,[8] assuming goods and time inputs of all commodities are substitutable.

As pointed out by Professor Linder (29), consumers may increase the yield of time in consumption by several methods: (1) multipurpose consumption in an activity, while time and goods inputs remain essentially the same (e.g., a conference during eating time); (2) simultaneous consumptions in many activities at the same time(e.g. enjoying food and entertainment at the same time); (3) successive consumption in which consumers enjoy many commodities, one at a time, each for a shorter period; (4) goods-intensive consumption. If time and goods inputs are not required in fixed proportions for an activity, more goods can be substituted for time; thus greater goods-intensity can be obtained. Then the consumer's utility per unit of time may be increased, and so will the total utility of that consumption. The demand for the commodities with which consumers can increase the yield of time through the above methods can be expected to increase relatively more than the demand for other commodities, when income and wage rates increase.

Increased wage and income over the past decades in the United States have been accompanied by shorter workweeks for market workers (23, 45). It seems that the income effect of a wage change outweighed the substitution effect.

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8. $\partial U^*/\partial T_{ik} = \partial U/\partial T_{ik} - \lambda w_k = 0.$
$\partial U/\partial T_{ik} = \lambda w_k.$

However, an alternative explanation may be possible. Productivity has increased in various productions. Due to new products (for example, electric appliances), many consumer activities require less time than ever before. Higher productivity in consumption enables the full price or cost of commodities to fall and substitution is induced, which causes a fall in work hours. Income effect due to a fall in the cost of commodities will induce an increased demand for consumption in general. The magnitude of impact on work hours and consumption of commodities depends on the income elasticity of the demand for commodities. If the demands for time-intensive commodities are more elastic, this leads to relatively more time for consumption and less time for work.

Changes in wage rates have income and substitution effects. The income effect is equal to the effect of a change in nonwage income, as described in the last section, and the pure substitution effect can be expressed as

$$S_{w_s}^{Z_{ik}} = \partial Z_{ik}/\partial w_s - N_s^*(\partial Z_{ik}/\partial I_o), \qquad k,s=M,F \quad (15)$$

where $S_{w_s}^{Z_{ik}}$ = pure substitution effect of a change in member s's wage rate on member k's Z_{ik}

N_s^* = member s's equilibrium level of market work hours.

By substitution effect, an increase in a member's own wage rate will induce a shift to more market work, and less

leisure activities and household services. Thus we have

$$S^{Z_{ik}}_{w_k} < 0. \tag{16}$$

The effect of a change in a member's own wage rate on leisure activities and household production will be greater, the more time-intensive the commodity Z_i is. This is simply because the time cost and so the overall costs of Z_i increase more than those of other commodities. Assuming that consumption of Z_i is more time intensive than Z_j, then we expect that, other things being equal,

$$\partial Z_{ik}/\partial w_k < \partial Z_{jk}/\partial w_k < 0, \quad i,j=1,2,\ldots,n. \tag{17}$$

In the case of a change in a spouse's wage rate, the cross substitution effects can be of any sign, depending on whether the time of husband and wife are complementary, independent or competitive in participating in those activities:

$$S^{Z_{ik}}_{w_s} \lessgtr 0, \quad k \neq s, \quad k,s=M,F. \tag{18}$$

Human capital stock

An individual's human capital stock, including knowledge and health, certainly affects his productivity or efficiency of production and consumption in the use of time and goods. Efficiency due to higher human capital stock reduces the time and money costs of production and consumption. If all leisure activities were normal goods and human capital had a commodity-neutral impact on each

commodity (i.e. productivities raised by the same percentage), then the effects of human capital will all be positive. Otherwise, if the impact of human capital is not commodity-neutral, the relative prices of commodities would change, which might cause a substitution effect and income effect in opposite direction. The effect of human capital on the demand for a commodity thus depends on the magnitudes of these two effects, and we have

$$\partial Z_{ik}/\partial H_k \gtrless 0, \qquad i=1,2,\ldots,n; \quad k=M,F. \tag{19}$$

Speaking of income effect, in general, the time involved in leisure activities may rise, remain constant or fall, depending on income elasticities $E_{iI} \gtrless 1$. In the case where a leisure activity is considered to be a luxurious good, the time spent on that activity would rise, since its income elasticity is greater than unity, and vice versa. Only if all leisure activities have income elasticities greater than unity, or the income elasticities are positively correlated with time intensities, would the total time for all leisure activities rise, and the market work hours be reduced.[9]

Human capital stock usually involves mental and physical investment and their stocks. Since our model

9. Professor Becker discussed this in his article (5). However, if total time of leisure activities is fixed, and if leisure activities exhaust nonmarket activities, then they could not all have income elasticities greater than unity.

does not consider investment in human capital, we will only consider the existing stocks. However, human capital stock itself is not easily measurable, and its data are not readily available. In general, human capital stock can be represented by the stock of knowledge and skill and physical condition or health. Knowledge and skill are usually represented by education, which raises the efficiency of production and consumption. Physical condition can be improved by education and medical care, but depreciates at an increasing rate after a certain age (22). A consumer's behavior influenced by age is often called the life cycle. In our empirical study, education and life cycle will be considered as factors affecting household activities. Life cycle will be discussed in more detail later, under the section on demographic variables; education will be discussed here.

Education

Education raises an individual's efficiency of production in both market and household production (32). It permits a consumer to complete a given leisure activity in less time. This will help to offset the relatively higher cost of time for the more educated. Thus, more leisure activities can be enjoyed by the more educated than by the less educated, given the same market work hours. A good example of the relationship between education and the efficiency of using time is reading. Since reading is a

time-intensive activity, it tends to be more expensive for the more educated, who have higher wage rates, in terms of full cost. But the more educated can read more rapidly, and so can read a given amount of materials in less time. Considering these opposite effects, it appears that, for more educated people, the effect of increased efficiency predominates and their reading increases.[10]

In addition to the use of time, an increase in education may also lead to more efficiency in the use of market goods. It has the effect of lowering the cost of market goods inputs, and hence the overall cost of the commodity to the consumer. This will induce him to consume more goods-intensive commodities.

The level of education measured by years of schooling is expected to be positively correlated with human capital stock. Its effects are expected to be similar to those outlined in human capital stock and Eq. (19) above.

Demographic Variables

Life Cycle

As mentioned before, a consumer's activities depend partly on his physical condition, which in turn is influenced

10. With further education, reading speed may increase at a diminishing rate after some point. When reading efficiency will not fully compensate for the increased cost of the time involved, reading may decrease with further education.

by his stage of life, or life cycle. Some activities require strenuous effort, while others do not. Some leisure activities, such as reading and TV-watching, require large amounts of time, low money inputs and very little effort. Almost everyone can engage in these activities, except those with serious handicaps (e.g. persons with severe vision problems). For some people, particularly older ones, physical restrictions can be an important factor in preventing them from many outdoor activities. It may involve disutility in preparing for and actually participating in those activities, due to various physical conditions.[11] The demand for some leisure activities requiring more physical effort will be positively correlated with physical conditions, and vice versa.

Life cycle is frequently quantified in terms of age or age period. The effect of age on the demand for commodities can be positive or negative, depending on the type of commodities:

$$\partial z_{ik} / \partial A_k \gtrless 0. \qquad (20)$$

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11. This perhaps will explain partly why the higher income class would participate in time consuming activities, which require quite a physical effort. Higher income class not only have higher income for better medical care, but also likely to have higher education and better knowledge to maintain good health. Thus their physical restriction and disutility of effort in those activities can be reduced.

Since health tends to depreciate after a certain age, the variables of both age and age-square (A, A^2) will be used. It allows the demand for commodities to vary with the life cycle. For simplicity, we have

$$Z_{ik} = a_o + a_1 A_k + a_2 A_k^2 . \qquad (21)$$

While coefficient a_1 indicates the change in Z_{ik} due to a change in variable A, coefficient a_2 indicates the rate of change is increasing, constant, or decreasing with age. According to this specification, it is possible that the demand for a commodity increases up to a certain age and then decreases, and vice versa. The maximum or minimum of the demand for Z_{ik} with respect to life cycle is determined by

$$dZ_{ik}/dA_k = a_1 + 2a_2 A_k = 0, \qquad (22a)$$

depending on

$$d^2 Z_{ik}/dA_k^2 = 2a_2 \lesseqgtr 0. \qquad (22b)$$

In examining the effect of lify cycle, we should take into account the effects of both variables A and A^2. However, in empirical study, there may be some activities which are linear functions of either variable A or A^2, but not both. In this situation, the demand for the activities will increase or decrease with age monotonically, depending on the signs of its coefficients.

Race and Sex

Although some activities are performed by family members together, sex difference should account for a

significant part of the variation of consumer behavior. Women engage in household activities more than men. In the labor market, relatively more women than men work on a part-time instead of a full-time basis. In addition, men and women frequently participate in different activities. This may involve traditional value judgements and natural physical conditions. Thus sex should be taken as a variable affecting the demand for various commodities. Alternatively, leisure activities of men and women (males and females) should be analyzed separately. This latter approach is employed in this study.

Race, like sex, should also account for some variation of the demand for various activities, due to apparent differences in their habits and value judgement, etc. Thus, leisure activities of whites and blacks will also be studied separately.

Family Structure

It has been observed that women, unlike men, enter the labor force relatively young, but most cease to work, at least for a time, because of child-rearing. After their children are in the upper grades of school or older, they may go back to market work. The length of their absence from the labor market varies with the variables used in this study.

Family structure, including family size and children's ages, certainly influences a household's behavior,

particularly the woman's, in the allocation of time and money. It may be inconvenient to travel with small children, but older children are usually more independent. There may exist economies or diseconomies of scale with respect to family size in housework, leisure activities and consumption of commodities (e.g., economies of scale in laundry and cooking). Therefore, family size and children's ages will be included in the explanatory variables in this study. For simplicity, children will be categorized as preschool, preteen and teenager.

Regional Factors

Different regions have different commercial and amusement facilities and different market situations, such as unemployment rates and substitutes of commodities. Urbanized regions supply more varieties of amusement, entertainment and other recreational or commercial facilities. Due to the demonstration effect, they also change people's tastes toward these activities. Rural areas, on the other hand, have fewer varieties of those facilities. If rural families utilize the facilities in urbanized areas, their costs will be higher than the costs for urban families. This is because of the longer distance and travel time for the rural families, which will lead the rural families to allocate more time to homebound activities. Furthermore, work hours are longer in the agricultural sector than in the non-agricultural sector, although the work hours have

generally been reduced in the United States (23). Thus, urbanization will influence the allocation of time among various activities for households.

Unemployment rates not only reveal the possibility of work in the market, they also affect people's attitude and choices between market work and household activities. The unemployment rate affects people's attitudes in allocating their time and money income toward various commodities. Therefore, we will consider it as an explanatory variable in estimating demand function.

Housing Factors

The condition of a house or dwelling unit and its neighborhood can be important in influencing household activities and the allocation of time. The size of a dwelling unit and its characteristics may reflect the needs and the tastes of a household, which influence the demand for commodities. The condition of the neighborhood may involve "keeping up with the Joneses." For instance, people in a more affluent neighborhood may spend more time in keeping their lawns and yards in good shape. Households in single-family houses are more likely to own the houses they live in, while those in multifamily houses or apartments are less likely to do so. Homeowners may have more desire to maintain or improve their houses, while tenants have more time to engage in other activities.

In our empirical study, housing factors will be

included as explanatory variables. The dwelling or housing factors can be categorized into H_1 to H_4 as follows:

H_1 = dwelling size measured as number of rooms in a house

H_2 = neighborhood condition rated from 1 to 7, from the least to the most desirable place to live respectively

H_3 = house characteristics rated from 1 to 7, indicating those housing units from the most run down to the finest in the area respectively

H_4 = dwelling type from 1 to 3 for a multifamily house such as apartment, a two-family house and a single-family house respectively.

It should be pointed out that the numbers assigned to the housing factors in our empirical study are opposite to the survey classifications. Our purpose is to indicate that households in the better dwelling and neighborhood categories are assigned a higher number.

Activity Period and Employment Status

We know that consumer activities are affected by their values of time, which in turn vary with their work hours and employment status. The institutionalized hours of work are usually not available for leisure activities. In addition, market workers work on different schedules. The lower income class and blue collar workers work relatively more in market on weekends than the high income class. Some

activities can be engaged in for short periods of time (e.g. card games in the evenings), while others require much more time (e.g. weekend trips). Thus, leisure activities may vary with the days of the week. In our empirical study, we will investigate leisure activities categorized into weekdays and weekends separately.

The value of time may vary greatly, depending on employment status. Unemployed people (and perhaps married women not employed in the market) not only have lower money incomes, but also have lower foregone earnings. This implies a relatively lower cost of time and thus a lower full cost of time-intensive commodities. Therefore, the unemployed may have more incentive to consume time-intensive commodities than those employed in the market. In our empirical study, we will examine leisure activities separately according to employment status, i.e. employed and not employed in the market.

III. METHODOLOGY OF EMPIRICAL ESTIMATION

This chapter outlines the economic model for our empirical estimation and analysis. The data and imputed variables such as wage rates will be discussed in more detail. Statistical procedures will follow.

Empirical Model and Estimation

According to the theoretical discussion of the economic model and the relevant variables in Chapter II, our empirical model for the study of the demand for leisure activities can be written as

$$Z_{ik}=Z_{ik}(w_M,w_F,I_o,S_M,S_F,A,A^2,N,C_1,C_2,C_3,U_1,U_2,H_1,H_2,H_3,H_4), \quad i=1,2,\ldots,n; \quad k=M,F \tag{23}$$

where w_M, w_F = wage rates of husband and wife respectively

I_o = nonwage income of household

S_M, S_F = educational levels (or years of schooling) of husband and wife respectively

A, A^2 = age and age-square of respondent

N = family size, including parents and children

C_1, C_2, C_3 = children factors: number of preschool, preteen or teenager respectively[12]

U_1, U_2 = urbanization and unemployment rates respectively for region where respondent lives

12. Teenagers include children in seventh grade or higher, but aged 15 or younger.

H_1, H_2, H_3, H_4 = housing factors representing dwelling size, neighborhood condition, house characteristics and dwelling type respectively.

The model will be employed to study leisure activities for different groups categorized by race, sex, activity period and employment status; i.e. whites and blacks, men and women, weekdays and weekends, and employed and not employed in the market. Regressions will be estimated separately for each of the groups, using the amount of time spent in each activity of reading and TV-watching as the dependent variable. (Reading includes magazines, newspapers, books and mail.)

Due to the lack of data on wage rates and educational levels of spouses, we will not examine their effects in our empirical analysis. Among the factors in family structure, by definition, $N = C_1 + C_2 + C_3 + 2$. In order to avoid a singular matrix which will cause the impossibility of matrix inverse in computing regressions, we have omitted variable C_3, the oldest children, since teenagers are considered to be the most independent of parents' activities. Since there are zero values in dependent and independent variables, their transformation into logarithmic values will be $-\infty$, which will make computation of loglinear regression impossible. Hence, all regressions in this study will be linear, using natural values without transforming them into logarithmic values. It should be mentioned that variable A^2 has been scaled down by dividing its original values by 100, in order

to make its magnitudes comparable with other variables.

Data and Sources

Survey Data

The data employed for our empirical study are cross sectional. They are mainly from a national survey conducted by the Response Analysis Corporation (36). The survey questionaire was developed jointly by RAC and Educational Testing Service. The details of the survey are described in The Questionaires and Methodology of Reading Activities Survey issued by RAC (37). The survey employed a national probability sample and completed 5,067 interviews from April to November 1971. The survey sampled persons of age 16 and over of the household population of the conterminous United States, which conforms to the definitions used by the Bureau of the Census. Each respondent was interviewed about the reading activities of one full day. Random samples were designed to cover weekdays as well as weekends on a systematic basis. The daily subsamples enable us to analyze leisure activities on weekdays and weekends separately.

Since the survey interviewed one person per sample household, the sample would favor small households. Therefore, weights were used to compensate for selection. The weights that compensated for this selection system were inversely proportional to the probability of selection. Since the respondents' information has not been verified,

the possibility of error should not be overlooked. The errors may be due to respondents' forgetting, interviewers' recording error, or other distortion of information.

The survey also provides data on socio-economic variables such as respondent's own earnings, family income and educational level; demographic variables such as race, sex, age and marital status; respondent's employment status, family structure, living location and environment. For our empirical estimation, income and wage rate are deflated by an index of cost of living by state or subregion, which will be discussed later in the section on other data and sources.

The data used in this study cover the samples of married families, including married men and women, whites and blacks, but excluding students, the self-employed and disabled respondents. Students are excluded because they have obligations(attending school and studying) in addition to the choice between work and leisure; our model does not consider the allocation of time to investment in human capital, and consequently is not directly applicable to students. Self-employed people usually work longer hours. Their work and leisure habits have been found to be quite different from other employees (23). Therefore, they are excluded from our study. Disabled respondents (e.g. people whose eye problems are more serious than simply wearing eye glasses) are excluded due to their disability, which results in a limitation of their choices in both market work and leisure activities. Since this study focuses on household

behavior, the data used for our analysis will be limited to families consisting of a husband and wife, and any children. Single adult families and families of non-married adults will also be excluded, since their behavior may be quite different from regular families.

The body of data actually used in our empirical study constitutes a more homogeneous sample than the original data available. Yet it covers a wide range of socio-economic backgrounds. The sample can be categorized into groups by race, sex, activity period and employment status. This will be explained later in a section on classification of sample.

The data on reading include the amounts of time spent daily on reading magazines, newspapers, books and mail, as well as materials related to job etc. Since our study focuses on leisure activities, only reading for pleasure on the first four items is included in this study. Reading done at work or on job-related materials is excluded. However, some reading which is included as reading for pleasure may also be job-related, especially for some professionals. It is difficult to distinguish between them. Since each of these four reading activities may have different impacts by various factors, we attempt to analyze them separately, as well as in total.

As to the data on TV-watching, the survey provides the amount of time spent on TV-watching on a daily average for the last several days preceding the interview. Since no

magnitude of abnormal watching is provided, the empirical results will be interpreted as when normal occurances are obtained.

Other Data and Sources

The survey data provide respondent's location of living. We categorized them by state and subregion. Then the urbanization and unemployment rates, as well as an index of cost of living by state or sub-region can be assigned to each observation. The urbanization rate used in this study is the ratio of urban population relative to total population in each state in 1970, as defined by the Bureau of the Census. Its data are provided in the Statistical Abstract or Census of Population (13, 14).

The unemployment rate by state, as defined by the Department of Labor, is the ratio of unemployed population, 16 years old and over, relative to the total labor force in each state in 1971. These data are also obtained from the Statistical Abstract.

The index of cost of living, used to deflate wage and income variables, is constructed for sub-regions in each state. The Statistical Abstract provides data on the annual cost of intermediate budgets[13] for four-person families in 1970 for metropolitan areas, as well as averages for

13. Includes family consumption, personal income and social security taxes, occupational expenses, gifts and contributions and basic life insurance, etc.

urban and nonmetropolitan areas. For some areas where the data are not available, averages of urban and nonmetropolitan areas are assigned to them according to their urbanization. For instance, rural areas are assigned the average of nonmetropolitan areas, while urban areas are assigned the average of urban areas. We then use the average for nonmetropolitan areas as a base of 100 percent. All other figures are divided by the base figure to obtain an index, which is then applied to our observations of different regions.

Imputed Variables

Unfortunately, the survey and other data sources described above do not give all the information that we need for empirical estimation. Some variables such as wage rate and nonwage income need to be imputed, or they have to be represented by some appropriate measures.

Wage Rates

The survey provided wage rates (hourly, weekly or monthly) directly only when the respondents did not give the figures of their own earnings. For a large portion of observations, the wage rates were obtained by dividing the respondents' earnings by the reported work hours. However, for people not employed in the market, neither earnings nor wage rates can be arrived at by this method. The other method is to substitute the wage rates of people

with similar backgrounds,e.g., women with similar education and socio-economic status. This can be done by regressing the wage rates or earnings of people employed in the market on a set of appropriate variables by race and sex. Then the resulting regressions can be used to predict the wage rates or earnings of other people whose data are not observed. For our particular case, where market wage rates, earnings and work hours are unobservable, particularly for married women not employed in the market, we may consider variables regarding personal characteristics such as race, sex, age and education, as well as variables regarding market conditions such as urbanization and unemployment rates of regions, etc., as explanatory variables. This is an attempt to extend Cain's concept of potential earnings capacity, which imputes wage as a function of education and occupation (10).

It should be mentioned that in our empirical regressions, wage rates are in terms of dollars per hour, while earnings and incomes are in terms of thousands of dollars per year.

Nonwage Income

Although the survey provides the data on family income and the respondent's own earnings, there is no way to find family nonwage income. Therefore, for the variable of nonwage income, we have to find some substitutes. First, we assume that nonwage income is related to family income.

Next, we consider that the difference of family income minus respondent's earnings may be a relevant proxy for nonwage income. In our empirical study, family income and its difference from respondent's earnings will be used alternatively as an explanatory variable representing nonwage income. In our empirical estimations, earnings and family income will be in terms of thousands of dollars per year.

Statistical Procedures

The present study utilizes the computer facility of Princeton University and the SPSS statistical package. The statistical package incorporates multiple regressions and stepwise regressions, using either raw data or correlation matrices. The regression coefficients so obtained indicate the net effects of each independent or explanatory variable, holding the influence of other variables constant. In addition to the estimated coefficients, the statistical results will also include t-values or standard errors of estimates, F-ratios and R-squares, which are used to evaluate the explanatory power of each variable and equation. With stepwise regression, the program provides information on the effect of each independent variable entering regression. This assists in identifying the contribution of each independent variable to the model.

The SPSS statistical package allows users to specify some statistical criteria for variables to enter regressions (e.g., the number of independent variables to enter, or the

criteria of F-ratio for a variable to enter). Since we are more interested in economic factors such as wage rate and nonwage income, and some other more significant variables, we specified that both wage rate and family income (or family income minus respondent's earnings alternatively) always enter the regressions, while other variables are allowed to enter the regressions only if they pass the criteria F = 1.64, which is close to a commonly used value of F = 1.50. It is equivalent to saying that t = 1.28 for a variable to be significant at .20 level for a very large sample. However, there was no guarantee that all variables which entered the regressions would yield coefficients at significance levels of .20 or better. This is because the regression subprogram of SPSS provides only forward stepwise inclusion. Independent variables are entered only if they meet certain statistical criteria. The subprogram does not delete variables that no longer meet the pre-established criteria in later steps.

IV. EMPIRICAL RESULTS AND ANALYSIS

Classification of Sample

According to our description of variables, we obtain a total of 2,300 observations with complete data. The observations have been grouped by race, sex, activity period and employment status, as shown in Table 1. Each group has an abbreviated name in parenthesis, with the first two letters standing for race and sex; the last three letters for activity period of weekday or weekend; and the middle letter for employment status, i.e. employed or not employed in the market. For instance, WFEEND refers to weekend activities of white females employed in the market, and BFNDAY refers to weekday activities of black females not employed in the market. Note that in the table, males are all employed in the market, since males not employed in the market are not in our analysis due to their extremely small sample sizes. Therefore, we omit the middle letter for males; e.g. weekday activities of white males would be WMDAY. For our later analysis, the abbreviated names, instead of full names, will be used.

All together there are 11 groups in this study. It can be seen from the table that the first four groups are for males, the next four groups for females employed in the market, and the last three groups are for females not employed in the market. Note also that the group of black females not employed in the market for the weekend activity

period is not included in our analysis, due to the very small sample size. The numbers of observations for different groups are shown in the last column of the table. The sample sizes of blacks, females and weekends are relatively smaller than whites, males and weekdays respectively. The largest group, WMDAY, in this study has a sample of 702 complete observations, while the smallest group, BFEEND, has only a sample of 14 observations, which is perhaps too small to yield very meaningful statistical results.

Empirical Results

Table 1 provides the distributions of the amounts of time spent in reading and TV-watching, including means and standard deviations (S.D.) by category, i.e. by activity, race, sex, employment status and activity period. For each category, regressions have been estimated with I_0 (family income) and separately with I_0' (family income minus respondent's earnings) as an alternative independent variable to represent nonwage income. Generally, regression results with either variable substituting for nonwage income are not obviously better than the others. This is perhaps due to high correlations between variables I_0 and I_0'. Since I_0' does not quite make sense for females not employed in the market, only empirical results of regressions with I_0 will be discussed in the text. The empirical results of regressions with I_0 (family income) are presented in Tables 2 through 12. The regression results with I_0' (family income

minus respondent's earnings) are provided in Appendix B.

Each table is prepared for all activities of reading and TV-watching for each separate group. Estimated coefficients and the corresponding t-values, as well as constant terms and R^2's, are provided. The elasticities of demand for reading and TV-watching with respect to wage rate and income are also provided, if the corresponding coefficients are significant.[14]

The R^2's of our empirical regressions are quite high for blacks, especially for females employed in the market, where they are as high as .85 for BFEEND on newspapers and .99 for BFEEND on mail. For whites, the R^2's are usually much lower. For white females, the R^2's are similar for those employed and not employed in the market. But for black females, the R^2's are much lower for those not employed in the market than for those employed. Generally, R^2's vary because of sample sizes or degrees of freedom. They tend to be smaller for larger samples or degrees of freedom, and vice versa.

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14. Since the regressions are run on natural values, the elasticities of demand for Z_i with respect to an explanatory variable Q_j should be calculated as

$$E_{ij} = (\partial Z_i/\partial Q_j)(Q_j/Z_i) = b_{ij}(Q_j/Z_i)$$

where b_{ij} is the coefficient of variable Q_j in the regression of Z_i. Elasticities at the means can be calculated, using b_{ij} and the mean values of Z_i and Q_j.

Amounts of Reading and TV-watching

The distributions of the amounts of time spent on reading and TV-watching per day, represented by their means and standard deviations (S.D.), are shown by activity and group in Table 1. The reading total is actually the sum of all four separate reading activities: magazines, newspapers, books and mail. The means and standard deviations vary with categories. TV-watching has the largest mean among all the activities for each group under this study. Among the four separate reading activities, newspapers have the largest mean for every group, while mail has the smallest. It indicates that, on the average, people spend the most time in TV-watching and reading newspapers, and the least time in reading mail, while the reading of books and magazines is in between.

According to the means of the reading total, males read more than females; whites read more than blacks. The means of the reading totals range from 39.0 minutes per day for BFNDAY to 75.7 minutes for WMEND. The standard deviations for whites are generally about the size of their means. For blacks, they are larger than their means, except for BFEEND. The standard deviations range from 60.7 minutes for BFNDAY to 85.2 minutes for BMDAY. Thus for blacks, the reading totals seem to disperse wider than that for whites, relative to their means.

The means of daily magazine reading range from 2.6 minutes for BFNDAY to 20.4 minutes for BMDAY, which is close

Table 1

Distributions of Time Spent in Reading and TV-watching by Category, USA, 1971

(minutes per day)

Activity / Group	Reading total	Magazines	Newspapers	Books	Mail	TV-watching	No. of observations
1. White Males-Weekday (WMDAY)							
Mean	73.4	18.9	33.4	15.8	5.3	127.6	702
S.D.	74.4	35.4	32.5	46.3	11.4	99.2	
2. White Males-Weekend (WMEND)							
Mean	75.7	14.6	39.9	16.9	4.3	124.3	265
S.D.	76.7	30.2	43.6	41.7	14.6	92.5	
3. Black Males-Weekday (BMDAY)							
Mean	69.5	20.4	29.8	16.7	2.6	166.0	50
S.D.	85.2	41.2	40.6	50.2	5.3	148.5	
4. Black Males-Weekend (BMEND)							
Mean	50.9	7.6	29.8	12.9	.6	185.7	21
S.D.	68.8	17.2	58.2	30.5	2.2	125.4	
5. White Females Employed in Market-Weekday (WFEDAY)							
Mean	69.6	16.9	28.5	19.0	5.1	139.0	417
S.D.	71.8	33.7	27.1	44.7	7.3	106.0	
6. White Females Employed in Market-Weekend (WFEEND)							
Mean	71.0	14.6	30.3	22.7	3.3	143.4	161
S.D.	71.9	27.9	35.0	50.8	7.0	123.7	
7. Black Females Employed in Market-Weekday (BFEDAY)							
Mean	50.6	6.9	17.4	23.5	2.7	206.3	48
S.D.	59.9	12.6	24.4	48.1	4.4	145.6	
8. Black Females Employed in Market-Weekend (BFEEND)							
Mean	41.6	7.4	21.1	6.4	6.8	177.9	14
S.D.	34.9	23.9	20.8	16.5	16.2	110.0	
9. White Females Not Employed in Market-Weekday (WFNDAY)							
Mean	73.9	16.3	29.5	22.9	5.2	168.9	440
S.D.	69.5	30.6	28.4	47.7	7.2	119.2	
10. White Females Not Employed in Market-Weekend (WFNEND)							
Mean	74.5	17.0	34.8	19.4	3.3	177.0	159
S.D.	66.3	31.3	36.1	40.2	5.7	129.5	
11. Black Females Not Employed in Market-Weekday (BFNDAY)							
Mean	39.0	2.6	14.8	19.6	2.0	302.6	23
S.D.	60.7	9.8	22.2	54.2	4.7	209.6	

Table 1 (continue)

Notes: Males in this table are all employed in the market.
Other possible groups not shown in this table are not included in this study, due to very small sample sizes. They include all males not employed in the market by race and activity period, and black females not employed in the market for the activity period of weekend.

to that for WMDAY. Generally speaking, whites read twice as much as blacks of the same sex and activity period, except BMDAY. The standard deviations of magazine reading are about twice their means, and are even bigger for BFEEND and BFNDAY. Thus magazine reading disperses even more than the reading totals, relative to the means.

The time spent in reading newspapers is longer for whites, males, and weekends than for blacks, females and weekdays respectively. Considering the largest item among four reading activities, the means of reading newspapers range relatively narrower than those of other activities, from 14.8 minutes for BFNDAY to 39.9 minutes for WMEND. The standard deviations, relative to the means, are usually larger for blacks and weekends than for whites and weekdays, respectively, except for BFEEND. The standard deviations range from 20.8 minutes for BFEEND to 58.2 minutes for BMEND.

The amounts of time for reading books distribute somewhat differently from the other reading activities. It seems that females read more books than males, except BFEEND. The means of book reading range from 6.4 minutes for BFEEND to 23.5 minutes for BFEDAY. The standard deviations are twice as much as the means of the corresponding groups, or more.

Reading mail takes the least time of all reading activities, with means ranging from .6 minutes for BMEND to 6.8 minutes for BFEEND. The time spent in reading mail on

weekends is usually less than on weekdays, except for BFEEND. Their standard deviations are about two to three times the means, even more for males on weekends.

As to TV-watching, it is the largest item of all activities in this study. The means of TV-watching time are larger for white females employed in the market than for white males. Blacks, especially black females not employed in the market, spent even more time in TV-watching. On the average, white males watch television for about two hours a day, regardless of weekdays or weekends. White females employed in the market watch somewhat more than white males, about ten minutes more on weekdays and twenty minutes more on weekends. Black males and females employed in the market watch television for about three hours on weekends. On weekdays, black males watch television for a little less than three hours, but females watch a little more. White females not employed in the market watch television only about 30 minutes more than white females employed in the market, on both weekdays and weekends. But black females not employed in the market spend, on the average, about five hours watching television on weekdays. Perhaps they watch even more on weekends. Unfortunately, they are not under our examination, due to the very small sample size.

Effects of Explanatory Variables

As mentioned before, regressions in this study have

been estimated for various groups classified by race, sex, employment status and activity period, for each of the reading activities (i.e. magazines, newspapers, books and mail, as well as their total) and TV-watching. For each category, regressions have also been run separately with I_o (family income) or I_o' (family income minus respondent's earnings) as an alternative independent variable, in addition to other variables. Each estimated coefficient of regression can be interpreted as the effect of the corresponding variable, holding other variables constant. Accompanying the estimated coefficients are the corresponding t-values, omitting signs for convenience, which show the significance of the coefficients. In other words, the significance of the effect of a variable depends on its t-value. Generally speaking, the higher the t-value, the more significant the effect of a variable. However, it also depends on sample size or degree of freedom (df). For instance, at the .05 significance level, a coefficient should have $|t| = 1.96$ or higher, disregarding the sign, for a large sample. For a smaller sample, the t-value should be larger for the same level of significance, e.g. $|t| = 2.01$ for df = 48 and $|t| = 2.08$ for df = 21.

In order to compare the effects of variables on the demand for different commodities, the transformation of the estimated coefficients into elasticities is desirable. For our empirical analysis, the estimated wage and income elasticities at the means will be calculated, when the

estimated coefficients are statistically significant. Since all variables in this study are positives, the signs of the estimated elasticities should be the same as the corresponding estimated coefficients.

As mentioned before, the results of regressions with I_0' (family income minus respondent's earnings) generally do not seem to be better than those of regressions with I_0 (family income). Besides, I_0' does not quite make sense for females not employed in the market. For the sake of comparisons among groups later in this chapter, we will analyze the regression results with I_0, as presented in Tables 2 through 12. The results of regressions with I_0' are provided in Appendix B.

The following analysis will be divided into (1) males employed in the market, (2) females employed in the market, and (3) females not employed in the market.

Males Employed in the Market

The regression results with I_0 (family income) for males are presented in Tables 2 through 5.

Wage Effect

The estimated coefficients of wage rate from reading regressions are mostly negative for males employed in the market, with varying degrees of significance. They are more significant for weekends than for weekdays, perhaps due to the effect of more choices among leisure activities upon

Table 2
Regression Results of Demand for Reading and TV-watching
Cross Section, WMDAY, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-.35	.38	8.80		.77		-7.78							-8.88	-25.14	.17
	(.21)	(.47)	(9.83)		(2.72)		(1.82)							(1.97)		
Magazines	.89	.06	2.32			-1.32								-3.26	-1.76	.07
	(1.06)	(.15)	(5.38)			(1.43)								(1.44)		
Newspapers	.17	.14	1.27	.59				-2.50	.17				1.31		-26.64	.10
	(.23)	(.37)	(3.01)	(5.82)				(1.90)	(1.86)				(1.34)			
Books	-1.37	-.02	5.01				-6.44	4.67	-.31				-3.53		.03	.12
	(1.28)	(.04)	(8.76)				(2.57)	(2.54)	(2.37)				(2.58)			
E:	-.44															
Mail	-.03	.27	.44		.06	-.51				.76		.48		-1.86	-4.07	.09
	(.12)	(2.12)	(2.98)		(1.39)	(1.55)				(1.94)		(1.31)		(2.43)		
E:		.61														
TV-watching	-1.43	.71	-4.18	-4.55	4.25					.52			-6.44		278.73	.05
	(.60)	(.62)	(3.14)	(2.04)	(1.63)					(1.84)			(2.11)			

Notes: Figures in parentheses are t-values of estimated coefficients, omitting the signs for convenience.
E: Wage and income elasticities computed at the means are given, when the corresponding estimated coefficients are statistically significant.

Table 3
Regression Results of Demand for Reading and TV-watching
Cross Section, WMEND, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading total	-4.88	3.39	6.87	5.31	-5.37		10.86				4.49			-35.02	-78.51	.24
	(1.89)	(2.80)	(4.66)	(1.96)	(1.70)		(1.74)				(1.44)			(4.65)		
E:	-.33	.53														
Magazines	-1.83	.76	2.13						-3.09					-7.17	25.61	.10
	(1.69)	(1.50)	(3.53)						(1.90)					(2.51)		
E:	-.65	.62														
Newspapers	-3.01	1.71	3.49	3.39	-2.86		5.15							-15.87	-53.03	.19
	(1.99)	(2.45)	(4.12)	(2.14)	(1.55)		(1.40)							(3.89)		
E:	-.39	.51														
Books	.42	.76	1.25	2.13	-2.88									-8.91	-19.98	.08
	(.27)	(1.07)	(1.46)	(1.34)	(1.54)									(2.16)		
Mail	-1.12	.19					1.82				1.94				-9.57	.06
	(.22)	(.77)					(1.57)				(3.33)					
TV-watching	5.61	-3.28	-4.23						.72						132.78	.05
	(1.65)	(2.10)	(2.25)						(1.66)							
E:	.23	-.31														

Notes: See Table 2.

Table 4
Regression Results of Demand for Reading and TV-watching
Cross Section, BMDAY, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-7.59	-1.70	10.44										8.46		-32.31	.18
	(1.27)	(.47)	(2.72)										(1.28)			
Magazines	-3.05	.63	3.53			-6.30									10.82	.14
	(1.03)	(.33)	(1.86)			(1.72)										
Newspapers	-1.65	.06	3.22										6.01	-9.66	2.79	.22
	(.58)	(.03)	(1.68)										(1.93)	(1.32)		
Books	-2.69	-.52													30.12	.02
	(.77)	(.24)														
Mail	1.20	.48		-.65	.91						-1.09	-1.34	1.70	2.15	2.59	.47
	(3.81)	(2.17)		(1.57)	(1.84)						(1.36)	(2.12)	(3.65)	(2.26)		
E:	1.63	1.40														
TV-watching	44.35	-11.50	-16.51		-3.20		-39.72			18.48	-25.16				370.12	.45
	(4.78)	(1.80)	(2.78)		(1.56)		(1.66)			(1.28)	(1.23)					
E:	.95	-.53														

Notes: See Table 2.

Table 5
Regression Results of Demand for Reading and TV-watching
Cross Section, BMEND, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**																
	-10.65	-7.38	1.10			28.93		-28.95		-24.23	37.48			30.44	-95.39	.77
	(1.01)	(1.60)	(.26)			(2.18)		(3.66)		(2.71)	(3.12)			(2.52)		
E:		-.98														
Magazines																
	-10.65	1.10	.23	2.82	-3.04	15.32	-2.15	-28.40					8.59		-99.76	.85
	(3.73)	(.89)	(.14)	(1.76)	(1.71)	(2.94)	(.31)	(4.41)					(3.48)			
E:	-3.73															
Newspapers																
	17.64	-2.22								-15.00	23.20				-33.57	.31
	(1.59)	(.47)								(1.44)	(1.82)					
E:	1.57															
Books																
	-5.14	-3.92	6.11		1.35										-35.57	.66
	(1.20)	(2.25)	(4.14)		(2.92)											
E:		-2.06														
Mail																
	-.26	-.44				-1.12	1.87	.16	-1.49					2.48	-2.61	.72
	(.91)	(3.10)				(4.15)	(3.15)	(5.18)	(3.97)					(3.12)		
E:		-4.97														
TV-watching																
	21.28	-11.78					-58.53						-126.95		602.20	.40
	(.99)	(1.32)					(1.92)						(2.45)			
E:		-.43														

Notes: See Table 2.

time constraint on weekends. For instance, for WMEND, the estimated coefficients are -4.88 and -3.01 for reading total and newspapers respectively. For BMEND, the estimated coefficient is -10.65 for magazines. There are some positive coefficients, but they are not significant, except for BMDAY on mail with a coefficient of 1.20.

The estimated coefficients of wage rate from regressions of TV-watching are positive, except for WMDAY which is not significant. The estimated coefficients for WMEND and BMDAY are 5.61 and 44.35 respectively, both of which are very significant.

If the significant estimated coefficients are transformed into elasticities at the means of variables, the wage elasticities, E_w, of the demand for reading are elastic for blacks, but inelastic for whites. The signs of estimated elasticities are the same as those of estimated coefficients. The wage elasticities of demand for reading for blacks range from $E_w = -3.73$ for BMEND on magazines, to $E_w = 1.63$ for BMDAY on mail. For whites, they vary in a narrower range, from $E_w = -.65$ for WMEND on magazines, to $E_w = -.33$ for WMEND on reading total. The estimated wage elasticities of the demand for TV-watching are positive and inelastic for both whites and blacks, ranging from $E_w = .23$ for WMEND to $E_w = .95$ for BMDAY.

Income Effect

The signs of the estimated coefficients of income from

reading regressions are usually positive, and more significant for weekends and reading mail. For instance, we have estimated coefficients of 3.39 and 1.71 for WMEND on reading total and newspapers. However, for BMEND, some significant negative coefficients have been obtained (e.g., -3.92 and -.44 for books and mail respectively). Thus, in general, with positive coefficients, reading seems to be a normal good. But for BMEND, reading may be an inferior good, particularly those items with significant negative coefficients. This implies that while reading may be a normal good during weekdays, it may be an inferior good during weekends for black males. Although there is no theoretical reason why this should not happen, it is possible that the results for BMEND may be less reliable because of smaller sample size, or less accurate data. Another possibility is the high correlation between income and wage variables for BMEND.

The estimated coefficients of income on TV-watching are negative except for WMDAY which is insignificant. The estimated coefficients are -3.28, -11.50 and -11.78 respectively for WMEND, BMDAY and BMEND. Thus, in general, TV-watching seems to be an inferior good for males.

In terms of the estimated income elasticities of demand for reading, according to the significant coefficients, they are inelastic for white males, ranging from E_I = .51 for WMEND on newspapers, to E_I = .62 for WMEND on magazines. For blacks, they are more elastic, and may be

negative, ranging from $E_I = -4.97$ for BMEND on mail, to $E_I = 1.40$ for BMDAY also on mail. The estimated income elasticities of the demand for TV-watching are negative and inelastic, ranging from $E_I = -.53$ for BMDAY to $E_I = -.31$ for WMEND.

Education Effect

Our regression results show that education is an important factor in influencing a household's behavior, except for a few cases where the variable did not enter the regressions. Generally speaking, education has significant positive effects on the demand for reading and a negative effect on the demand for TV-watching. The effects are even more significant for whites. For reading, the estimated coefficients appearing in the regressions range from .44 for WMDAY on mail, to 10.44 for BMDAY on reading total. For TV-watching, the estimated coefficients range from -16.51 for BMDAY to -4.18 for WMDAY. The results indicate that with a higher level of education or years of schooling, there is more reading and less TV-watching.

Life Cycle Effect

The effect of life cycle should take into account both variables A and A^2 in our empirical regressions. However, there are some regressions with estimated coefficients of only variable A or A^2, but not both. It implies that the demand is a linear function of either variable A or A^2.

In this case, life cycle has either a positive or a negative effect monotonically throughout the age periods in our study.

In our empirical estimation, some regressions yield estimated coefficients of both variables A and A^2. In this case, there are minimums or maximums of demand at certain ages. The estimated coefficients of A^2 indicate the rates of change, with signs determining minimum or maximum. The estimated coefficients of A^2 for males range from -5.37 for WMEND on reading total to 4.25 for WMDAY on TV-watching. Incorporating with the estimated coefficients of A (and remembering that the values of variable A^2 have been scaled down by dividing the original values by 100), we obtain the minimums of demand with respect to life cycle for WMDAY on TV-watching and BMDAY on mail, at the ages of about 54 and 36 respectively. On the other hand, we have maximums of demand for WMEND on reading total, newspapers and books, and for BMEND on magazines, at the ages of about 49, 59, 37 and 46 respectively. Note that the reading activities of WMEND involve more maximums.

For males, we have a regression with only an estimated coefficient of variable A, but not variable A^2. This is for WMDAY on newspapers with an estimated coefficient of .59, indicating that the demand increases with age at that constant rate. On the other hand, there are four regressions with estimated coefficients of variable A^2, but not variable A. The estimated coefficients of A^2 are .77 and

.06 for WMDAY on reading total and mail respectively, -3.20 for BMDAY on TV-watching, and 1.35 for BMEND on books. The directions and magnitudes of the effects of A or A^2 can be seen directly from these coefficients. For those activities with positive coefficients, the demand increases with age or age square, and vice versa.

Family Structure Effect

There are three variables representing family structure in our empirical study. According to our regression results, variable N, family size, has no impact on reading newspapers, books or on TV-watching. For other activities, family size does not have a very significant impact for white males, while it has more impact for black males. The estimated coefficients of N are positive for BMEND, except in mail, and negative for BMDAY on magazines. They range from -6.30 for BMDAY on magazines, to 28.93 for BMEND on reading total. Therefore, the larger the family size, the more reading by BMEND, except for mail, but there is less magazine reading by BMDAY.

Variable C_1, preschool children, seems to have more effect than family size, N, although it has no significant effect on magazine reading. Its effects on reading are mostly for whites, except BMEND on mail. The effects on whites are negative for weekdays and positive for weekends. For instance, the estimated coefficients of C_1 on reading total are -7.78 for WMDAY and 10.86 for WMEND. Therefore,

for white males, the more preschool children, the less reading on weekdays, but the more reading on weekends. For black males, the effect of C_1 is limited to BMEND on mail, with an estimated coefficient of 1.87.

The effect of C_1 on TV-watching seems to be opposite to that on reading. It has no effect on whites. Its effects on TV-watching for blacks are negative, with estimated coefficients of -39.72 for BMDAY and -58.53 for BMEND. This result suggests that the more preschool children in black families, the less the TV-watching for the fathers on both weekdays and weekends.

Variable C_2 has no impact on reading mail and TV-watching for males. Actually, the variable yields only four significant coefficients for males. They are -82.95 and -28.40 for BMEND on reading total and magazines, and -2.50 and 4.67 for WMDAY on newspapers and books. The results indicate that the more children of elementary school age, the less the reading of the first three items with negative coefficients, but the more the reading of the last item with a positive coefficient.

Regional Effect

There are two variables representing regional factors. Variable U_1, urbanization rate, has no effect on blacks' reading and TV-watching, except for BMEND on mail. The estimated coefficients in the regressions of reading are .17 and -.31 for WMDAY on newspapers and books respectively.

The estimated coefficients in the regressions of TV-watching are .52 and .72 for WMDAY and WMEND respectively. Thus, in more urbanized areas, more time is spent in TV-watching by all whites; and for WMDAY, more time is spent in reading newspapers and less is spent on reading books. The estimated coefficient for BMEND on mail is .16, which indicates that the more the area is urbanized, the more the mail reading for BMEND.

Variable U_2, unemployment rate, does not have an effect on the demand for reading books. Its effects on other reading are mostly negative for weekends, except for WMDAY on mail. For instance, the estimated coefficients are -24.23 and -1.49 for BMEND on reading total and mail, and -3.09 for WMEND on magazines. Thus, the higher the unemployment rate of an area, the less the reading, except for WMDAY on mail with an estimated coefficient of .76. As to TV-watching, variable U_2 yields the only estimated coefficient of 18.48 for BMDAY, but it is not very significant statistically.

Housing Effect

There are four variables representing housing factors which have different impacts on reading and TV-watching. Variable H_1, dwelling size, has no effect for males on reading magazines and books. Its effects are mostly positive on weekends, except BMDAY on mail, which is not very significant. The estimated coefficients are 4.49

and 1.94 for WMEND on reading total and mail, and 37.48 and 23.20 for BMEND on reading total and newspapers. Thus, the larger the dwelling size, the more reading is done by males on weekends, particularly the reading of those items mentioned above.

On TV-watching, variable H_1 yields the only estimated coefficient, -25.16, for BMDAY. Yet it is not very significant statistically. Thus H_1 does not seem to affect the demand of males for TV-watching to any significant degree.

Among the four housing variables, variable H_2 has the least effect on the demand for reading and TV-watching by males. It affects only reading mail on weekdays, which is very significant only for BMDAY. Thus, the better the neighborhood, the more the reading of mail by WMDAY, but the less the reading of mail by BMDAY.

Variable H_3, house characteristics, has some effects on weekday activities and for BMEND on magazines. Most of the estimated coefficients are positive, except for WMDAY on books and TV-watching. Thus it seems that the better the house characteristics, the more reading by males on weekdays, particularly of those items with significant positive coefficients, but the less the TV-watching and reading of books for WMDAY.

Variable H_4, dwelling type, has the most effect among housing variables. Its effects on reading seem to be negative for whites, and positive for blacks, except on

newspapers, which is statistically not very significant. Thus, white males who live in single-family houses read less than those who live in two-family houses; who in turn read less than those living in multifamily houses. But for blacks, the opposite appears to be true.

As to TV-watching, H_4 has the only estimated coefficient, -126.95, for BMEND, which is very significant. It indicates that for BMEND, on the average, individuals living in single-family houses spent much less time in watching television than those living in two-family houses; who in turn watch much less television than those living in multifamily houses.

Females Employed in the Market

The regression results with I_0 (family income) for females employed in the market are presented in Tables 6 through 9.

Wage Effect

Generally, the estimated coefficients of wage rate in reading regressions for females employed in the market show some interesting patterns: positive for weekdays and negative for weekends; more significant and larger magnitudes for blacks. Thus, the higher the wage rate of females employed in the market, the more the reading on weekdays, but the less the reading on weekends, especially for black females. The estimated coefficients of wage rate in reading

Table 6
Regression Results of Demand for Reading and TV-watching
Cross Section, WFEDAY, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	1.94	-.60	7.78		.88										-37.93	.09
	(1.24)	(.89)	(5.27)		(2.56)											
Magazines	.73	-.50	2.53		.22				.14						-24.28	.05
	(.97)	(1.54)	(3.53)		(1.35)				(1.27)							
E:		-.35														
Newspapers	-.04	.38	1.94	.69			2.99	2.61	.14						-38.24	.13
	(.07)	(1.51)	(3.48)	(5.91)			(1.28)	(2.00)	(1.53)							
E:		.16														
Books	.72	-.52	3.00												-13.42	.03
	(.72)	(1.20)	(3.19)													
Mail	.35	-.08	.29	.07			1.36		.06		.40				-7.75	.07
	(2.18)	(1.09)	(1.87)	(2.05)			(2.07)		(2.25)		(1.68)					
E:	.18															
TV-watching	-3.29	-1.67		-6.14	6.49		27.92								339.70	.10
	(1.43)	(1.62)		(1.87)	(1.75)		(2.99)									
E:	-.06	-.14														

Notes: See Table 2.

Table 7
Regression Results of Demand for Reading and TV-watching
Cross Section, WPEEND, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-6.23	.62	4.49				-28.94	10.83					10.25		-21.19	.17
	(2.02)	(.61)	(2.00)				(3.23)	(1.78)					(2.36)			
E:	-.21															
Magazines	-.66	.73													7.31	.03
	(.53)	(1.91)														
E:		.61														
Newspapers	-1.69	.31			.52	-3.69	-7.43						4.96		13.46	.17
	(1.13)	(.65)			(1.80)	(1.69)	(1.52)						(2.35)			
Books	-3.09	-.39	3.27				-11.87	16.66					4.56		-31.72	.14
	(1.39)	(.53)	(2.03)				(1.85)	(3.81)					(1.46)			
E:	-.32															
Mail	.10	.10											-.74		5.13	.02
	(.31)	(1.02)											(1.65)			
TV-watching	-3.97	-1.80	-14.48				56.79	-14.23					18.80	-18.44	310.16	.21
	(.77)	(1.05)	(3.71)				(3.76)	(1.37)					(2.54)	(1.36)		

Notes: See Table 2.

Table 8
Regression Results of Demand for Reading and TV-watching
Cross Section, BFEDAY, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	16.18	2.71		6.55	-8.92	-13.15			-.88		-5.39				30.52	.50
	(3.08)	(1.90)		(1.74)	(1.93)	(3.18)			(1.92)		(1.36)					
E:	.59	.45														
Magazines	1.77	.67	1.47			-6.09	7.90	4.47	.20		-1.35			4.62	-23.42	.65
	(1.74)	(2.35)	(2.85)			(4.22)	(4.30)	(2.13)	(2.27)		(1.74)			(2.03)		
E:	.47	.81														
Newspapers	2.03	.13	3.09			-3.87				3.61					-25.15	.25
	(.80)	(.18)	(2.26)			(2.15)				(1.29)						
Books	9.04	1.88				-5.35			-1.16		-6.65				128.49	.34
	(1.95)	(1.53)				(1.63)			(2.90)		(1.96)					
E:	.71	.66														
Mail	.07	.14	.61		.13						-.73				-3.45	.30
	(.16)	(1.14)	(2.46)		(2.14)						(2.22)					
TV-watching	-9.97	2.75		-5.37			-40.42								434.00	.24
	(.67)	(.71)		(3.20)			(2.20)									

Notes: See Table 2.

Table 9
Regression Results of Demand for Reading and TV-watching
Cross Section, BFEEND, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-11.04	1.72		-1.87			-30.37				-20.29		5.94		213.29	.92
	(3.56)	(1.90)		(4.75)			(3.59)				(3.54)		(2.43)			
E:	-.54	2.77														
Magazines	1.34	-.03		-12.35	11.85		-21.63		.27					40.50	178.15	.95
	(.75)	(.04)		(7.49)	(6.38)		(4.73)		(1.80)					(8.01)		
Newspapers	1.69	3.53	-1.73							-12.00			5.00		55.51	.85
	(.78)	(4.48)	(1.76)							(4.47)			(2.98)			
E:		1.12														
Books	-3.88	-.67	1.75								-9.14	-8.41			72.94	.70
	(1.68)	(.85)	(1.54)								(2.26)	(3.13)				
E:	-1.24															
Mail	-.27	-1.33		-1.37	1.94		-15.95			3.20		9.58	-6.35	-26.12	83.69	.99
	(.38)	(5.54)		(2.06)	(2.55)		(10.01)			(3.00)		(7.93)	(9.99)	(13.90)		
E:		-1.31														
TV-watching	3.87	-11.90		-3.40											402.67	.41
	(.19)	(2.06)		(1.60)												
E:		-.45														

Notes: See Table 2.

regressions range from -11.04 for BFEEND on reading total to 16.18 for BFEDAY, also on reading total. In terms of the estimated wage elasticities of demand, they are very inelastic for white females, ranging from $E_w = -.32$ for WFEEND on books, to $E_w = .18$ for WFEDAY on mail, based on significant coefficients. For blacks, they are more elastic, ranging from $E_w = -1.24$ for BFEEND on books, to $E_w = .71$ for BFEDAY on books.

The effects of wage rate on TV-watching are negative, except for BFEEND, but not significant, except for WFEDAY which has an estimated coefficient of -3.29. It amounts to an estimated elasticity of $E_w = -.06$, very inelastic indeed.

Income Effect

The estimated coefficients of income for females employed in the market are positive for reading total and newspapers, which are statistically quite significant for blacks. For other reading activities, the signs for whites tend to be negative for weekdays, and positive for weekends. The opposite is true for blacks. They range from -1.33 for BFEEND on mail, to 3.53 for BFEEND on newspapers. The reading activities with positive coefficients are considered as normal goods, whereas those with negative coefficients are inferior goods.

In terms of the estimated income elasticities of the demand for reading, they are much more elastic for blacks than for whites. Based on the two significant estimated

coefficients for whites, both for magazine reading, the estimated income elasticities are $E_I = -.35$ for WFEDAY, and $E_I = .61$ for WFEEND. For blacks, the estimated income elasticities range from $E_I = -1.31$ for BFEEND on mail, to $E_I = 2.77$ for BFEEND on reading total.

As to TV-watching, the estimated coefficients of income are negative, except for BFEDAY, and quite significant for WFEDAY and BFEEND. The estimated coefficients of these two groups are -1.67 and -11.90 respectively. In terms of estimated income elasticities, they are $E_I = -.14$ and $E_I = -.45$ respectively, both being inelastic.

Education Effect

Education also plays an important role in the allocation of time for females employed in the market, as for males. Its effects are mostly positive, except for BFEEND on newspapers. The results imply that, with more years of schooling, females employed in the market read more, except for BFEEND on newspapers.

The regressions of TV-watching yield the only estimated coefficient of -14.48 for WFEEND. It indicates that the higher the years of schooling, the less TV-watching for WFEEND. On the whole, as for males, the positive effect of education on reading and the negative effect on TV-watching are what we expected.

Life Cycle Effect

There are some regressions with estimated coefficients of both variables A and A^2 for females employed in the market. The estimated coefficients of A^2 for females employed in the market are 6.49 for WFEDAY on TV-watching, 11.85 and 1.94 for BFEEND on magazines and mail respectively, and -8.92 for BFEDAY on total reading. Incorporating with the estimated coefficients of A, we obtain the minimums of demand with respect to life cycle at the ages of about 47, 52 and 35 respectively for the first three items with positive coefficients of A^2. The demand decreases with age up to those certain ages, and then increases. For the last item, we have a maximum of demand at the age of about 37. In other words, on the average, the demand for total reading by BFEDAY increases up to that age, and then decreases.

There are some regressions with only estimated coefficients of variable A, but not variable A^2. They are the regressions for WFEDAY on newspapers and mail, for BFEDAY on TV-watching, and for BFEEND on total reading and TV-watching. Their estimated coefficients are .69, .07, -5.37, -1.87 and -3.40 respectively. On the other hand, there are regressions with estimated coefficients of variable A^2, but not variable A. They are the regressions for WFEDAY on total reading and magazines, for WFEEND on newspapers, and for BFEDAY on mail. The estimated coefficients of A^2 are .88, .22, .52 and .13 respectively. The demand for

activities with positive coefficients of either A or A^2 increases with age monotonically, and vice versa.

Family Structure Effect

Variable N, family size, has very significant impacts for BFEDAY on all reading activities, except mail. The estimated coefficients of N for BFEDAY are -13.15, -6.09, -3.87 and -5.35 respectively for total reading, magazines, newspapers and books. The other estimated coefficient is -3.69 for WFEEND on newspapers. All the estimated coefficients obtained are negative and statistically significant or highly significant. Therefore, for these items, the larger the family size, the less reading there is. It seems to have no impact on other reading and TV-watching.

Variable C_1, preschool children, has the most impact among all the variables of family structure on the demand for reading and TV-watching. But its impact varies with categories. It appears to have no impact on total reading on weekdays, on magazines for whites, on newspapers for blacks, or on books for all groups other than WFEEND. The estimated coefficients of C_1 for reading range from -30.37 for BFEEND on total reading to 7.90 for BFEDAY on magazines. In general, the estimated coefficients for reading are positive for weekdays and negative for weekends. Therefore, the more preschool children in a family, the more reading on weekdays, but the less on weekends, for females employed in the market. Variable C_1 has impacts on TV-watching only

for whites. The estimated coefficients are 27.92 and 56.79 for WFEDAY and WFEEND respectively. Therefore, the more preschool children, the more TV-watching for white females, on both weekdays and weekends.

Variable C_2, preteen children, has less impact than C_1, as expected. Its estimated coefficients are quite different from those of C_1. They are positive for reading, and negative for TV-watching. The estimated coefficients of C_2 for reading range from 2.61 for WFEDAY on newspapers to 16.66 for WFEEND on books. The estimated coefficients for TV-watching are -40.42 and -14.23 respectively for BFEDAY and WFEEND. Thus, in general, the more children of elementary school age, the more reading, but the less TV-watching by females employed in the market.

Regional Effect

Both urbanization and unemployment rates U_1 and U_2 have no impact on TV-watching for females employed in the market. On reading, variable U_1 has no impact for WFEEND, and variable U_2 has no impact for whites. The estimated coefficients of U_1 on reading range from -1.16 for BFEDAY on books to .27 for BFEEND on magazines. They are positive for whites, and negative for blacks, except for magazines. Therefore, in general, the more urbanized the area, the more reading by WFEDAY, but the less reading by blacks, except for magazines.

The estimated coefficients of U_2 appearing in

regressions are only for black females on newspapers and mail. They are -12.00 and 3.20 for BFEEND on newspapers and mail respectively, and 3.61 for BFEDAY on newspapers, which is statistically not very significant. Thus, the interpretation of the effect of U_2 should be limited to the above items, particularly the first two with very significant coefficients. It indicates that the higher the unemployment rate of an area, the less the reading of newspapers, but the more the reading of mail by BFEEND.

Housing Effect

Variable H_1, dwelling size, has some impact for females employed in the market, except for reading newspapers and TV-watching. All estimated coefficients of H_1 are negative and are for blacks, except for a positive coefficient of .40 for WFEDAY on mail. The estimated coefficients for blacks range from -20.29 for BFEEND on reading total to -.73 for BFEDAY on mail. Therefore, the larger the dwelling size, the less the reading by blacks, but the more the reading of WFEDAY on mail.

Variable H_2, neighborhood condition, has little impact on the demand for reading and TV-watching for females employed in the market. Actually we obtained only two estimated coefficients, both for BFEEND. They are -8.41 for books and 9.58 for mail. That is, the better the neighborhood, the less the book reading, but the more the reading mail for BFEEND.

Variable H_3, house characteristics, has no impact on the demand for reading and TV-watching on weekdays for females employed in the market. It has no impact on the demand for reading magazines either. All the estimated coefficients obtained are for weekends and are positive, except for mail. For reading, they range from -6.35 for BFEEND on mail to 10.25 for WFEEND on total reading. For TV-watching, the only estimated coefficient, 18.80, is for WFEEND. Therefore, the better the house, the less the reading of mail but the more the reading of other items and TV-watching. But these interpretations should be limited to those activities on weekends only.

Variable H_4, dwelling type, has impacts only on the demand for reading magazines and mail. The estimated coefficients of H_4 are positive for the former and negative for the latter. They are 4.62 and 40.50 for BFEDAY and BFEEND on magazines, and -26.12 for BFEEND on mail. Thus, for black females employed in the market, we expect that those living in single-family houses read more magazines than those living in two-family houses, who in turn read more than those living in multifamily houses. But the opposite appears to be true for reading mail on weekends.

Females Not Employed in the Market

The regression results with I_0 (family income) for females not employed in the market are provided in Tables 10 through 12. It should be mentioned that for females not

Table 10
Regression Results of Demand for Reading and TV-watching
Cross Section, WFNDAY, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**																
	33.61	-3.99		1.34								6.41			-34.89	.11
	(4.93)	(3.59)		(4.32)								(2.42)				
E:	1.05	-.66														
Magazines																
	11.96	-.82		-1.32	2.12						-2.04	2.34		6.09	.17	.08
	(3.48)	(1.72)		(1.38)	(1.84)						(1.72)	(1.85)		(2.05)		
E:	1.69	-.61														
Newspapers																
	8.33	-1.08		.89									2.03	-3.91	-8.37	.16
	(2.85)	(2.63)		(7.17)									(1.94)	(1.61)		
E:	.65	-.45														
Books																
	-7.64	-.21	3.14						.34		3.16				-38.34	.03
	(.74)	(.21)	(1.67)						(1.82)		(1.91)					
Mail																
	2.36	-.17	-.43							.41			.70		1.37	.04
	(1.71)	(1.21)	(1.55)							(1.31)			(2.52)			
E:	1.04															
TV-watching																
	7.81	-3.91	-6.61			-7.99									308.20	.06
	(.37)	(1.78)	(1.52)			(2.17)										
E:		-.28														

Notes: See Table 2.
W = predicted hourly wage.

Table 11
Regression Results of Demand for Reading and TV-watching
Cross Section, WFNEND, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	32.98	-.15							-.77						69.03	.12
	(3.09)	(.71)							(1.81)							
E:	1.02															
Magazines	4.80	.78						-5.22					-3.72		16.78	.08
	(.99)	(1.11)						(2.25)					(1.93)			
Newspapers	15.05	-.13													1.79	.13
	(2.84)	(.17)														
E:	.99															
Books	-8.24	.32	4.71						-.67					-8.42	53.12	.08
	(.61)	(.24)	(1.84)						(2.43)					(1.37)		
Mail	.65	-.05									.58	.56			-3.59	.09
	(.71)	(.39)									(1.58)	(1.45)				
TV-watching	-22.78	-1.10		-17.65	19.70			21.00							588.60	.15
	(1.16)	(.38)		(3.10)	(2.80)			(2.17)								

Notes: See Tables 2 and 10.

Table 12
Regression Results of Demand for Reading and TV-watching
Cross Section, BFNDAY, 1971

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading total	-17.19	6.61									16.16	20.02			-111.62	.48
	(1.58)	(1.53)									(1.63)	(2.61)				
E:	-.72	.82														
Magazines	-5.08	-.95	1.72												-.34	.32
	(2.47)	(1.16)	(2.23)													
E:	-3.18															
Newspapers	4.57	-.18			-.44				-7.20	8.05	10.47	-4.37			-5.06	.66
	(1.18)	(.11)			(1.47)				(2.04)	(2.23)	(2.63)	(1.45)				
Books	-17.09	7.09	6.01		1.91										-79.22	.38
	(1.52)	(1.57)	(1.08)		(2.21)											
E:	-1.42	1.75														
Mail	-.52	-.04							1.23						-3.33	.09
	(.48)	(.10)							(1.39)							
TV-watching	63.50	5.57						-81.22				-68.09			448.76	.44
	(1.52)	(.38)						(2.97)				(2.47)				
E:	.34															

Notes: See Tables 2 and 10.

employed in the market, their wage rates and earnings are the predicted values according to the procedure described previously.

Wage Effect

The estimated coefficients, including magnitudes and signs, of wage rate for females not employed in the market are quite different from those for females employed in the market. Generally speaking, the estimated coefficients of wage rate for females not employed in the market are more significant than those for females employed in the market. The magnitudes seem to be larger for them as well. Previously, we found that the wage effects on the demand for reading for females employed in the market tend to be positive for weekdays and negative for weekends. Now the estimated coefficients of wage rate for females not employed in the market show the following patterns. For newspapers, they are positive, which is significant for white females but not very significant for black females. For books, they are negative, not at all significant. For all other reading activities, they are positive for white females, negative for black females; more significant for WFNDAY, not very significant for black females, except on magazines.

The estimated coefficients of wage rate on reading range from -17.19 for BFNDAY on reading total to 33.61 for WFNDAY, also on reading total. In terms of estimated wage elasticities of demand for reading for females not employed

in the market, they are more elastic than those for females employed in the market. Based on significant coefficients, they range from $E_w = -3.18$ for BFNDAY on magazines to $E_w = 1.69$ for WFNDAY on magazines. For TV-watching, the estimated coefficients range from -22.78 for WFNEND to 63.50 for BFNDAY. However, all the coefficients are not very significant statistically, except for BFNDAY, which provides an estimated wage elasticity of $E_w = .34$.

It should be pointed out that the unexpected positive wage effect for white females not employed in the market is perhaps due to high correlations between the variables of predicted wage rate and education, which is expected to have a positive effect on reading, as shown in Appendix C.

Income Effect

The estimated coefficients of income for reading and TV-watching are generally negative for whites, and mixed but more significant positive estimates for blacks. The levels of significance are even lower than those for females employed in the market, except for WFNDAY. Actually, none of the estimated coefficients for WFNEND is significant. This is perhaps due to a high correlation between wage rate and family income, as shown in Tables C-9 through C-11 in Appendix C. The estimated coefficients of income on reading range from -3.99 for WFNDAY on reading total, to 7.09 for BFNDAY on books. The estimated coefficients of income on TV-watching range from -3.91 for WFNDAY to 5.57 for BFNDAY,

but are statistically insignificant, except for WFNDAY. The pattern seems to be similar to those for females employed in the market, although the magnitudes are somewhat different. Thus, reading and TV-watching seem to be inferior goods for white females, but normal goods for black females.

In terms of estimated income elasticities of demand for reading, they are all inelastic, except for BFNDAY on books with $E_I = 1.75$. For TV-watching, the only estimated income elasticity is for WFNDAY having $E_I = -.28$, which seems to be more inelastic than for reading.

Education Effect

Variable of education enters regressions for females not employed in the market less often and less significantly than for those females employed in the market. It enters all regressions for books, for WFNDAY on mail and BFNDAY on magazines. The estimated coefficients are positive, except for WFNDAY on mail. Thus, for females not employed in the market, the higher the level of education or years of schooling, the longer the time spent in reading books. The same is true for BFNDAY on magazines, but the opposite is true for WFNDAY on mail. However, none of the coefficients is very significant statistically, except for BFNDAY on magazines.

As to the effect of education on the demand for TV-watching for females not employed in the market, only the

regression for WFNDAY yields an estimated coefficient,-6.61. It indicates that the higher the education, the less the TV-watching for WFNDAY.

The above regression results seem to suggest that education does not play an important role for females not employed in the market. However, the lack of significance of education for females not employed in the market might be due to a high correlation between schooling and predicted wage rate, as can be seen from Appendix C. Therefore, it cannot be concluded that education does not play a role for females not employed in the market.

Life Cycle Effect

There are two regressions with estimated coefficients of both variables A and A^2 for females not employed in the market. They are the regressions for WFNDAY on magazines and WFNEND on TV-watching, both involving white females. Their estimated coefficients of A^2 are 2.12 and 19.70 respectively. Taking the estimated coefficients of both variables A and A^2 into account, we obtained minimums of demand with respect to life cycle at the ages of about 31 and 45 respectively for the above two activities. Thus for these two particular items, the demand decreases up to those ages and then increases.

There are two other regressions with estimated coefficients of only variable A, but not variable A^2. Both regressions are for WFNDAY, with estimated coefficients of 1.34

and .89 for reading total and newspapers respectively. On the other hand, there are two regressions with estimated coefficients of only variable A^2, but not variable A. Both regressions are for BFNDAY, with the estimated coefficients of -.44 and 1.91 for newspapers and books respectively. Thus the demand is decreasing monotonically with age for BFNDAY on newspapers, but increasing with age for the other three items.

Family Structure Effect

For females not employed in the market, we obtain two significant coefficients for activities which did not previously yield coefficients for females employed in the market: an estimated coefficient of C_2, -5.22, for WFNEND on magazines, and a coefficient of N, -7.99, for WFNDAY on TV-watching. It suggests that the more children of elementary school age, the less the reading of magazines for WFNEND; and that the bigger the family size, the less the TV-watching for WFNDAY. Thus for females not employed in the market, the impact of family structure seems to be limited to these two particular items. Note that both cases involve only white females.

Regional Effect

The two regional factors seem to have less impact on females not employed in the market than on those employed. Variable U_1 yields a positive coefficient of .34 for WFNDAY

on books, and negative coefficients of -.77 and -.67 for WFNEND on reading total and books respectively, the latter being very significant. Therefore, the more urbanized the area, the more the reading of books for WFNDAY, but the less the reading of books and total reading for WFNEND.

Variable U_2 yields positive coefficients of .41 and 1.23 both on reading mail for WFNDAY and BFNDAY respectively, and a very significant coefficient of -7.20 for BFNDAY on reading newspapers. Hence, the higher the unemployment rate is, the more the reading of mail for both WFNDAY and BFNDAY, but the less the reading of newspapers for BFNDAY.

As to TV-watching, neither regional factor shows an impact for females not employed in the market, which is the same as the result for females employed in the market.

Housing Effect

Variable H_1, dwelling size, has a positive impact on some demand for reading for females not employed in the market, particularly for WFNDAY on books, for WFNEND on mail, and for BFNDAY on total reading and newspapers. It has a negative effect on reading magazines for WFNDAY. Thus, the larger the dwelling size, the more the reading of the first few items, but the less the reading of magazines for WFNDAY.

The estimated coefficients of H_2, neighborhood condition, are all positive. They are 6.41 and 2.34 for WFNDAY on total reading and magazines, .56 for WFNEND on mail, and

20.02 and 10.47 for BFNDAY on total reading and newspapers respectively. They are statistically quite significant, especially for reading total and newspapers. Thus, the better the neighborhood, the more the reading of females not employed in the market, particularly for those items mentioned above.

H_3, house characteristics, has some significant positive effects and some negative effects on different reading items. The estimated coefficients of H_3 are 2.03 and .70 for WFNDAY on newspapers and mail, -3.72 for WFNEND on magazines, and -4.37 for BFNDAY on newspapers. These results suggest that the better the house, the more the reading for WFNDAY on newspapers and mail, but the less the reading for WFNEND on magazines and BFNDAY on newspapers.

H_4, dwelling type, shows no effect for BFNDAY. It has some negative effects for WFNDAY on newspapers and for WFNEND on books, having estimated coefficients of -3.91 and -8.42 respectively. It has a very significant positive effect for WFNDAY on magazines, with an estimated coefficient of 6.09. Therefore, white females not employed in the market, living in single-family houses, read more magazines than those in two-family houses, on weekdays; who in turn read more than those in multidwellings or apartments. But the opposite may be true for WFNDAY on reading newspapers and for WFNEND on books. Note also that H_4 involves only white females.

As to the effect of housing factors on TV-watching,

only H_2 appeared in regression for BFNDAY, with a very significant coefficient of -68.09. It suggests that the better the neighborhood, the less the TV-watching for BFNDAY. For white females not employed in the market, the housing factors do not seem to affect their TV-watching at all, which is quite different from the results for females employed in the market.

Comparisons Among Groups

Wage Effect

The wage effects on the demand for reading are mostly negative for males, and more significant for weekends. For females employed in the market, the effects are mostly positive for weekdays and negative for weekends, and are relatively more significant for blacks. For females not employed in the market, they seem to be mostly positive for whites, but negative for blacks. The unexpected positive wage effect for females not employed in the market, is perhaps due to a high correlation between the predicted wage rate and the education variable, as noted previously.

The wage effects on the demand for TV-watching appear to be positive for males, negative for females except BFNDAY. Since some estimated coefficients are not significant, we have generally found more significant negative price effects on reading and TV-watching. But the actual effect depends on categories.

Income Effect

Generally speaking, the effects of income are positive for reading, except for white females on weekdays, but negative for TV-watching. Although for females not employed in the market, we found more negative signs for reading, they are mostly insignificant. Therefore, reading seems to be a normal good except for white females, while TV-watching seems to be an inferior good.

Education Effect

Education plays an important role in allocation of time by households. Its effects seem to be positive for reading and negative for TV-watching. Thus, the higher the level of education, the more reading, but the less TV-watching. For females, the effect is more apparent for those employed in the market than for those not employed in the market. This is perhaps due to high correlations between education and predicted wage rate for females not employed in the market. The effect of education is even more profound for males.

Life Cycle Effect

Our empirical results show some effects of life cycle on the demand for reading and TV-watching. There are some regressions with estimated coefficients of both variables A and A^2. And the demandsfor the reading of magazines and mail and TV-watching are found to have minimums at certain

ages; while the demands for other reading activities have maximums, with respect to life cycle. However, there are some regressions with estimated coefficients of either A or A^2. In this case, the effects of life cycle will be positive or negative monotonically with respect to age. In this study, we have found that males seem to involve more minimums and maximums of demand with respect to life cycle, while females involve more linear effect of either variable A or A^2.

Family Structure Effect

Family structure has more effect on the demand of people who are employed, especially females. Among the three variables of family structure, preschool children, C_1, has the most impact on the demand for reading and TV-watching for males and females employed in the market, although it does not show significant impact for females not employed in the market. The impacts of C_1 are different for males and females. For females employed in the market, its impacts on the demand for reading are positive for weekdays and negative for weekends. The opposite seems to be true for males. The effects of C_1 on TV-watching are positive for white females employed in the market but negligible for black females. On the other hand, the effects of C_1 on TV-watching for males are negative for blacks but negligible for whites.

For reading, family size, N, has negative effects for

females employed in market, while elementary school children, C_2, has positive effects. For males, the signs are mixed and seem to be more significant for blacks. For TV-watching, N and C_2 have no impact for males at all. Their impacts for females employed and not employed are different. While N affects only those not employed in the market, C_2 affects only those employed in the market. Their actual impacts vary with race and activity periods. However, it is worthy of mention that variables N and C_2 are highly correlated. Their real effects may not be as conclusive as indicated by the regression results.

Regional Effect

Variables U_1 and U_2, representing regional factors, have some impact on reading, though their effects on TV-watching are not very significant statistically. For reading activities of males and females employed in the market, urbanization rate U_1 has more effect on weekdays. For females not employed in the market, the effect is found only for whites. Unemployment rate U_2 has positive effects for males on weekdays and negative effects on weekends. For females employed and not employed in the market, the effects are more significant for blacks.

Housing Effect

Housing factors seem to have different impacts on the demand for reading and TV-watching. For reading, H_1,

dwelling size, has positive effects for males and for females not employed in the market, and negative effects for females employed in the market, particularly blacks. H_2, neighborhood condition, has some positive significant effects for females not employed in the market. It affects black females employed in the market only on weekends, with mixed signs, and it affects males only on mail on weekdays. H_3, house characteristics, has some positive effects for males on weekdays and for females employed in the market, on weekends. Its effects for females not employed in the market seem to be positive for whites on weekdays, and negative for blacks on weekends. The effects of H_4, dwelling type, for males are negative for whites and positive for blacks. For females employed in the market, its effects are found only for blacks; positive for magazines and negative for mail. For females not employed in the market, H_4 has no effect for blacks, but has some effects with mixed signs for whites.

As to TV-watching, the housing factors do not yield very significant coefficients, except in the following cases: for males, H_3 and H_4 have negative effects on WMDAY and BMEND respectively; for females employed in the market, H_3 has a positive effect for WFEEND; for females not employed in the market, H_2 has a negative effect for BFNDAY.

It should be pointed out that for whites, H_2 and H_3 are usually highly correlated, regardless of males or females, and employed or not employed in the market.

Although the regression results indicate some effects of either H_2 or H_3 for some groups, their real effects cannot be concluded simply from the regression results.

V. SUMMARY AND REMARKS

This thesis has attempted to analyze household demand for leisure activities, particularly reading and TV-watching. The household is considered as a consumption as well as a production unit. The importance of the value of time has been emphasized. The effects of various factors are examined, including socio-economic factors such as nonwage income, wage rate and education; demographic variables such as life cycle, race and sex; family structure such as family size and children's ages; regional factors represented by urbanization and unemployment rates; and housing factors such as dwelling size, neighborhood condition, house characteristics and dwelling type. Activity period and employment status, which affect the time values of consumers, have also been considered. Each activity of reading (magazines, newspapers, books and mail as well as their total) and TV-watching has been investigated separately.

The data for our empirical study are mainly from a national survey of reading activities conducted by Response Analysis Corporation in 1971. The survey also provided the data on TV-watching and other variables. The data on regional factors were obtained from the Statistical Abstract. However, some variables are not directly available and have to be imputed (e.g., wage rate) or substituted by other variables (e.g., nonwage income). We then have a

total of 2,300 observations with complete data sets, which can be categorized according to race, sex, employment status and activity period.

Table 1 shows the distributions of the amounts of time spent on reading and TV-watching by category. All means and standard deviations in terms of minutes per day vary with categories. TV-watching has the largest mean, followed by reading totals and newspapers, while the reading of mail has the smallest mean. According to the means of reading totals and newspapers, males read more than females, and whites read more than blacks. However, females seem to read more books than males. For TV-watching, on the average, white males watch for about two hours daily. White females employed in the market watch a little more than white males. White females not employed in the market watch even more; about 30 minutes more than those employed in the market. Blacks watch more than whites. Black males and females employed in the market watch about three hours a day. But black females not employed in the market, on the average, watch about five hours on weekdays. Perhaps they watch even more on weekends. Unfortunately, they are not under our examination, due to the very small sample size.

The empirical regressions have been estimated for each category, with either I_0 (family income) or I_0' (family income minus respondent's earnings) alternatively as an independent variable, in addition to other variables. Due to the high correlation between I_0 and I_0', the regression

results with either I_0 or I_0' are not obviously better than the others. Our examination of factor effects is mainly based on the empirical regressions with I_0, as presented in Tables 2 through 12. The regression results with I_0' are provided in Appendix B.

Despite the fact that some R^2's of our empirical regressions are low and that some results are difficult to interpret, we have found some significant variables affecting household behavior. The unsatisfactory portion of the results is perhaps due to inaccuracy of data, inappropriate measure of time values, multicollinearity of independent variables or even inadequacy of our model.

Generally, we have found negative wage effects on the demand for reading, indicating that the higher the time cost, the less the demand for reading, though there are some exceptions. They are even more significant for people who are employed in the market, and for activities on weekends, when people have more choices among leisure activities. The estimated wage elasticities of demand for reading are generally inelastic for whites, but elastic for blacks. Wage rate does not have as much effect on the demand for TV-watching as on reading. The estimated coefficients on TV-watching have mixed signs. The estimated wage elasticities of demand for TV-watching are inelastic for both whites and blacks, and generally less elastic than those for reading. There are instances in which positive wage effects are obtained for reading and TV-watching,

especially for females not employed in the market. It is possibly because of the high correlations of independent variables between predicted wage rate and income and between predicted wage rate and education.

With some exceptions, empirical results on income effects generally indicate that the activities of reading are normal goods, and that TV-watching is an inferior good. The estimated income elasticities of demand for reading and TV-watching are generally inelastic.

Education plays an important role in the allocation of time, although its effects seem to be less significant for females not employed in the market, which may be due to the high correlation between predicted wage rate and education. Our empirical results suggest that the higher the level of education, the more reading, but the less TV-watching.

Life cycle has an impact on household behavior. It has been found that some activities under this study are functions of both variables A and A^2. Among them, TV-watching and reading of magazines and mail are found to have minimums of demand with respect to life cycle for some groups, while other reading activities have maximums. The demand for the activities with minimums decreases up to certain ages, and then increases. The opposite is true for the activities with maximums. However, regression results also show that some activities are linear functions

of either variable A or A^2, but not both. The effect of variable A or A^2 can be positive or negative, depending on categories. It seems that males involve more maximums or minimums with respect to life cycle, while females involve more linear functions of variable A or A^2.

Among the three variables chosen for family structure, preschool children, C_1, has the most impact, especially for females employed in the market. On the other hand, family size, N, and elementary school children, C_2, have less impact than C_1. In fact, empirical results show that they have no impact on males' TV-watching, as may be expected.

The regional factors represented by urbanization and unemployment rates, U_1 and U_2, have positive effects on TV-watching only for males, but no effect for other groups. But they have various effects on reading, although they vary with categories.

The four housing factors also show varied impacts on reading and TV-watching. For instance, their impacts are negligible for WFEDAY. But house characteristics, H_3, is a very significant variable in influencing activities of WFEEND.

The empirical results for females not employed in the market are quite different from those for other female groups, particularly regarding wage and income effects. Another finding, which is somewhat unexpected, is that the variable of education seems to have less effect or less

significant effect for females not employed in the market. Whether this is due to the imputation of their wage rates and earnings because of the lack of survey data cannot be ascertained. Nevertheless, we have found that for females not employed in the market, the correlations of independent variables between predicted wage rate and income and between predicted wage rate and education are much higher than those for other groups. These multicollinearities may cause a variable to be insignificant in regressions (e.g., education appears to be less important for females not employed in the market). Another possible reason is that time value measured by wage rate may be inappropriate.

There are a few cases for blacks where both wage and income effects are positive and significant (e.g. BMDAY on mail), which is somewhat inconsistent with economic theories. This is perhaps due to the inaccuracy of the data, or inadequacy of our model.

Finally, before we conclude this thesis, some remarks are worthy of mention. First of all, we had hoped that all the relevant variables would be directly and independently available from the survey, especially regarding economic variables such as wage rates and nonwage incomes. Unfortunately this was not the case in this study. Whenever wage rates are not directly available, earnings divided by work hours or predicted values are used. For nonwage income, we use family income, or family income minus respondent's earnings, as proxies.

Next, in order to analyze household behavior more adequately, at least the data on both husband and wife should be available, with respect to their economic status and personal backgrounds. For those people currently not employed in the market, especially females, perhaps their past experiences, wage rates and earnings can be helpful.

In order to study leisure activities more meaningfully, the amounts of both goods and time, or their equivalent values, for consumption should be available, though it sounds more complicated and difficult.

With the limited data, we have only included reading and TV-watching in this study. We hope that better data on work and on a wider range of leisure activities will be available in the future. They will be needed in order to understand the allocation of time and household behavior more fully.

APPENDIX A

BIAS OF TRADITIONAL ESTIMATES

Traditional study of consumption of goods disregarding the time constraint or time cost will result in biased estimates of various measures such as income elasticity. In a two-commodity case, a household utility function, production function and full income constraint can be written as

$$U=U(Z_1,Z_2) \tag{A.1}$$

$$Z_i=F_i(X_i,T_{iM},T_{iF},Y_i), \qquad i=1,2 \tag{A.2}$$

$$I^*=\sum_{i=1}^{2}(p_iX_i+w_MT_{iM}+w_FT_{iF})$$

$$= w_MT + w_FT + I_o \tag{A.3}$$

The demand function for Z_i is

$$Z_i= Z_i(p_1,p_2, w_M, w_F, I_o), \tag{A.4}$$

All notations are defined the same as in text.

Assume production is linear homogeneous in X_i, T_{iM}, and T_{iF}. Let the average cost per unit of Z_i be

$$c_i=p_ix_i+w_Mt_{iM}+w_Ft_{iF} \tag{A.5}$$

where $x_i = X_i/Z_i$

$t_{iM} = T_{iM}/Z_i$

$t_{iF} = T_{iF}/Z_i$.

In equilibrium,

$$c_i(dZ_i) = -c_j(dZ_j), \qquad i,j=1,2; \quad i\neq j. \tag{A.6}$$

From Eq. (A.6), we can derive

$$r_i e_{ii} = -r_j e_{ij}, \qquad i \neq j \tag{A.7}$$

where $r_i = c_i Z_i / I^* =$ share in full income for Z_i

$e_{ii}, e_{ij} =$ own or cross price elasticity (in full cost or full price sense) between commodities Z_i and Z_j for $i=j$, or $i \neq j$ respectively.

From Eq. (A.7), we have

$$e_{ii} = -(r_j/r_i)e_{ij}. \tag{A.8}$$

It can be shown that the relative change in Z_1 responsive to a price change, with compensated income, equals

$$dZ_1/Z_1 = e_{11}(dc_1/c_1) + e_{12}(dc_2/c_2) \tag{A.9}$$

Substituting Eq. (A.8) into Eq. (A.9), we have

$$dZ_1/Z_1 = e_{12}((dc_2/c_2) - (r_2/r_1)(dc_1/c_1)) \tag{A.10}$$

A change in wage rate representing time cost will change the full cost of each commodity and the consumer's income position. Its effects on the demand for commodities will include both price and income effects. Observing that

$$dc_i/c_i = h_{ik}(dw_k/w_k), \qquad i=1,2; \quad k=M,F \tag{A.11}$$

where $h_{ik} = w_k t_{ik}/c_i$.

The effect of a wage change on Z_i can be shown as

$$\begin{aligned} dZ_1/Z_1 &= e_{12}(h_{2k}(dw_k/w_k) - (r_2/r_1)h_{1k}(dw_k/w_k)) \\ &\quad + m_1 y_k (dw_k/w_k) \\ &= e_{12}(h_{2k} - (r_2/r_1)h_{1k})(dw_k/w_k) + m_1 y_k (dw_k/w_k) \end{aligned} \tag{A.12}$$

where $m_1 =$ true income elasticity of demand for Z_1, with respect to money income

$y_k = w_k N_k / I^*$

= share of member k's earnings in full income.

The first term on the right of Eq. (A.12) is similar to Eq. (A.10) above. It indicates the impact of a wage change through a price effect. The second term indicates the impact of a wage change through an income effect.

Rearranging Eq. (A.12), we have

$$m_1 = (dZ_1/Z_1)/(y_k(dw_k/w_k)) - e_{12}(h_{2k} - (r_2/r_1)h_{1k})/y_k. \quad (A.13)$$

The first term on the right is the traditional estimate of income elasticity. The second term expresses the effect of time intensity on the true income elasticity.

In a three-commodity case, we have

$$U = U(Z_1, Z_2, Z_3) \quad (A.14)$$

The relative change in Z_i responsive to a price change, with compensated income, equals

$$dZ_1/Z_1 = e_{11}(dc_1/c_1) + e_{12}(dc_2/c_2) + e_{13}(dc_3/c_3). \quad (A.15)$$

Since $$r_1 e_{11} = -(r_2 e_{12} + r_3 e_{13}), \quad (A.16)$$

$$dZ_1/Z_1 = e_{12}((dc_2/c_2) - (r_2/r_1)(dc_1/c_1)) + e_{13}((dc_3/c_3) - (r_3/r_1)(dc_1/c_1)). \quad (A.17)$$

And the equations similar to Eqs. (A.12) and (A.13) will take the forms of

$$dZ_1/Z_1 = (e_{12}(h_{2k} - h_{1k}(r_2/r_1)) + e_{13}(h_{3k} - h_{1k}(r_3/r_1)) + m_1 y_k)(dw_k/w_k) \quad (A.18)$$

$$m_1 = (dZ_1/Z_1)/(dw_k/w_k)y_k - (e_{12}(h_{2k} - h_{1k}(r_2/r_1)) + e_{13}(h_{3k} - h_{1k}(r_3/r_1)))/y_k. \quad (A.19)$$

The traditional estimate of income elasticity has a bias equal to the second term of Eq. (A.19).

In general, in a multicommodity case, the difference between the true income elasticity and the traditional estimate can be shown as

$$B_i = \sum_{j=1}^{n} e_{ij}(h_{jk}-h_{ik}(r_j/r_i))/y_k. \qquad (A.20)$$

It can be seen that the difference between the true income elasticity and the traditional estimate depends on e_{ij}'s, h_{ik},'s, r_j/r_i and y_k; i.e., cross price elasticities, share of member k's time in full cost of commodities, the share of each commodity in full income and the importance of member k's earnings in full income.

APPENDIX B

REGRESSION RESULTS OF DEMAND FOR READING AND TV-WATCHING

by Category, Cross Section, USA, 1971

(I_o' = family income minus respondent's earnings)

B-1. Regression Results of Demand for Reading and TV-watching, WMDAY

B-2. Regression Results of Demand for Reading and TV-watching, WMEND

B-3. Regression Results of Demand for Reading and TV-watching, BMDAY

B-4. Regression Results of Demand for Reading and TV-watching, BMEND

B-5. Regression Results of Demand for Reading and TV-watching, WFEDAY

B-6. Regression Results of Demand for Reading and TV-watching, WFEEND

B-7. Regression Results of Demand for Reading and TV-watching, BFEDAY

B-8. Regression Results of Demand for Reading and TV-watching, BFEEND

B-9. Regression Results of Demand for Reading and TV-watching, WFNDAY

B-10. Regression Results of Demand for Reading and TV-watching, WFNEND

B-11. Regression Results of Demand for Reading and TV-watching, BFNDAY

Table B-1

Regression Results of Demand for Reading and TV-watching
Cross Section, WMDAY, 1971

	W	I_0'	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading total	.47	.62	8.77		.77		-7.61							-8.87	-25.64	.17
	(.43)	(.75)	(9.89)		(2.72)		(1.78)							(1.96)		
Magazines	1.02	.11	2.32			-1.31								-3.26	-1.87	.07
	(1.90)	(.25)	(5.42)			(1.42)								(1.44)		
Newspapers	.37	-.03	1.31	.59				-2.53	.17				1.34		-26.87	.10
	(.72)	(.09)	(3.12)	(5.85)				(1.92)	(1.89)				(1.37)			
Books	-1.27	.38	4.94				-6.18	4.73	-.31				-3.61			.08	.12
	(1.78)	(.72)	(8.72)				(2.47)	(2.58)	(2.42)				(2.64)			
Mail	.49	.26	.46		.06	-.51				.76		.47		-1.84	-4.22	.09
	(2.72)	(1.94)	(3.13)		(1.40)	(1.54)				(1.93)		(1.29)		(2.41)		
TV-watching	-.04	.71		-4.52	4.22					.52			-6.45		278.00	.05
	(.03)	(.60)		(3.13)	(1.62)					(1.83)			(2.03)			

Notes: Figures in parentheses are t-values of estimated coefficients, omitting the signs for convenience.

Table B-2

Regression Results of Demand for Reading and TV-watching
Cross Section, WMEND, 1971

	W	I_o'	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**		1.75	2.58	6.50							5.96			-30.56	31.19	.22
		(.82)	(1.99)	(4.56)							(1.94)			(4.09)		
Magazines		-.41	.74	2.18					-3.03					-6.89	24.35	.10
		(.47)	(1.36)	(3.64)					(1.85)					(2.42)		
Newspapers		.05	1.45	3.64	3.60	-3.12		5.03						-15.24	-58.31	.18
		(.04)	(1.91)	(4.30)	(2.26)	(1.68)		(1.36)						(3.73)		
Books		1.56	.64	1.80			2.96							-9.17	.30	.07
		(1.27)	(.84)	(2.17)			(1.71)							(2.25)		
Mail		.27	.25					1.87			1.94				-9.77	.06
		(.69)	(.94)					(1.61)			(3.39)					
TV-watching		.05	-1.92	-4.73					.74						130.82	.04
		(.00)	(1.14)	(2.51)					(1.69)							

Notes: See Table B-1.

Table B-3

Regression Results of Demand for Reading and TV-watching
Cross Section, BMDAY, 1971

	W	I'_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-8.59	-2.11	10.64					-20.55							3.12	.19
	(1.44)	(.94)	(2.85)					(1.36)								
Magazines	-2.20	-1.45	4.11		-.92	-6.34								14.08	-11.64	.21
	(.73)	(.65)	(2.08)		(1.49)	(1.81)								(1.73)		
Newspapers	-1.30	-2.13	4.38										5.98		-31.22	.21
	(.46)	(1.01)	(2.48)										(1.93)			
Books	-2.82	.12													26.51	.01
	(.81)	(.04)														
Mail	1.31	.29										-1.39	1.65	1.87	-8.88	.36
	(3.93)	(1.12)										(2.28)	(3.65)	(2.28)		
TV-watching	40.51	-2.68	-17.09					-41.26		-48.07					462.97	.40
	(4.29)	(.39)	(2.91)					(1.82)		(2.69)						

Notes: See Table B-1.

Table B-4

Regression Results of Demand for Reading and TV-watching
Cross Section, BMEND, 1971

	W	I_o'	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-25.50	-10.00	-.42			32.20	-91.01		-21.79	36.84	14.87	31.92			-146.01	.80
	(2.50)	(1.83)	(.12)			(2.57)	(4.19)		(2.44)	(3.24)	(1.51)	(2.78)				
Magazines	-2.81	.82	3.72	.83			8.29								-63.81	.54
	(1.05)	(.59)	(3.61)	(2.30)			(1.71)									
Newspapers	-7.67	-12.47			-1.94					44.53	19.95				-141.52	.48
	(.65)	(1.99)			(1.48)					(2.18)	(1.66)					
Books	-11.66	-3.85	5.33		1.35										-30.67	.63
	(2.98)	(1.80)	(3.65)		(2.79)											
Mail	-1.36	-.73				-1.34	2.06		.17	-1.37				2.99	-3.66	.82
	(5.51)	(4.63)				(5.73)	(4.25)		(6.82)	(4.66)				(4.45)		
TV-watching	-1.76	-13.87					-61.23							-124.01	600.86	.40
	(.10)	(1.24)					(1.99)							(2.37)		

Notes: See Table B-1.

Table B-5

Regression Results of Demand for Reading and TV-watching
Cross Section, WFEDAY, 1971

	W	I_o'	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading total	1.53	-.46	7.58		.86										-37.41	.09
	(.99)	(.66)	(5.27)		(2.48)											
Magazines	.38	-.62	2.36						.17						-19.89	.05
	(.51)	(1.86)	(3.41)						(1.45)							
Newspapers	.37	.70	1.86	.63				2.10	.12						-35.04	.14
	(.65)	(2.71)	(3.45)	(6.02)				(1.61)	(1.35)							
Books	.28	-.70	2.96												-12.29	.03
	(.28)	(1.56)	(3.23)													
Mail	.31	-.03	.25	.07			1.42		.06		.36				-7.69	.07
	(1.92)	(.41)	(1.68)	(2.03)			(2.17)		(2.26)		(1.50)					
TV-watching	-3.99	-.35	-4.73	-6.25	6.74		29.87				-3.36				351.08	.09
	(1.73)	(.32)	(2.19)	(1.98)	(1.77)		(3.16)				(.95)					

Notes: See Table B-1.

Table B-6

Regression Results of Demand for Reading and TV-watching
Cross Section, WFEEND, 1971

	W	I_o'	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-5.82	.52	4.71				-29.19	10.71					10.78		-21.70	.16
	(1.98)	(.51)	(2.15)				(3.24)	(1.75)					(2.33)			
Magazines	-.53	.48	1.35												-5.02	.03
	(.44)	(1.21)	(1.51)													
Newspapers	-1.66	.67		-2.21	3.20	-2.98	-9.41						4.61		52.89	.18
	(1.20)	(1.34)		(1.30)	(1.54)	(1.30)	(1.86)						(2.17)			
Books	-2.97	-.61	3.03				-11.18	17.06		4.08			5.26		-54.77	.15
	(1.40)	(.83)	(1.93)				(1.74)	(3.90)		(1.31)			(1.65)			
Mail	.20	.03											-.65		5.39	.01
	(.68)	(.37)											(1.43)			
TV-watching	-5.63	-.20	-15.59				56.54	-14.06					17.03	-20.23	320.53	.21
	(1.14)	(.11)	(4.10)				(3.73)	(1.35)					(2.26)	(1.49)		

Notes: See Table B-1.

Table B-7

Regression Results of Demand for Reading and TV-watching
Cross Section, BFEDAY, 1971

	W	I_0^*	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading total	17.82 (3.32)	2.08 (1.32)	5.01 (1.79)			-11.97 (3.13)			-.95 (2.10)		-6.34 (1.62)				98.39	.45
Magazines	3.10 (3.10)	.33 (1.14)	1.81 (3.49)			-5.87 (3.88)	7.26 (3.80)	3.50 (1.65)	.13 (1.56)						-15.11	.59
Newspapers	2.02 (.81)	-.17 (.24)	3.29 (2.50)			-3.81 (2.11)				3.67 (1.32)					-25.78	.25
Books	11.67 (2.64)	1.91 (1.46)				-5.69 (1.72)			-1.14 (2.87)		-6.77 (1.98)				130.15	.33
Mail	.23 (.51)	.12 (.92)	.65 (2.74)		.14 (2.20)						-.74 (2.21)				-3.71	.29
TV-watching	-6.07 (.43)	3.31 (.81)		-5.36 (3.20)				-40.56 (2.22)							431.99	.24

Notes: See Table B-1.

Table B-8

Regression Results of Demand for Reading and TV-watching
Cross Section, BFEEND, 1971

	W	I'_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-11.30	4.60		-2.29			-35.39		-.62		-22.16	-5.86	13.16		268.04	.96
	(4.56)	(3.52)		(6.19)			(5.37)		(2.28)		(4.90)	(1.69)	(4.07)			
Magazines	1.29	-.13		-12.31	11.79		-21.61		.28					40.56	176.92	.95
	(.72)	(.22)		(7.47)	(6.36)		(4.82)		(1.85)					(8.04)		
Newspapers	4.07	6.05	-2.33						-.43	-13.49			10.02		73.22	.87
	(1.80)	(4.00)	(2.14)						(1.54)	(5.08)			(3.60)			
Books	-7.81	1.30	1.53	3.21	-4.47				-.37		-12.43	-16.53	7.91		63.29	.93
	(3.79)	(1.04)	(1.56)	(2.13)	(2.42)				(1.60)		(5.32)	(5.75)	(2.76)			
Mail	-.91	-1.41		-1.37	1.86		-14.80			3.09	8.34	-6.43	-25.04	85.04		.96
	(.95)	(3.95)		(1.54)	(1.83)		(7.14)			(2.17)	(5.73)	(7.34)	(10.34)			
TV-watching	-2.36	-14.10		-3.36											385.47	.43
	(.12)	(2.18)		(1.61)												

Notes: See Table B-1.

Table B-9

Regression Results of Demand for Reading and TV-watching
Cross Section, WFNDAY, 1971

	W	I'_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	24.46	-3.91		.76					.37			6.70			-46.05	.12
	(3.75)	(3.32)		(2.50)					(1.51)			(2.52)				
Magazines	10.30	-.79		-1.39	2.08						-1.75	2.29		5.55	2.20	.08
	(3.55)	(1.50)		(1.47)	(1.79)						(1.48)	(1.81)		(1.90)		
Newspapers	7.82	-1.36		.71								2.34		-4.56	-5.23	.16
	(3.23)	(2.96)		(5.86)								(2.18)		(1.87)		
Books	9.34	-2.15						3.43			2.51				-4.56	.02
	(2.15)	(2.63)						(1.64)			(1.52)					
Mail	1.97	-.17	-.39							.45			.66		.66	.04
	(1.71)	(1.31)	(1.49)							(1.47)			(2.38)			
TV-watching	-37.70	1.10		-14.51	17.53	-4.82			.71						494.21	.09
	(3.16)	(.51)		(3.86)	(3.68)	(1.07)			(1.68)							

Notes: See Table B-1.
W = predicted hourly wage.

Table B-10

Regression Results of Demand for Reading and TV-watching
Cross Section, WFNEND, 1971

	W	I'_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	36.00	-2.20							-.82						66.17	.13
	(3.85)	(1.27)							(1.95)							
Magazines	4.73	1.19				-4.53							-3.96		34.04	.09
	(1.05)	(1.38)				(2.67)							(2.05)			
Newspapers	18.02	-.93													-1.05	.14
	(3.86)	(1.03)														
Books	-7.51	.32	4.64						-.68					-8.13	53.82	.08
	(.66)	(.22)	(1.89)						(2.47)					(1.41)		
Mail	.40	-.01									.59	.51			-3.50	.09
	(.50)	(.05)									(1.64)	(1.39)				
TV-watching	-21.57	-1.83		-17.74	19.57			21.71							587.81	.15
	(1.24)	(.54)		(3.15)	(2.78)			(2.23)								

Notes: See Table B-9.

Table B-11

Regression Results of Demand for Reading and TV-watching
Cross Section, BFNDAY, 1971

	W	I'_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	Constant	R^2
Reading **total**	-22.45	11.27					17.42					32.84		30.03	-151.99	.53
	(1.72)	(2.31)					(1.37)					(3.64)		(1.71)		
Magazines	-6.02	-1.13	1.59												.75	.32
	(2.85)	(1.20)	(2.21)													
Newspapers	13.52	-2.22			-1.05		-12.61			-12.59	11.40	7.58	-4.89		27.89	.70
	(1.75)	(.97)			(2.00)		(1.36)			(2.45)	(2.66)	(1.73)	(1.61)			
Books	-7.83	8.80										18.31		23.87	-113.48	.34
	(.76)	(1.76)										(2.29)		(1.34)		
Mail	-.54	.07							1.20						-3.55	.09
	(.51)	(.15)							(1.39)							
TV-watching	69.14	3.63						-81.27				-66.32			451.45	.43
	(1.73)	(.20)						(2.96)				(2.43)				

Notes: See Table B-9.

APPENDIX C

MATRICES OF SIMPLE CORRELATION COEFFICIENTS OF INDEPENDENT VARIABLES

by Category, Cross Section, USA, 1971

Table C-1

Matrix of Simple Correlation Coefficients of Independent Variables, WMDAY

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I'_o
W	1.00														
I_o	.82	1.00													
S^o	.36	.41	1.00												
A_2	.16	.14	-.22	1.00											
A^2	.13	.11	-.23	.99	1.00										
N	.03	-.02	.06	-.33	-.39	1.00									
C_1	-.05	-.11	.09	-.46	.46	.47	1.00								
C_2	.04	-.00	.05	-.20	-.25	.79	.12	1.00							
U_1	.16	.19	.26	-.00	-.01	-.00	-.03	-.01	1.00						
U_2	.11	.11	.13	.05	.05	.02	-.04	.03	.25	1.00					
H_1	.35	.33	.17	.22	.19	.11	-.08	.11	.05	.01	1.00				
H_2	.36	.36	.28	.20	.19	-.09	-.14	-.03	.07	.08	.31	1.00			
H_3	.36	.36	.29	.18	.17	-.09	-.12	-.07	.04	.08	.29	.74	1.00		
H_4	.12	.10	-.07	.23	.21	.16	-.04	.18	-.14	-.07	.21	.21	.16	1.00	
I'_o	-.19	.39	.09	-.00	-.00	-.09	-.12	-.07	.06	.01	-.00	.06	.04	-.03	1.00

Notes: I_o = family income;
I'_o = family income minus respondent's earnings;
For other notations, see text.
Figures .00 indicate that the values are less than .005.

Table C-2

Matrix of Simple Correlation Coefficients of Independent Variables, WMEND

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I'_o
W	1.00														
I_o	.74	1.00													
S	.48	.50	1.00												
A	.09	.05	-.17	1.00											
A^2	.07	.02	-.18	.99	1.00										
N	.03	-.02	-.08	-.25	-.28	1.00									
C_1	-.10	-.16	-.08	-.44	-.42	.43	1.00								
C_2	.05	-.03	-.09	-.14	-.18	.68	.04	1.00							
U_1	.16	.14	.27	-.05	-.06	.03	-.07	.06	1.00						
U_2	.03	-.04	.15	-.02	-.02	.10	.03	.10	.31	1.00					
H_1	.32	.41	.29	.19	.15	.14	-.17	.16	.09	.02	1.00				
H_2	.32	.40	.40	.01	-.00	-.04	-.17	.03	-.00	.07	.42	1.00			
H_3	.27	.32	.41	.11	.10	-.18	-.24	-.09	.05	.12	.37	.74	1.00		
H_4	.13	.17	-.06	.15	.12	.20	.01	.18	-.18	-.07	.42	.19	.07	1.00	
I'_o	-.23	.44	.07	-.03	-.02	-.11	-.12	-.13	.02	-.14	.13	.16	.11	.03	1.00

Notes: See Table C-1.

Table C-3

Matrix of Simple Correlation Coefficients of Independent Variables, BMDAY

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I_o'
W	1.00														
I_o	.18	1.00													
S	.40	.32	1.00												
A	-.16	-.33	-.37	1.00											
A^2	-.16	-.36	-.36	.99	1.00										
N	.13	.32	.08	-.17	-.21	1.00									
C_1	.32	.39	.26	-.38	-.38	.66	1.00								
C_2	.04	.11	-.09	-.14	-.18	.82	.44	1.00							
U_1	.34	.12	.14	-.04	-.06	.29	.25	.09	1.00						
U_2	-.18	.21	.00	-.00	-.01	.27	.04	.22	.34	1.00					
H_1	-.12	.08	-.26	.44	.41	-.11	-.18	-.04	-.02	-.21	1.00				
H_2	.12	.37	.19	.15	.12	.05	.09	-.03	-.02	-.04	.34	1.00			
H_3	-.04	.06	.10	.15	.15	-.06	-.06	-.17	.08	-.20	.38	.55	1.00		
H_4	-.34	-.07	-.42	.45	.44	-.10	-.33	.03	-.39	-.13	.49	.09	-.02	1.00	
I_o'	-.09	.79	.15	-.13	-.15	.13	.13	-.13	-.04	.22	.04	.27	.02	.09	1.00

Notes: See Table C-1.

Table C-4

Matrix of Simple Correlation Coefficients of Independent Variables, BMEND

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I'_o
W	1.00														
I_o	.60	1.00													
S	.36	.47	1.00												
A	-.47	-.33	-.56	1.00											
A^2	-.32	-.37	-.54	.99	1.00										
N	-.32	-.37	.17	-.10	-.12	1.00									
C_1	-.11	-.07	-.04	-.44	-.45	.60	1.00								
C_2	-.29	-.31	.01	-.05	-.09	.86	.40	1.00							
U_1	.29	.42	.39	-.17	-.14	-.12	-.12	-.06	1.00						
U_2	.23	.20	-.09	-.09	-.06	-.22	.06	-.12	.56	1.00					
H_1	-.08	.21	-.07	.42	.38	.12	-.30	.28	.25	-.05	1.00				
H_2	-.03	.07	-.02	.11	.05	-.00	-.11	.09	.14	.01	.14	1.00			
H_3	.48	.35	.43	-.30	-.33	.15	-.11	.35	.50	.22	.31	.12	1.00		
H_4	-.05	.03	-.19	.45	.40	.09	-.18	.20	-.22	-.04	.53	-.08	.08	1.00	
I'_o	-.27	.52	-.02	.19	.20	-.26	-.05	-.19	.27	.18	.31	.22	-.08	.15	1.00

Notes: See Table C-1.

Table C-5

Matrix of Simple Correlation Coefficients of Independent Variables, WFEDAY

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I'_o
W	1.00														
I_o	.27	1.00													
S	.26	.34	1.00												
A	.04	.08	-.10	1.00											
A^2	.04	.05	-.09	.99	1.00										
N	-.04	-.00	-.10	-.29	-.34	1.00									
C_1	.00	-.09	.01	-.41	-.39	.40	1.00								
C_2	-.03	-.00	-.09	-.18	-.22	.80	.03	1.00							
U_1	.10	.07	.17	.07	.08	-.11	-.11	-.04	1.00						
U_2	.09	-.09	.09	.01	.02	-.03	-.05	.01	.42	1.00					
H_1	.11	.31	.14	.25	.22	.14	-.01	.12	.01	-.06	1.00				
H_2	.08	.31	.32	.09	.08	-.11	-.09	-.07	.09	.03	.35	1.00			
H_3	.12	.36	.30	.15	.14	-.16	-.08	-.15	.09	.06	.30	.70	1.00		
H_4	-.06	.11	-.12	.18	.15	.18	.01	.17	-.16	-.21	.40	.08	.12	1.00	
I'_o	-.08	.79	.17	-.01	-.04	.17	.02	.12	.05	-.08	.28	.24	.24	.12	1.00

Notes: See Table C-1.

Table C-6

Matrix of Simple Correlation Coefficients of Independent Variables, WFEEND

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I_o'
W	1.00														
I_o	.42	1.00													
S	.30	.39	1.00												
A	-.04	.14	-.10	1.00											
A^2	-.04	.12	-.08	.99	1.00										
N	-.00	-.04	-.13	-.26	-.30	1.00									
C_1	-.09	-.04	-.03	-.41	-.40	.34	1.00								
C_2	-.01	-.04	-.08	-.17	-.20	.75	-.03	1.00							
U_1	.13	.08	.08	.03	.03	-.02	-.07	-.02	1.00						
U_2	-.09	-.01	.05	.03	.02	-.08	-.02	-.04	.29	1.00					
H_1	.18	.37	.13	.15	.12	.21	-.07	.15	-.07	-.09	1.00				
H_2	.20	.43	.30	.14	.13	-.01	-.04	-.03	-.11	-.10	.41	1.00			
H_3	.18	.37	.24	.17	.17	-.13	-.14	-.08	-.07	-.07	.37	.77	1.00		
H_4	.01	.10	-.20	.21	.18	.22	.03	.16	-.27	-.20	.48	.17	.14	1.00	
I_o'	.22	.90	.24	.12	.09	.05	.03	.00	.04	.05	.43	.42	.37	.13	1.00

Notes: See Table C-1.

Table C-7

Matrix of Simple Correlation Coefficients of Independent Variables, BFEDAY

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I_o'
W	1.00														
I_o	.32	1.00													
S	.32	.47	1.00												
A	.11	.06	-.18	1.00											
A^2	.08	.00	-.24	.99	1.00										
N	.11	.10	.19	-.42	-.44	1.00									
C_1	.10	-.08	.02	-.48	-.45	.60	1.00								
C_2	.15	.17	.19	-.27	-.31	.82	.36	1.00							
U_1	.09	.16	.04	.28	.27	-.02	-.21	.03	1.00						
U_2	-.06	.03	-.09	.20	.21	-.14	-.22	-.14	.19	1.00					
H_1	-.05	.32	.08	.26	.25	.03	-.09	.12	.08	.10	1.00				
H_2	.14	.27	.28	.05	.03	-.00	-.16	-.02	.16	.02	.33	1.00			
H_3	.10	.10	.31	.04	.02	.17	-.15	.23	.15	-.22	.27	.61	1.00		
H_4	.17	-.15	.09	.21	.22	-.16	-.09	-.21	-.29	.19	.32	.04	-.09	1.00	
I_o'	-.05	.89	.29	.00	-.04	.14	-.02	.12	.12	-.01	.20	.21	.01	-.21	1.00

Notes: See Table C-1.

Table C-8

Matrix of Simple Correlation Coefficients of Independent Variables, BFEEND

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I_o^*
W	1.00														
I_o	.19	1.00													
S	.46	.53	1.00												
A	-.55	-.19	-.36	1.00											
A^2	-.55	-.21	-.36	.99	1.00										
N	.25	-.11	.24	-.52	-.56	1.00									
C_1	.37	-.11	.25	-.59	-.57	.43	1.00								
C_2	-.01	-.09	.06	-.12	-.18	.77	.00	1.00							
U_1	.25	.48	.20	-.26	-.25	-.16	-.06	-.02	1.00						
U_2	.20	.06	-.02	.19	.23	-.44	-.03	-.53	.04	1.00					
H_1	-.30	-.24	-.33	.36	.37	-.50	-.04	-.63	-.04	.37	1.00				
H_2	.25	.32	.53	-.60	-.61	.26	.21	-.06	.31	-.50	-.09	1.00			
H_3	.26	-.23	.22	-.19	-.16	-.19	.07	-.39	.35	-.06	.33	.47	1.00		
H_4	-.58	-.18	-.33	.69	.66	.12	-.42	.25	-.36	-.08	.25	-.32	-.34	1.00	
I_o^*	.01	.94	.36	-.08	-.11	-.05	-.08	.05	.42	.11	-.23	.09	-.47	-.02	1.00

Notes: See Table C-1.

Table C-9

Matrix of Simple Correlation Coefficients of Independent Variables, WFNDAY

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I'_o
W	1.00														
I_o	.82	1.00													
S	.72	.34	1.00												
A	.18	.33	-.06	1.00											
A^2	.19	.32	-.07	.99	1.00										
N	-.10	-.11	.00	-.44	-.49	1.00									
C_1	-.11	-.22	.02	-.55	-.53	.38	1.00								
C_2	-.07	-.06	.00	-.24	-.29	.78	-.04	1.00							
U_1	.36	.13	.24	.15	.16	-.07	-.08	-.02	1.00						
U_2	.17	.05	.04	.12	.13	-.07	-.06	-.07	.25	1.00					
H_1	.46	.44	.25	.24	.21	.07	-.14	.09	.05	-.00	1.00				
H_2	.34	.40	.32	.31	.29	-.11	-.19	-.05	.11	.06	.47	1.00			
H_3	.42	.38	.33	.25	.25	-.20	-.18	-.12	.13	.10	.39	.79	1.00		
H_4	-.07	.10	.01	.05	.03	.11	.01	.09	-.17	-.13	.33	.19	.07	1.00	
I'_o	.75	.94	.26	.05	.03	.15	-.00	.10	.08	.06	.45	.35	.29	.11	1.00

Notes: See Table C-1.

Table C-10

Matrix of Simple Correlation Coefficients of Independent Variables, WFNEND

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I_o^*
W	1.00														
I_o	.83	1.00													
S	.78	.44	1.00												
A	.04	.21	-.07	1.00											
A^2	.03	.18	-.09	.99	1.00										
N	-.05	-.10	-.01	-.44	-.47	1.00									
C_1	.07	-.12	.15	-.63	-.60	.48	1.00								
C_2	-.07	-.07	-.08	-.19	-.23	.72	.02	1.00							
U_1	.31	.11	.21	.05	.05	-.06	-.03	.04	1.00						
U_2	.21	.08	.11	-.07	-.08	-.06	.07	-.04	.18	1.00					
H_1	.49	.43	.39	.21	.19	.03	-.11	.08	.04	-.03	1.00				
H_2	.37	.48	.36	.27	.26	-.22	-.18	-.16	.02	-.02	.55	1.00			
H_3	.51	.51	.39	.20	.19	-.25	-.10	-.24	.02	.10	.52	.79	1.00		
H_4	-.02	.16	.07	.20	.18	.01	-.12	.02	-.15	-.09	.37	.24	.11	1.00	
I_o^*	.77	.94	.37	-.10	-.12	.16	.12	.08	.09	.12	.40	.40	.43	.10	1.00

Notes: See Table C-1.

Table C-11

Matrix of Simple Correlation Coefficients of Independent Variables, BFNDAY

	W	I_o	S	A	A^2	N	C_1	C_2	U_1	U_2	H_1	H_2	H_3	H_4	I_o'
W	1.00														
I_o	.37	1.00													
S	.49	.58	1.00												
A	-.06	-.10	-.41	1.00											
A^2	-.10	-.12	-.40	.99	1.00										
N	.42	.04	.38	-.38	-.43	1.00									
C_1	.54	-.04	.32	-.55	-.55	.60	1.00								
C_2	.39	.16	.31	-.24	-.29	.93	.44	1.00							
U_1	.15	.43	.37	.24	.26	-.08	-.16	-.14	1.00						
U_2	.34	.32	.25	-.26	-.31	.09	-.10	.11	-.05	1.00					
H_1	.04	.32	.22	.09	.08	.23	.22	.20	.41	-.27	1.00				
H_2	.19	.21	.42	.40	.43	-.03	-.30	.01	.42	-.22	.03	1.00			
H_3	.38	.19	.45	.19	.21	.08	-.05	.10	.32	.01	.03	.69	1.00		
H_4	.06	.08	.01	.08	.04	.18	.05	.15	-.01	.23	.46	-.30	-.38	1.00	
I_o'	-.09	.83	.27	-.14	-.15	-.05	-.11	.02	.40	.04	.47	-.05	-.19	.13	1.00

Notes: See Table C-1.

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