and 40 percent of the Class 2 price. This would occur even if the particular farmer's milk was used only in the production of Class 2 products.

The impact of classified prices for milk in the U.S. is significant. In 1985, the year of this study, there were 45 Federal milk marketing orders in existence. Almost three-quarters of the U.S. population resided in these order areas. Seventy percent of all milk marketed in the U.S. and 80 percent of all grade A milk marketed in the U.S. was marketed in Federal order areas (USDA 1986, p. 11).

CONSUMER AND WELFARE LOSSES FROM MILK MARKETING ORDERS

The welfare loss model and the estimation of prices and quantities are discussed in the first two sections. The gains and losses from milk marketing orders in 1985 are given in the final section. Consideration is also given to the regressive effects of milk marketing orders on consumers.

Welfare Loss Model

Data for Class 2 and Class 3 milk were combined in this analysis for purposes of simplification. Class 1 milk was fluid milk while Class 2 milk was all manufactured milk products. The welfare loss model is shown in Figure 1. Prices and quantities are given on the vertical and horizontal axes respectively. The demand curves for Class 1 and Class 2 milk are given in Figures 1A

and 1B. When the two demand curves D_1D_1 and D_2D_2 are added horizontally the result is DD the aggregate demand curve which is shown in Figure 1C. This demand curve reflects the use of grade A milk for both fluid and manufacturing purposes. The supply of all grade A milk is given by SS.

In a competitive market all grade A milk would sell for one price regardless of its use. This single competitive price is determined by the intersection of the aggregate demand (DD) and supply curves (SS), identified as point K in Figure 1C. The price, $\hat{P}$, represents the price of grade A milk that would exist in a competitive market and $\hat{Q}_s$ represents the total quantity that would be sold in a competitive market. It is equal to $\hat{Q}_1$ and $\hat{Q}_2$ which are the competitive quantities in the Class 1 and Class 2 markets, respectively.

Under milk marketing orders, the price of Class 1 milk (P_1) is set higher than the price of Class 2 milk (P_2). In Figure 1A, P_1, the price of Class 1 milk under milk marketing orders, results in the quantity Q_1 being demanded. Similarly, in Figure 1B, P_2, the price for Class 2 milk, results in a quantity Q_2 being demanded.

The blend price, P_b, is the price received by farmers and is calculated as follows:

$$P_b = [P_1Q_1 + P_2(Q_s - Q_1)]/Q_s.$$

This formula means that all milk not consumed as Class 1 is assigned to Class 2.
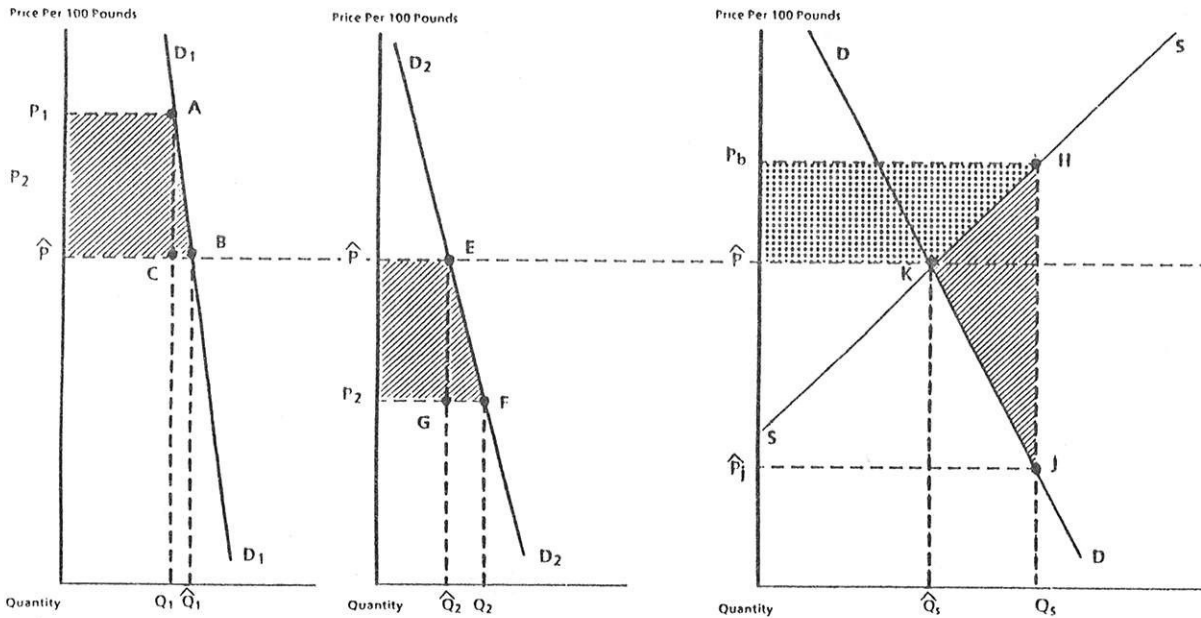

Figure 1A

Figure 1B

Figure 1C

Figure 1 - Milk Marketing Model

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As shown in the graphs, the single competitive price $\hat{P}$ is higher than P_2, but lower than P_1 and P_b. This relationship is based on the results of existing studies and is confirmed by the results of this study. Finally the price $\hat{P}_j$ is given by the intersection of the aggregate demand curve and the line HQ_s. This price is important since it is used in the estimation of the efficiency loss.

The welfare loss is based on changes in consumer and producers surpluses and the efficiency loss when marketing orders replace a competitive market system. In Figure 1A the price increase from $\hat{P}$ to P_1 results in a loss in consumer surplus equal to $\hat{P}P_1AB$. In contrast, there is a gain in consumer surplus in the Class 2 market due to a price decrease from $\hat{P}$ to P_2. This gain is equal to $\hat{P}P_2FE$. The net loss in consumer surplus is obtained by deducting the gain in Class 2 market from the loss in Class 1 market.

There is also a gain in producer surplus or quasi-rent when the competitive $\hat{P}$ is replaced by the blend price P_b. It is equal to $\hat{P}P_bHK$. The final component is the efficiency loss which is given by HKJ. It reflects the production of $Q_s - \hat{Q}_s$ units under milk marketing orders as milk producers respond to the blend price. The willingness to pay for this additional quantity is given by $\hat{Q}_sKJQ_s$ while the additional costs are given by $\hat{Q}_sKHQ_s$. The difference between these two components is the efficiency loss.

The absolute welfare loss is equal to the net loss in consumer surplus plus the efficiency loss minus the gain in producer surplus. It is also possible to estimate the relative welfare loss which is given by the absolute welfare loss divided by the change in producer surplus. In this manner the net transfer costs of aiding dairy farmers may be assessed. Thus a relative welfare loss of 0.60 indicates that each $100 transferred to producers through milk marketing orders costs the economy $160.

Estimation of Prices and Quantities Used in the Analysis

Equilibrium prices and quantities were based on actual prices and quantities under milk marketing orders and price elasticities of demand and supply.

The formula for the price elasticity of demand for Class 1 milk is:

(1) $N_1 = [\Delta Q/Q_1]/\Delta P/P_1] = (\Delta Q/\Delta P)/(P_1/Q_1)$

where N_1 = price elasticity of demand for Class 1 milk at point A (Figure 1A),

P_1 = price of Class 1 milk at point A, and

Q_1 = quantity of Class 1 milk at point A.

This formula may be rewritten as follows:

(2) $N_1 = [(Q_1 - \hat{Q}_1)/(P_1 - \hat{P})][P_1/Q_1]$.

Similarly, the Class 2 formula is given by:

(3) $N_2 = [(Q_2 - \hat{Q}_2)/(P_2 - \hat{P})][P_2/Q_2]$

where

N_2 = price elasticity of demand at point F

P_2 = price of Class 2 milk at point F, and

Q_2 = quantity of Class 2 milk at point F.

The supply elasticity formula can be expressed as:

(4) $E_s = [(Q_s - \hat{Q}_s)/(P_b - \hat{P})][P_b/Q_s]$

where E_s is the price elasticity of supply at point H and the other terms are as defined earlier. In addition, the quantities of Class 1 and Class 2 milk demanded would equal the quantity supplied. This equilibrium situation can be stated as:

(5) $\hat{Q}_1 + \hat{Q}_2 = \hat{Q}_s$.

Equations 2, 3, 4 and 5 can then be solved for the four unknowns – $\hat{P}$, $\hat{Q}_1$, $\hat{Q}_2$ and $\hat{Q}_s$.

The analysis was done using 1985 data. Prices and quantities of milk demanded and supplied during 1985 were collected from the USDA (1987, 1986). A summary of prices and quantities is given in Table 1. There is excess production of 13.2 billion pounds.

Several authors have studied supply and demand elasticities for fluid and manufactured milk products (Dobson and Buxton 1977, p. 35; Hammond, Buxton and Thraen 1979, p. 26; Dahlgren 1981, pp. 33-4; AAEA 1986, pp. 25-30). Based on these studies, two sets of demand elasticities were used:

$N_1 = -.18$; $N_2 = -.35$ and

$N_1 = -.35$; $N_2 = -.65$.

Values of two and four were used for the supply elasticities.

The competitive prices and quantities under different sets of demand and supply elasticities are also given in Table 1. Competitive prices range from $12.56 to $12.97. In all instances they are lower than the Class 1 price ($14.67) and higher than the Class 2 price ($12.44). The total competitive quantity is also less than the quantity produced under milk marketing orders (97.764 billion pounds). There is no excess production.

The price $\hat{P}_j$, which was needed to estimate the efficiency loss, was obtained by first deriving a point on the aggregate demand curve corresponding to price P_2. Assuming linear demand

TABLE 1. Price/Quantity Data Under Milk Marketing Orders and a Competitive Market: 1985

System	P_1	P_2	Q_1	Q_2	Q_s
	(Dollars per 100 pounds)		(Billions of pounds)		
Milk Marketing Orders	$14.67	$12.44	42.201	42.362	97.764
Competitive Market ($E_s = 2$)					
$N_1 = -.18$, $N_2 = -.35$	$12.56	$12.56	43.294	42.219	85.513
$N_1 = -.35$, $N_2 = -.65$	$12.61	$12.61	44.274	41.983	86.257
Competitive Market ($E_s = 4$)					
$N_1 = -.18$, $N_2 = -.35$	$12.96	$12.96	43.088	41.746	84.834
$N_1 = -.35$, $N_2 = -.65$	$12.97	$12.97	43.916	41.197	85.113

TABLE 2. The Gains and Losses from Milk Marketing Orders: 1985

Price Elasticity of Supply E_s	Price Elasticities of Demand		Net Loss in Consumer Surplus ($ Million)	Gain in Producer Surplus ($ Million)	Efficiency Loss ($ Million)	Absolute Welfare Loss ($ Million)	Relative Welfare Loss[a]
	N_1	N_2					
2	-.18	-.35	851	770	489	570	0.740
	-.35	-.65	818	726	251	343	0.472
4	-.18	-.35	513	404	517	626	1.551
	-.35	-.65	513	396	276	393	0.992

[a]Absolute welfare loss divided by the gain in producer surplus

TABLE 3. Regressive Effects of Milk Marketing Orders: 1985
($E_s = 2$)

(1) Income Group	(2) Midpoint of Income Range ($)	(3) Net Costs ($)	(4) Net Costs Divided by Income (%)	(5) Federal Income Tax Rate (%)	(6) Surcharge[a] (%)
1	8,279.50	25.83	0.31	2.15	14.4
2	11,959.50	24.60	0.21	5.29	4.0
3	16,559.50	30.69	0.19	7.84	2.4
4	24,839.50	32.11	0.13	11.08	1.2
5	41,399.50	35.44	0.09	17.08	0.5
6	77,600.00	37.68	0.03	26.86	0.1

[a]Column (4) divided by column (5)

curves, similar triangles could then be used to obtain the price $\hat{P}_j$ (Figure 1C).

The Gains and Losses from Milk Marketing Orders

The gains and losses from milk marketing orders are given in Table 2. The net loss in consumer surplus ranges from $513 million to $851 million depending on demand and supply conditions. The price elasticity of supply has the greatest impact reflecting a lower competitive price under more inelastic supply conditions. The gain in producer surplus also increases as the elasticity of supply decreases ranging from $396 million to $404 million for an elasticity of supply equal to four and from $726 million to $770 million for an elasticity of supply equal to two.

In contrast to these results, the price elasticities of demand have a greater impact on the efficiency loss than the price elasticity of supply. The efficiency loss increases by more than 85 percent when the price elasticities of demand change from -.35 and -.65 to -.18 and -.35.

The absolute welfare loss was obtained by deducting the gain in producer surplus from the net loss in consumer surplus and the efficiency loss. It ranges from $343 million to $626 million with the price elasticities of demand again having the greatest impact. The most interesting result shown in Table 2 pertains to the relative welfare loss which is given in the last column. It ranges from 0.472 to 1.551 with the highest values occurring under the most elastic supply conditions and the most inelastic demand conditions. This means that it costs the economy from $147 to $255 to increase the income of dairy farmers by $100.

The excess over $100 reflects the inefficiencies or leaks which occur with this type of income assistance program.

It should be noted that these results do not include the costs of storing, handling and transporting excess milk which may be produced under milk marketing orders. This amounted to $129 million in 1985 (USDA 1987, p. 22). If this component were included, the absolute welfare loss would range from $472 million to $755 million while the relative welfare loss would range from 0.650 to 1.869.

Finally, the regressive effects of milk marketing orders on consumers were investigated using the methods developed by Hickok (1985). The percentage increase in price for Class 1 milk and the percentage decrease in price for Class 2 milk were first estimated. These changes were then multiplied by annual expenditures on fluid milk and manufactured milk products for each income group to determine the net costs of milk marketing orders on consumers. The net costs were then divided by the midpoint of each income group. The "income tax" surcharge was ascer-

tained by dividing the percentage of income that the net costs represented by the Federal income tax rate. The results are given in Table 3 for an elasticity of supply equal to two. The surcharge ranges from 0.1 percent for the highest income group to 14.4 percent for the lowest income group that paid Federal income tax. The corresponding values for an elasticity of supply equal to four were 0.1 percent and 9.3 percent. These results indicate the regressive effects of milk marketing orders and reflect the fact that Class 2 milk consumers are being subsidized by Class 1 milk consumers under milk marketing orders.

RECONSTITUTED MILK

The United States Public Health Service defines reconstituted or recombined milk as "...milk products... which result from the recombining of milk constituents with potable water" (Hammond, Buxton and Thraen 1979, p. 5). The process of recombining involves mixing water and nonfat dry milk at certain temperatures and then adding the desired amount of milk fat (Hammond, Buxton and Thraen 1979, p. 3). Blended milk is a mixture of reconstituted milk and fresh milk (Novakovic and Aplin 1981, p. 1). The technology of reconstituted milk has been available since the 1950's.

Reconstituted milk is not prohibited from sale. However, the "down allocation" and "compensatory payment" provisions of milk marketing orders effectively prohibit the sale of reconstituted milk. Under milk marketing orders, minimum grade A milk prices are set according to how the milk is used (i.e. - for fluid milk or manufactured milk products). "Down allocations" require that reconstituted milk be assigned to the lowest use class (Class 2 in this study) of a processor, regardless of the class for which it is actually used. Allocation provisions of the USDA require that all local fresh milk is first assigned to Class 1 uses. Any remaining local milk, as well as imported and reconstituted milk is then assigned to manufacturing uses (Whipple 1983, p. 207). The compensatory payment provision requires that a processor who uses reconstituted milk in excess of his lowest class production (e.g. - Class 2 production) is charged a compensatory payment equal to the Class 1 differential on the excess (Novakovic 1982, p. 19).

Although these policies are intended to make the cost of reconstituted milk the same as fresh milk to the processor, the effect is to make reconstituted milk more expensive than fresh milk since there are additional costs involved for dehydration, reconstitution and storage of reconstituted milk.

In August 1979, a consumer interest group called the Community Nutrition Institute (CNI) made a proposal to the USDA that reconstituted milk products be eliminated from the "down allocation" and "compensatory payment" provisions of milk marketing orders. The effect of this proposal would have been to reclassify all reconstituted milk in the lowest use class applicable to a region (i.e. - Class 2 or 3). The cost of reconstituted milk would then have been the manufacturing price plus the costs of concentration and reconstitution.

The CNI proposal was based on the arguments that existing reconstituted milk provisions:

1. eliminated an equally nutritious, lower cost substitute for fresh milk;

2. were unnecessary to protect milk producers in today's market conditions;

3. were contrary to other policies in the Agricultural Adjustment Act that protected against unreasonable fluctuations in prices and supplies;

4. created barriers to selling nonfat dry milk and

5. exceeded USDA's authority to regulate prices of milk substitutes (Federal Register 1980).

The CNI proposal was rejected by the Secretary of Agriculture for a number of reasons. They included: 1) increased competition and market instability which was contrary to the intent of the Agricultural Marketing Agreement Act of 1937, 2) decreased returns for milk producers, 3) negligible gains to consumers and 4) the argument that consumers could buy nonfat dry milk and blend it with fresh milk at home.

The rejection of the CNI proposal means that there is no incentive to use reconstituted milk to satisfy fluid milk requirements in the United States today. As a result milk production is not concentrated in the efficient milk-producing regions and shipped and recombined in less productive regions (MacAvoy 1977, p. 6).

DISCUSSION

The Agricultural Adjustment Act of 1937, which instituted milk marketing orders, was an attempt to ameliorate the conditions that existed in the dairy industry during the 1920's and 1930's. The objectives of this act were to ensure adequate supplies of milk from the depressed farming industry and to protect farmers from the monopsonistic power of milk handlers.

The purpose of this study was to measure the consumer and welfare losses from milk marketing orders in 1985. The losses from milk marketing orders were estimated by first determining the prices and quantities that would prevail under a competitive system.

The net loss in consumer surplus ranged from $513 million to $851 million with Class 2 milk consumers gaining at the expense of Class 1 milk consumers. As a result the effect of milk marketing orders on consumers was regressive. The absolute welfare loss ranged from $343 million to $626 million which is in agreement with the results of other studies of milk marketing orders (Dalgren 1980, Ippolito and Mason 1978). The relative welfare loss, which had not been estimated in other studies, ranged from 0.47 to 1.55. This means that the current system of producer protection costs from $147 to $255 for every $100 transferred to dairy farmers. These are relatively high transfer costs. The above results must be considered as conservative since the costs of storing, handling, and transporting the excess production of milk in 1985 were not included.

In view of these findings it might be queried why milk marketing orders continue to exist in the United States. One of the reasons for their continued existence may be historical. In the early years of milk marketing, there was a need for policies which ensured local supplies of milk since milk could not be transported over long distances nor stored for long periods. Dairy farmers had to be insulated from outside competition to protect local production capabilities. Milk marketing orders were designed to provide this insulation. However, there are significant contrasts between the situation in the post-Depression milk industry and the industry today. Due to improved transportation facilities, information and communication capabilities, milk markets need no longer be local in nature. Thus, it is no longer appropriate to require that local consumption be satisfied strictly from local supplies.

The ability to reconstitute milk has reduced even further the dependence on local milk supplies. The fact that supply and price fluctuations may be evened out means that milk marketing orders are no longer needed to ensure price stability (Lenard and Mazur 1985). It is ironic that a technology which could ensure adequate and low-cost supplies of milk throughout the year was rejected because of its impact on a milk marketing order system which was no longer needed. These developments indicate the need to inform consumers and consumer organizations about the adverse effects of producer oriented policies and the need to protest policies which are obsolete, inefficient and inequitable.

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FEMALE-HEADED HOUSEHOLDS:
IMPACT OF FAMILY STRUCTURE ON
HOUSEHOLD EXPENDITURES FOR CLOTHING

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The objective of this research was to analyze the impact of family structure (female-headed vs. two-parent) on expenditures for clothing. Expenditures for women's, girl's, boy's and infant's clothing were estimated via OLS. Family structure did not have a significant independent effect on clothing expenditures. In combination with total expenditures, family structure was significant for women's and for girl's clothing. Marginal propensities to consume clothing were higher in the female-headed households.

The purpose of this study was to determine the relationship, and the nature of the relationship, between type of family structure (female-headed-without-spouse-present and two-parent) and disaggregate household expenditures for clothing.

Between 1972 and 1982 the number of families headed by women increased by 57%, compared with a 10% increase of other family types (Bureau of Labor Statistics 1983). By 1984, households headed by women with one or more children less than 18 years old made up 19% of all family types (Bureau of the Census 1985).

At the same time that the proportion of households headed by women has increased, the relative economic status of these households has declined. Women generally earn less than men, and women raising children by themselves often are not awarded child support (Bureau of the Census 1984).

In 1981, one out of every three families headed by women were living in poverty (Bureau of the Census 1984). By 1985, 54% of children less than 18 years old (6.8 million children) living in female-headed households were living below the poverty level (Bureau of the Census 1985). As a result of income and opportunity imbalances, and the fact that children of separated and divorced families usually remain with the mother, women and children most often bear the economic brunt of divorce and separation. In 1983, the per capita incomes of separated and divorced male-headed households were $8,014 and $10,248, respectively. The per capita incomes of comparable female-headed households were $3,258 and $5,281 (Bureau of the Census 1985).

The economic well-being of female householders and their children should concern government and civic officials and policy makers. Making recommendations and implementing policy about what "should be" with respect to clothing allowances in child support litigation, foster care payments, or clothing stocks for children in group homes comes under the rubric of normative (prescriptive) economics. Since clothing is one of the three basic needs of most people (along with food and shelter), it is incumbent upon us as a society to determine the level of people's basic needs and attempt to meet them. An analysis of the clothing expenditure patterns of two-parent and female-headed households can provide valuable information as to the welfare differential between these two types of families: is family structure, per se, an indicator of family well-being, or are there other factors that are better indicators of a family's ability to provide for itself?

As is typical of most household demand and expenditure studies, research on demand and expenditures for clothing most often employs data on two-parent households with children. As nontraditional family structures become more prevalent, it is imperative to include these families in expenditure studies so that resource issues unique to these family structures can be identified and addressed.

THE DATA

The study employed data obtained from the public use tapes of the Quarterly Interview component of the 1984 Consumer Expenditure Survey (CES) conducted by the Bureau of Labor Statistics (BLS).

Quarterly cross-sectional clothing expenditure data from the four quarters of 1984 were employed here. Expenditures for gifts of clothing that transferred out of the household were excluded from the data set. The criteria for admissability of households into the sample were (1) families were either female-headed-without-spouse-present or two-parent families with at least one child less than 16 years of age; and (2) the parent(s) in both family types were the only household members 16 years of age and older.

The form of the clothing expenditure data made available by the Bureau of Labor Statistics for public use imposed several limitations on the use of these data; it impacted on both the sample selection and the empirical analysis.

Although the BLS identifies and collects clothing
expenditure data associated with each individual
member of the household, it aggregates these data
into five age and sex expenditure categories
before making them available to the public.
Clothing expenditure data for individual family
members are aggregated into the following
categories: expenditures on clothing for infants
(both male and female) less than 2 years old; for
girls and for boys from 2 to 15; and for women
and for men 16 years of age and older. This
aggregation dictated the age ceiling of less than
16 years for children in the first sample
selection criterion listed above. Although the
age range for dependent children is usually
considered to be less than 18, the nature of
these aggregate expenditure categories makes it
impossible to determine for whom, a teenaged
child 16 to 18 years of age, or an adult parent
of the same sex, the clothing was purchased.
Over 19 percent of the 1984 CES sample of female-
headed households with dependent children
(children and/or grandchildren less than 18 years
old), and over 18 percent of the two-parent
households with dependent children were omitted
from the subsample used here because of this
limitation. (Approximately one percent of both
family types contained dependent children who
were not the children or grandchildren of the
householder.) In addition, the aggregation of
expenditures for children into three broad
categories --infants less than 2; girls 2 to 15,
and boys 2 to 15-- limits the analysis to that of
estimating expenditures for an average child in
each category. Categories with an age range of 2
to 15 years pose special difficulties, since
certain explanatory variables, e.g., hours of
mother's labor force participation, might be
expected to have variable effects on, for
example, clothing expenditures for a three year
old vs. those for a teenager.

The second sample selection criterion was also
imposed as a result of the aggregation of
individual clothing expenditures. Just as it is
impossible to distinguish between expenditures
for teenaged children between 16 and 18 and
parents of the same sex, it is not possible to
pinpoint expenditures for specific same-sex
adults (individuals at least 18 years of age) in
the household. Another 36 percent of the CES
female-headed sample, and an additional 19.5
percent of the two-parent, were not selected
because these families contained other adult
individuals in addition to the parent(s). (Of
that 36 (19.5) percent, 23 (16) percent of the
households contained adult children or
grandchildren of the householder; and 13 (3.5)
percent contained adults other than the children
or grandchildren of the householder.)

In total, over 56 percent of the female-headed
households, and 39 percent of the two-parent
households with at least one dependent child,
were not selected based on data-driven
constraints imposed by aggregation.

Sixteen percent of the sample of 4,149 households
selected are female-headed; 84 percent two-
parent. Mean per capita expenditures were

substantially lower in the female-headed
households, $2,870, vs. $3,780 in the two-parent.
Both family types had a mean of slightly less
than two children, and the mean ages of the women
in both were just under 32 years. Thirty-two
percent of the women in the female-headed
households had some college education, and 2.5
percent had attended graduate school for at least
a year. A slightly higher percentage of the
women in the two-parent households had attended
college, 37 percent, and almost 9 percent had
some graduate education. Sixty-seven percent of
the female-headed households were white, as
compared to 89 percent in the two-parent
households. Sixty-five percent of the female
householders were employed, of those, 78 percent
were employed full-time. A slightly higher
percentage of the women in the two-parent
households participated in paid employment, 69
percent, but only 60 percent of those were
employed full-time. The sample is predominately
urban; 91 percent of the female-headed households
and almost 89 percent of the two-parent
households resided in urban areas.

ESTIMATION PROCEDURE

The analysis was designed to control for total
household expenditures and the characteristics of
the mother as well as those of the family. The
data were analyzed via ordinary least squares.
Percent zero expenditures were not high enough to
indicate the use of TOBIT: zero quarterly
expenditures for women's clothing were 15
percent; for boy's clothing 16 percent; for
girl's clothing 23 percent; and for infant's
clothing 12 percent. A clothing expenditure
model was estimated separately for expenditures
for the mother's clothing and for (an average)
boy's, (an average) girl's, and (an average)
infant's clothing. The expenditure equations for
the children's clothing were estimated only on
those subsamples of households that contained at
least one child in the age/sex clothing category
being estimated.

CLOTHING EXPENDITURE MODEL

The following model was estimated:

$$(1) \quad E_1 = a_{10} + \sum_{j=1}^{12} B_{1j} X_{1j} + \sum_{j=1}^{11} b_{1j} D_{1j} + a_{dx} (D_1 * X_1)$$

where: E_1 = expenditures for women's clothing;
E_2 = expenditures for girl's clothing;
E_3 = expenditures for boy's clothing; and
E_4 = expenditures for infant's clothing.

For each estimation of the clothing expenditure
model, the explanatory variables were:

X_1 = total expenditures; X_2 = mother's
education; X_3 = mother's age in
years; X_4 = mother's age squared; X_5 =
annual hours of mother's employment;
$X_6 ... X_{12}$ = numbers of children in seven
age and sex categories; D_1 = family
structure (0 = female-headed); D_2 =
mother's race (0 = nonwhite); $D_3 - D_5$ =

seasons of the year (0 = summer); D_6 – D_8 = geographic region in which the household resides (0 = midwest); D_9 = urban/rural location of the household (0 = rural); D_{10} = ownership of washing machine; D_{11} = ownership of clothes dryer; $D_1 * X_1$ = interaction of family structure with total expenditures.

The total effect of family structure (holding all else constant) is:

if: $E_1 = a_0 + B_1 D_1 + B_2(D_1 * X_1) + e_1$

where: E_1 = Expenditures for Clothing
$\quad\quad D_1$ = Family Structure Dummy (0 = Female-Headed)
$\quad\quad X_1$ = Total Expenditures

then: $$\left. \frac{\delta E_1}{\delta D_1} \right|_{D_1 = 1} = B_1 + B_2(X_1)$$

Total annual expenditures were used as a proxy for permanent income. In the short run households have more control over expenditures than over income, and, for expenditures on clothing and household durables, total expenditures is believed to be a better explanatory variable than annual income (Prais & Houthakker 1971). Although expenditures for clothing is a component of total expenditures, clothing expenditures are usually less than 7 percent of the total (Dardis, Derrick, & Lehfeld 1981), so the bias resulting from this relationship between the dependent variable and one of the independent variables, is of less concern than if clothing constituted a larger percentage of total expenditures (Prais & Houthakker 1971).

Total expenditures were interacted with the family structure variable to allow construction of marginal propensities to consume (MPC) clothing for the two-parent households. For female-headed households, the MPC is simply the coefficient on total expenditures, but for the two-parent households, the MPC is the sum of the coefficients on total expenditures and the interaction term:

if: $E_1 = a_0 + B_1 D_1 + B_2 X_1 + B_3(D_1 * X_1) + e_1$

where: E_1 = Expenditures for Clothing
$\quad\quad D_1$ = Family Structure Dummy (0 = Female-Headed)
$\quad\quad X_1$ = Total Expenditures

then: $$\left. \frac{\delta E_1}{\delta X_1} \right|_{D=0} = B_2$$

$$\left. \frac{\delta E_1}{\delta X_1} \right|_{D=1} = B_2 + B_3$$

The remaining explanatory variables were included in the model based on economic theory and/or past research that indicates that they are significant with respect to expenditures on clothing.

Variables used to describe the characteristics of the mother were her age, education, race, and labor force participation. The mother's age was squared and used as an explanatory variable since the relationship between age and expenditures was expected to be nonlinear.

The following variables were used to describe the characteristics of the family (in addition to family structure): numbers of children in seven age and sex categories (to control for family composition); urban/rural and geographic location of the household (to control for prices); and whether the family owned a clothes washer and/or a dryer. It was hypothesized that, all else equal (including per unit prices of garments), the ownership of a washer and dryer might negatively affect expenditures for clothing if in-home access to this machinery means that fewer items of clothing are needed to insure that clean clothing is readily available.

Expenditures for clothing are characteristically seasonal, therefore, seasonal dummies were included in the model.

RESULTS

Family Structure

Family structure, in and of itself, did not have a significant impact on clothing expenditures in any of the equations estimated (Table 1). To test the significance of the family structure variables as a group, the family structure dummy and the interaction of family structure with total expenditures were dropped from the model for each equation and the regressions run without them to obtain an F-Ratio between the unrestricted (with the family structure variables) and the restricted (without the family structure variables) models for each category of clothing expenditures (Pindyck & Rubinfeld 1981). The family structure variables as a group were significant with respect to expenditures for women's and for girl's clothing, but were not significant for those for boy's or for infant's clothing. The combined effects (calculated at the mean total expenditures) of the family structure variables on expenditures for women's clothing indicates that the women in the two-parent households spent $17.58 less per quarter on their clothing than did the women in the female-headed families; for expenditures on girl's clothing the combined effect (calculated at the mean total expenditures for this subsample) amounted to $16.26 less per quarter being spent on girl's clothing in the two-parent households.

It may be the case that female-householders spend more on clothing for themselves than do comparable married women because the female householders are the sole adult decision makers

Table 1. Results of the Four Estimations of the Clothing Expenditure Model

Independent Variables	Dependent Variables			
	Women's Clothing	Boy's Clothing	Girl's Clothing	Infant's Clothing
Total Expenditures	.0046*	.0018*	.0025*	.0024
Family Structure (0 = Female-Headed)	.69	-1.27	-12.30	-8.56
Family Structure * Total Expenditures	-.0014***	-.0005	-.0003	.0001
Mother's Education	1.62*	-.03	.49***	.93***
Mother's Age	.70	1.83	-.19	-8.58
Mother's Age Squared	-.02	-.03	.01	.15
Mother's Hours in Labor Force	.0083*	.0004	-.0068*	.0089**
Mother's Race (0 = Nonwhite)	8.04	-7.13***	-4.46	-27.96*
# Infants (< 2 years)	-4.03	-3.44	-11.69**	-16.06
# Girls (2-5 years)	-7.12	-7.64**	-21.75*	-17.08**
# Girls (6-12 years)	-3.34	-4.74***	-7.30**	-17.19**
# Girls (13-15 years)	16.94**	-3.07	12.71*	8.35
# Boys (2-5 years)	-11.39**	-19.97*	-8.54***	-5.26
# Boys (6-12 years)	-7.06***	-4.94***	-2.06	-8.86
# Boys (13-15 years)	11.51***	4.62	9.55***	-16.21
Urban (0 = Rural)	2.19	-3.39	-5.94	24.81**
Northeast (0 = Midwest)	18.20**	9.69**	9.38***	14.96***
South (0 = Midwest)	4.30	3.85	5.28	10.05
West (0 = Midwest)	10.24	-1.48	.66	-8.50
Winter (0 = Summer)	19.47*	-22.00*	-3.17	12.29
Spring (0 = Summer)	.07	-13.30*	3.42	6.22
Fall (0 = Summer)	24.38*	-13.02*	12.59**	28.45*
Washer Ownership	3.59	-3.66	-2.80	4.69
Dryer Ownership	.65	-1.25	12.13***	-5.08
Expenditure Elasticity	.80*	.40*	.43*	.36
Intercept	-39.53	30.54	33.67	163.71***
R²	.12	.12	.17	.17
F - Ratio	3.08**	.81	2.87***	.20

*Significant at the α = .01 level.
**Significant at the α = .05 level.
***Significant at the α = .10 level.

in the family; the mix of commodity purchases between the two family structures may differ as a result. Girls in female-headed households may "benefit" from this decision-making differential as well. Hagar and Bryant (1977) investigated the differential effects of disaggregate sources of family income on expenditures for clothing. They found that income generated by the wife's employment was used more than other sources of family income for purchasing clothing.

The female-headed households in the sample exhibited a higher MPC for each category of clothing (except for infant's clothing, for which total expenditures were not significant) than did the two-parent households (Table 2). Since mean per capita total expenditures were lower in the female-headed households, it may be the case that expenses for major categories such as food and housing are taken care of first --that expenditures for clothing can be delayed or offset more easily-- so that, as total expenditures increase in these households, expenditures for clothing account for a higher proportion of the increase than in the two-parent households. The fact that total expenditures were not significant with respect to expenditures for infant's clothing is not surprising. The same result was obtained in previous research by the author (DeWeese 1987), and is probably a function of the significant informal market for infants' clothing. Often a family's major source of infants' clothing is from gifts, and most families usually take advantage of "hand-me-downs" as well (Britton 1969).

Table 2. Marginal Propensities to Consume Clothing (Per Quarter) in Two-Parent and Female-Headed Households

	Family Structure	
Type of Clothing	Female-Headed	Two-Parent
Women's	.0046	.0032
Boy's	.0018	.0013
Girl's	.0025	.0022
Infant's	.0024	.0025

Mother's Characteristics

Years of the mother's education and hours of her labor force participation had significant, positive, effects on expenditures for the mother's own clothing, as well as on those for girls and infants. Previous research by the author (DeWeese 1987) indicates that when married women were employed in the labor force, even after controlling for income, expenditures for clothing increased for other family members as well as for the wife. This may be a household production phenomenon: employed wives may try to substitute their limited, relatively higher cost, nonmarket evening time with increased stocks of clothing for the entire family in order to better control the "production" of clean clothing (i.e., delay laundry activities until the relatively less costly weekend hours). Higher educational attainment may be associated with certain occupations and social activities, and therefore, with higher expenditures for clothing (Hagar & Bryant 1977). The mother's age did not have a significant effect on expenditures for any category of clothing estimated. As has been found in previous studies (Dardis, Derrick & Lehfeld 1981; DeWeese 1987; Horton & Hafstrom 1985), white families spent significantly less on clothing than did nonwhite households, ceteris paribus. Dardis, Derrick and Lehfeld (1981) hypothesize that the effect of race is due to compensatory consumption on the part of the blacks in their sample.

Household Characteristics

Although there are some mixed results with respect to the family composition variables (the seven age/sex categories for children), there is some evidence that there are economies of scale with respect to purchasing clothing for young children. In the infant's equation, the coefficient on number of infants in the family is not significant, but it is negative, indicating that clothing expenditures for an average infant decrease as the number of infants in the family increases. There are negative relationships as well between expenditures for an average girl's, and an average boy's clothing, and increases in the numbers of younger (2-5, and 6-12 year old) girls and boys, respectively. However, expenditures for girl's clothing increase with an increase in young teenaged girls (13-15 years of age) in the family, as they do for an average boy's clothing with an increase in the number of 13-15 year old boys (the coefficient is not significant in the case of boy's clothing, however.) Since clothing for older children is often more expensive than that for younger siblings, an increase in the number of older children in the family could serve to increase expenditures for an "average" same-sex child.

The effects on expenditures for a family member's clothing by an increase in numbers of children not in the category being estimated is mixed. In general, there is a negative relationship between the number of different-category children and the expenditure category being estimated, e.g., the more boys over 2 years of age in the family, the less that was spent on expenditures for infant's clothing. This effect is reasonable since, as family size increases, there are less resources per child. The statistically significant exceptions to this effect are: as the numbers of young teenaged girls and boys in the family increased, expenditures for women's clothing increased; and an increase in young teenage boys impacted positively on expenditures for girl's clothing. The first exception may be a life cycle phenomenon; a mother with older children may spend more on herself than when her children

were young. The effect of the number of 13-15 year old boys on expenditures for girl's clothing could result from that fact that girls with older brothers are more likely to be in the older age range as well; therefore average expenditures per girl increase since cost per item is usually higher for older children's clothing.

The only clothing expenditure category that was affected by whether the household was located in an urban or rural location was that of infant's clothing; expenditures for an average infant were almost $100 a year higher in urban areas, all else equal. The only geographic region of the county that was significant was the northeast, clothing expenditures for every category estimated were significantly higher in the northeast than in the midwest.

Ownership of a washer and/or dryer was significant only for the positive relationship between ownership of a dryer and expenditures on girl's clothing. This result is puzzling, not just because the relationship is the reverse of what was hypothesized, but because it was not washer ownership that was significant; families usually consider a clothes washer to be more essential than a dryer.

Seasonal Influence

The influence of the seasons was mixed: expenditures for women's clothing were higher in the fall and winter than in the summer; for boy's they were lower in all seasons when compared to the summer; and for girl's and for infant's they were higher in the fall than in the summer. It may be the case that expenditures for women's, girl's, and infant's clothing are fairly constant throughout the year, but that fall and winter clothing is more expensive per item.
Expenditures for boy's clothing may peak in the late summer months as a new school wardrobe is purchased.

CONCLUSIONS

Family structure as defined here did not have a significant independent effect on expenditures for clothing. It is when family structure is taken into consideration along with total expenditures that family structure becomes significant for expenditures on women's and on girl's clothing.

Total expenditures as a proxy for the family's permanent, long term, income appears to be the more determinative variable with respect to explaining expenditures for clothing. The MPCs for clothing of the female-headed households indicate that an increase in total expenditures has a proportionately larger impact on the female-headed households than on the two-parent; as total expenditures (permanent income) increases, a larger proportion of that increase goes to expenditures on clothing in the female-headed households than in the two-parent.

These results provide useful information to agencies and individuals concerned for the well-being of female householders and their children. When dealing with resource issues specific to these families, it may be more realistic to focus also on their ability to generate adequate income, and not just on the fact that they are female-headed.

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DEVELOPMENT OF A CAUSAL MODEL OF HOUSEHOLD
EXPENDITURES FOR FOOD CONSUMED OUTSIDE THE HOME

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A causal model was developed to represent household purchase of food consumed outside the home. Data from the 1985 Consumer Expenditure Survey: Interview Survey were used to evaluate hypotheses drawn from the literature. The overall explanatory level of the system, adjusted R^2's for the structural equations, and individual coefficients are reported.

INTRODUCTION

While researchers have had some success in identifying various elements of the explanation and prediction of a household's eating out behavior, the phenomenon is still not fully understood. Factors often thought to be associated with food consumption away from home are income, education, presence and ages of children, and race. While associations of these variables with food consumption away from home have often been statistically significant, their aggregate explanation typically yields multiple R-squares in the 0.10 to 0.20 range (Prochaska & Schrimper, 1973; Reilly & Wallendorf, 1987; Livens & Volker, 1986; Bellante & Foster, 1984).

There are also inconsistent findings on several key relationships. For example, the status of the wife's employment outside the home has received support as a positive factor in eating out versus food preparation and consumption in the home (Redman, 1980), it has been shown to have no association (Morgan, 1985; Lippert & Love, 1986), and it has been shown to be negatively related (Lippert & Love, 1986). The underlying difficulty may be differences in data sets and estimation techniques or lack of an integrated and sufficiently complex model to characterize the phenomenon of eating out behavior by households.

In previous studies, purely demographic variables have not worked sufficiently well to represent the decision to eat out. It is our suspicion that psychological factors are also important (Coursey, 1985), and we will make an attempt to infer some of them. For example, we plan to assess the influence of time pressure from household employment status on food spending

(Kahle, 1985; Hornik, 1984; Jackson, McDaniel, & Rao, 1985). Second, complex relations between variables are likely to be at work, such that intermediate stages of effects leading to a decision to eat out need to be represented.

METHOD

Data

The data base for the investigation was the 1985 U.S. Bureau of Labor Statistics (BLS) Consumer Expenditure Survey: Interview Survey (Garner, 1988). The sample consisted of 1157 nonmilitary, nonretired single-consumer unit households who were interviewed for the first time in the first quarter of 1985 and interviewed in each of the remaining quarters in 1985.

For the purpose of analysis, the sample was divided into halves using the random sampling procedure of the SPSS-X Statistical Package. Sample A was used in developing the model and Sample B will be used in confirming the model.

The Hypothesized Model

The relationships shown in Figure 1 represent the set of hypotheses tested in the study. They parallel, in their flow from left to right, our expectation that demographic factors give rise to household status indicators, which in turn determine food consumption behavior. The food consumption behavior targeted in the model is the percentage of the food budget spent for food away from home. Many of the relationships have been suggested in the literature. However, we incorporate them into a comprehensive system evaluated with a causal approach. The negative signs on some paths indicate that a negative relationship was hypothesized. Lack of a negative sign indicates that we expected a positive relationship or could not predict the expected relationship.

The model is shown in equation form in Table 1. Seven structural equations are used to specify the hypothetical model. We hope to clarify the relationships by testing the structural equations inherent in the model.

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FIGURE 1. The Hypothesized Model

Marital Status
X_1

Household Size
Y_5

Children
Y_3

Age
X_2

Hours Worked
Y_4

Foodout
Y_7

Education
Y_1

Income
Y_6

Occupation
Y_2

Race
X_3

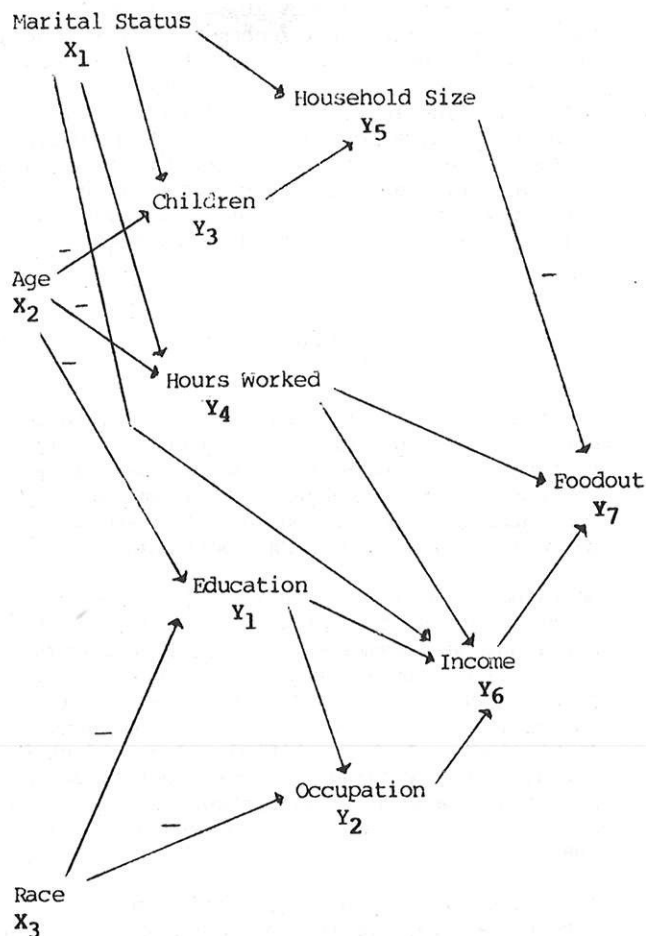TABLE 1. Hypothesized Model

FOODOUT = f(Hours Worked, - Household Size, Income)

INCOME = f(Education, Hours Worked, Marital Status, Occupation)

HOURS WORKED = f(Marital Status, -Age)

HOUSEHOLD SIZE = f(Marital Status, Children)

CHILDREN = f(Marital Status, -Age)

EDUCATION = f(-Age, -Race)

OCCUPATION = f(Education, -Race)

Variables

Food out, the primary dependent variable, was the proportion of spending away from home on food to all food expenditures. This variable was calculated by dividing the BLS food away from home variable[1] by the BLS total food expenditure variable[2] for the first quarter of 1985. If the value of either variable was missing for the current quarter, the reported value for the previous quarter was used.

Exogenous variables included marital status, age, and race. For the analysis, marital status was recoded into a dummy variable. The omitted category was unmarried.

Age and race were represented by the characteristics of the reference person. Early analysis of the data had revealed a high correlation between these characteristics for the reference person and spouse in married-couple families, precluding the use of both variables in the analysis. The reference person's age was reported in years and ranged between 18 and 90 years. Race was recoded into two categories, white and nonwhite. White was coded as "0" and nonwhite as "1".

Endogenous variables included foodout, educational level, presence of children, household size, income, occupation, and hours worked. The reference person's educational level included six levels: 1 = elementary school graduation, 2 = high school attendance, 3 = high school graduation, 4 = college attendence, 5 = college graduation, 6 = more than four years of college.

Presence of children in the household was created as a dummy variable. No children was coded as "0" and at least one child was coded as "1". Household size ranged from one to eleven members. Occupation was represented by the occupation of the reference person, unless that person was married and unemployed or retired, in which case the spouse's occupation was used. Preliminary analysis revealed high correlation between occuational levels of a married couple, precluding the use of both occupations for a married couple. Occupation was recoded into 8 categories with an 8 indicating the highest level and 1 as the lowest ranking, based on occupational status hierarchies developed by Duncan and the Census Bureau (Miller, 1977).

Average annual employed hours per adult in each household were calculated. First, the hours for each earner were calculated by multiplying the reported weekly work hours by the weeks worked in the past year. For single person households, the total household work hours represented the average work hours for that person. For married

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[1] Food away from home included: dining out at resturants, etc; food or board, including at school; school meals; meals received as pay.

[2] Food expenditures included: food away from home; catered affairs food on out-of-town trips; food prepared by consumer unit on trips; food and nonalcoholic beverages at grocery, convenience, and specialty stores.

couple households with one earner, this number represented the total household work hours and was divided by two to calculate average work hours per adult. For two earner households, annual work hours were summed and divided by two, providing a per-adult figure.

After-tax money income included reported income from all sources.[3] Households with incomplete responses on key components of the income variable were identified by BLS. If a household classified as an incomplete reporter in the first quarter of 1985 was classified as a complete reporter in the fourth quarter of 1985, the last quarter was used in the analysis. After this correction was made 78 households, or 6.7 percent of the 1157 households, contained missing data on the income variable.

All variables were standardized for further analysis. The standardized variables had a mean of 0 and a standard deviation of 1.

Income Imputing

Households with incomplete responses on key components of the income variables were classified by the Bureau of Labor Statistics as incomplete reporters. Twelve percent of the total sample were classified as incomplete reporters. Nearly 5 percent of the sample provided a complete income response in a subsequent interview and these income figures were used. However, 43 households (7.3 percent) of the half sample of 589 households remained as incomplete income reporters.

Methodological concerns associated with indirect or incidental censoring of the dependent variable have been discussed in the literature (Heckman, 1979; Berk, 1983; Kinsey, 1984; Zick, 1985). The concern in the present study was the incomplete reporting of after-tax income and the resulting decision regarding whether or not to include these cases in the analysis. Elimination of these incomplete reporters could distort the analysis. Therefore, a procedure was employed to retain these cases in the sample.

To correct for a possible sample-selection bias due to classification as an incomplete income reporter, a three-step procedure was used (Heckman, 1979; Berk, 1983; Green, 1981). First, a probit analysis was used on the entire sample to model the likelihood of being an incomplete reporter and thus excluded from the analysis. Second, an instrumental variable, lambda, was calculated to represent exclusion from the sample. This variable was used as an additional

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[3] Money income included the combined income of all consumer-unit members. Components were salaries and wages, interest and dividends, transfer payments, self-employment income, and rental income. After-tax income was calcultaed by substracting federal taxes from total income.

regressor in the ordinary least squares estimation of after-tax income for the subsample of complete income reporters. The LIMDEP program authored by William Green was used in the analysis. The third step involved predicting after-tax income for each incomplete-reporting household by applying the regression coefficients to household characteristics. The imputed after-tax income was used for households which were classified as incomplete reporters.

ANALYSIS

The technique of path analysis was used to refine our hypothesized model and to perform initial testing of it. Path analysis provides causal interpretation of a system of variables. Strengths of influence on each path are measured by standardized regression coefficients.

An issue in path analysis models is identification, the determination of whether or not a unique parameter estimation is possible. Models can be underidentified, just-identified, or overidentified. Underidentified models lack sufficient restrictions and cannot be tested (estimated). Just-identified and overidentified models can be estimated. Underidentification is not usually a problem with recursive models such as the one proposed in the present study (Asher, 1983).

Identification of the hypothesized model is determined by comparing the number of pair-wise correlations with the number of parameters. First, the number of pair-wise correlations possible in the system is $n(n-1)/2$, where n is the number of variables, ten. In our case, the number of pair-wise correlations is 45. Second, the number of parameters in the hypothesized model is calculated by summing (a) the number of path coefficients, (b) the correlations between exogenous variables, and (c) the correlations between the disturbances (error terms for each endogenous variable). These are 17, 3, and 21, respectively, for a total of 41. (Kenny, 1979) Therefore, the hypothesized model has four overidentifying restrictions.

RESULTS

Path analysis findings for the hypothesized model are shown in Table 2. Note that the directions of all relationships are as predicted except one. Among the (adult) respondents, age correlates negatively with hours worked per person, while marital status correlates positively. The relationship between being nonwhite and having a higher occupational status was negative. Note, also, that the R^2's and the betas (with four exceptions) are significant beyond the .01 level.

TABLE 2: Structural Equations, Hypothesized Model

$Y_1 = -.277^* X_2 - .134^* X_3 + .955 \qquad R^{2a} = .088^*$

$Y_2 = .055 X_3 + .380^* Y_1 + .926 \qquad R^2 = .143^*$

$Y_3 = .405^* X_1 - .323^* X_2 + .843 \qquad R^2 = .289^*$

$Y_4 = .236^* X_1 - .439^* X_2 + .858 \qquad R^2 = .264^*$

$Y_5 = .185^* X_1 + .352^* Y_3 + .860 \qquad R^2 = .260^*$

$Y_6 = .378^* X_1 + .191 Y_1 + Y_2^b$
$\qquad - .117 Y_4 + .937 \qquad R^2 = .122^*$

$Y_7 = .609^* Y_4 - 1.052^* Y_5 + .601^* Y_6$
$\qquad + .969 \qquad R^2 = .062^*$

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* p < .01

^{a} R^2's are adjusted R^2's

^{b} coefficient not estimated

To evaluate the total model, a statistic similar to R^2 in OLS regression can be calculated. The statistic, M, can be defined for an overidentified system of path equations as

(1) $\qquad M = 1-(1-R^2_1)(1-R^2_2)...(1-R^2_p)$

for a set of p paths (Specht & Warren, 1975). For our hypothesized model, M is computed as

(2) $\qquad M = 1-(1-.088)(1-.1829)(1-..143)$
$\qquad (1-.289)(1-.264)(1-.260)$
$\qquad (1-.062) = .751$

Thus, the hypothesized model has accounted for 75% of the variance among this set of variables.

Additional refinement of the hypothesized model will utilize a multiple indicator approach, such as LISREL, to evaluate the fit of the hypothesized model with actual correlations among the data. A separate, randomly selected panel is set aside for confirming the model.

CONCLUSIONS AND DISCUSSION

Our findings have been consistent with the research expectations, suggested here by other work in this field. The overall model, from exogenous demographic factors to purchase and consumption of food outside the home, has a relatively high degree of explanatory power, indicated by the M statistic. While individual adjusted R^2's are smaller on some key relationships (consistent with other research results), all are significant.

What about the food purchased away from home but not accounted for in our model? Our suspicions are that psychological factors, not demographic, will play a great part in prediction. Work is needed to evaluate the components of eating out that are aspects of entertainment, recreation, or other "stimulation" reasons. We have captured some of the psychological aspects of convenience, time-pressure, and perhaps status in several variables. But more thorough investigation is needed of a relatively complete set of attitudinal and motivational factors. Unfortunately for marketers, family economists, and public policy officials, the available demographic factors do not yet appear to be adequate proxies for underlying psychological determinants.

We need to continue research, then, on several fronts. Enhanced systems of variables, as we worked with in this paper, will refine and sharpen our representation of this consumption behavior. Improved specification of objective factors is also necessary to provide more and valid indicators of population characteristics. For example, we had some difficulties with our working definition of occupation, hours worked, and in some cases income. Unfortunately we could not distinguish between eating at fast food or conventional restaurants. Finally, psychological determinants of this phenomenon need to be more thoroughly investigated. Psychological variables were not available in the Consumer Expenditure Survey data.

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CONSUMER EXPENDITURES AND INEQUALITY:
AN ANALYSIS USING THE GINI COEFFICIENT

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Consumption expenditures are evaluated in terms of the inequality of these expenditures across consumer units. The Gini coefficient is used as the measure of inequality. Gini coefficients are produced for the total population sample and for demographic subgroups. In addition, the Gini coefficient is decomposed by budget components, using the Lerman and Yitzhaki covariance method, to examine the effects of changes in expenditures on overall inequality. Data from the U. S. Consumer Expenditure Survey Interview for 1987-88 are analyzed. An overall Gini of .33 results; this Gini is slightly lower than estimates based on income. Differences in inequality across demographic subgroups exist. The decomposition of the Gini by budget components reveals that shelter accounts for the largest contribution to overall inequality in expenditures. Holding all else constant, reductions in inequality can be achieved by increasing expenditures for food, fuel and utilities, private transportation, and medical care and services.

INTRODUCTION

Economic well-being can be defined in terms of the command individuals or households have over potential consumption. Official income statistics are produced to reflect the consumption potential of individuals and families, with money income used to proxy this consumption potential most frequently. However, consumption, rather than income, may be a better measure of the actual economic welfare of a household than its current income. The value of consumption may be much greater than annually reported income to the extent that households have accumulated savings or accounting losses from a business (Sawhill 1988, p. 1077), or because they are able to borrow against future income. Another advantage of using the value of consumption is that it is considered to be less subject to random transitory variations than is income. Thus, one could argue that consumption reflects material well-being in terms of past, current, and expected future income, not just current income. How a household allocates its income across different consumption categories can affect the overall economic well-being of households differently. Thus, identifying the impact of marginal changes in different expenditures on the inequality of total expenditures can provide useful information, particularly for policymakers. Also, when measuring economic well-being, whether by the use of income or consumption, differences among households are expected since households have differing needs. Thus, measures of economic welfare should account for these differences (Kakwani 1966).

The purpose of this study is to examine the inequality in the distribution of household consumption expenditures using the Gini coefficient.[2] Gini coefficients based on total annual consumption

expenditures are compared to Gini coefficients based on annual income before and after taxes. Next, Gini coefficients are produced for demographic subgroups of the population defined in terms of consumer unit size, household composition, the race and age of the reference person, and region and degree of urbanization of residence. The Lerman and Yitzhaki (1984; Yitzhaki 1983) covariance method for decomposing the Gini by factors, used previously to study income inequality by income source (e.g., Ahearn, Johnson, Strickland 1985; Lerman and Yitzhaki 1985), is used to examine the effects of the inequality within expenditure budget components on overall inequality. A primary advantage of the covariance approach is that individual rather than grouped data can be used, thus yielding presumably more accurate estimates. In addition, the approach is insensitive to the order in which the contribution from each component is measured. To study the decomposition of the Gini coefficient by factors, total expenditures are divided among ten budget components: food, shelter, fuel and utilities, household operations, apparel and services, private transportation, public transportation, medical care and services, entertainment, and other expenditures. U. S. Consumer Expenditure Survey (CEX) Interview data, collected in 1987 Quarter 1 through 1988 Quarter 1, are used to produce the Gini coefficients. Only consumer units participating in four consecutive Interviews are included in the sample. As a result of this research, it is hoped that the distribution of consumption expenditures will be considered more strongly as a viable and useful complement to the distribution of income in the study of the material well-being of households.

METHODOLOGY

In the first part of this section, the basic Gini formula and the decomposition of the Gini are presented. The data source and variables used for the estimations are described in the second part of this section.

The Gini Coefficient and Decomposition

The overall Gini coefficient is used to produce estimates of the inequality of total household consumption expenditures over the population and by demographic subgroups. The formula upon which these coefficients are based can be expressed in terms of the covariance of total expenditures (X), the cumulative distribution of X (F), and the mean of X (m). The overall Gini is defined as

$$(1) \qquad G = \frac{2\ Cov\ (X,\ F)}{m}.$$

This relationship is derive by Lerman and Yitzhaki (1984) from the formula for half of the Gini's mean difference (see reference for derivation). The lower the value of the Gini, the less the inequality in the distribution of expenditures. Thus, as expenditures become more equally distributed across consumer units, the value of the Gini declines. A Gini of zero would represent absolute equality of expenditures.

The overall Gini is decomposed by expenditure budget components to evaluate the contribution of the various components to overall inequality. First let $x_1,...,x_K$ represent the budget components of total expenditures, such that $X = \sum_{k=1}^{K} x_k$. Let F_k represent the

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[1]Economist. This paper does not represent an official position of the U.S. Department of Labor, Bureau of Labor Statistics.

[2]The Gini coefficient is a measure of the inequality of a distribution; it is a summary statistic of inequality derived from the Lorenz Curve and is equal to one minus twice the area under the Curve.

cumulative distribution of x_k and m_k represent the mean. The Gini coefficient of concentration for component x_k can then be expressed as

$$(2) \qquad G_k = \frac{2 \, Cov \, (x_k, \, F_k)}{m_k}.$$

Hence, it can be shown (Lerman and Yitzhaki 1985) that the overall Gini coefficient of total expenditures based upon budget components is as follows:

$$(3) \qquad G = \frac{2 \sum\limits_{k=1}^{K} Cov \, (x_k, \, F)}{m}$$

where $Cov(x_k, F)$ is the concentration index of budget component x_k with respect to the cumulative distribution of total expenditures, X. Multiplying and dividing each component x_k in equation (3) by $Cov(x_k, F_k)$ and by m_k yields the sum of budget components as the decomposition

$$(4) \qquad G = \sum_{k=1}^{K} \left[\frac{Cov \, (x_k, \, F)}{Cov \, (x_k, \, F_k)} \cdot \frac{2 \, Cov \, (x_k, \, F_k)}{m_k} \cdot \frac{m_k}{m} \right] = $$

$$\sum_{k=1}^{K} R_k \, G_k \, S_k \, ,$$

where R_k is defined as the Gini correlation between the expenditure component x_k and total expenditures, G_k is the relative Gini of component x_k (the Gini index of concentration for component x_k), and S_k is component x_k's share of total expenditures (Lerman and Yitzhaki 1984).

Lerman and Yitzhaki (1985) note that the Gini correlation (R_k) has properties which are similar to the Pearson and rank correlations. Like the latter two, the Gini correlation ranges between -1 and +1; however, the Gini can result in more extreme values than can the Pearson correlation coefficient. A value of +1 (-1) will result when x_k is a monotonically increasing (decreasing) function of X. When the expenditure on category k is a constant across all consumer units, R_k will equal 0, thus, implying that the component's share of the Gini is 0. When the share of such components increases, overall inequality will fall.

A primary reason given in the income literature for using the decomposition approach is its usefulness in examining how marginal changes in particular sources or components can affect overall inequality. Whether these changes affect inequality in the same way across expenditure categories is an issue under examination in this study. Output from applying the Lerman and Yitzhaki approach is used to examine a budget component's marginal effect on inequality relative to the overall Gini coefficient, or in other words, the marginal effect upon overall inequality of a proportional change in an expenditure component. The direction of this relationship indicates the effect at the margin of an increase in an expenditure component on overall inequality. Suppose there is a change in each consumer unit's expenditure for a particular component k equal to ex_k. If e represents a percentage change in component x_k that is identical for all consumer units, the component's marginal effect relative to the overall Gini coefficient can be expressed as

$$(5) \qquad \frac{\partial G / \partial e_k}{G} = \frac{R_k G_k S_k}{G} - S_k.$$

The ratio on the right side of the equal sign is the proportional contribution of component x_k to the overall Gini and S_k is the

component's share of total expenditures. The sum of relative marginal effects is zero. The overall Gini would remain unchanged if all components were multiplied by e (Lerman and Yitzhaki 1985).

Data Source and Variables

Data for this study are from the U.S. Consumer Expenditure Survey (CEX), Interview. The CEX is sponsored by the Bureau of Labor Statistics (BLS); data collection for the survey is conducted by the Bureau of the Census. Data are collected on approximately 90 to 95 percent of total family expenditures. The CEX data are collected from a national probability sample of households designed to represent the total civilian noninstitutional population and a portion of the institutional population living in selected types of group quarters. Housing units for students are also surveyed. Data are collected from consumer units within a household. The Interview sample, selected on a rotating panel basis, is targeted at 5000 consumer units per quarter. Each quarter one-fifth of the sample is new to the survey. After being interviewed for five consecutive quarters, each panel is dropped from the survey (U. S. Department of Labor 1986).

The data upon which this study is based are drawn from the 1987-88 Interview Survey which includes consumer unit characteristics, income, and expenditures. Since an objective of this study is produce Gini coefficients based upon total expenditures, and subsequently to compare these to Gini coefficients based on income, it was most desirable to limit the sample to those consumer units that were interviewed for four consecutive quarters during the survey period. Thus, Gini coefficients based on annual expenditures and annual income could be compared for the same time period. Interviews were conducted during the period January 1987 through March 1988. The expenditures and income reported refer to those for the last quarter of 1986 through the third quarter of 1987 or from the first quarter of 1987 through the last quarter of 1987. For the expenditure-income comparison, an additional criteria for inclusion into a subsample was that the consumer unit had to be identified by the Bureau of Labor Statistics as a complete income reporter. Completeness of income reporting is based on whether the respondent to the Interview provides values for various sources of income, primarily for major sources such as wages and salaries, self-employment income, and Social Security income.[3]

For this study, expenditure items are aggregated into ten budget components. As noted earlier, the ten components include: food, shelter, fuel and utilities, household operations, apparel and services, private transportation, public transportation, medical care and services, entertainment, and other expenditures. (A more detailed description of the goods and services included in each expenditure category is available upon request from the author.) For this analysis, expenditure values of zero are assigned to items for which the consumer unit reported not making an expenditure. Although collected in the Interview, expenditures for life insurance, endowments, annuities, other personal insurance, retirement and pensions, and Social Security are not included as part of total expenditures for this study since expenditures for these items are not considered to be for current consumption. This excluded group

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[3]Across-the-board zero income is considered an invalid response and the consumer unit is identified as an incomplete income reporter. It is important to note that even complete income reporters may not have provided a full accounting of all income from all sources. Thus, it is possible for consumer units not reporting income completely to be considered complete income reporters (for more detail, see Garner 1987).

of items accounts for approximately 9 percent of the total expenditures reported by the BLS for the U. S. population in 1987 (U.S. Department of Labor 1989). In order to produce Gini coefficients for total consumption expenditures representative of a population, observations and expenditures are weighted with the adjusted inverse selection probabilities on the CEX file.

Demographic variables are used to subset the data to produce overall Gini coefficients for each subgroup of the population. These variables include consumer unit size, household composition, race and age of the reference person, and the region and degree of urbanization of residence. Consumer unit size is defined in terms of five groups: one person, two persons, three persons, four person, and five and more person. Household composition is defined in terms of six categories: (1) singles, (2) one parent with children, (3) husband and wife only consumer units, (4) husband and wife with children, (5) other husband and wife consumer units, and (6) other consumer units. Race is defined as black or non-black (white, American Indian, Aleut, Eskimo, Asian or Pacific Islander, or other). Age is divided into two groups: less than 65 years and greater than or equal to 65 years of age. Region refers to the Northeast, Midwest, South, or West. Degree of urbanization refers to a large urban area, a small urban area, or a rural area (farm and non-farm).

RESULTS AND DISCUSSION

The Gini coefficients based on total expenditures and income are presented in Table 1. The results are presented for all consumer units in the sample and for complete income reporters only. The primary sample includes 2071 consumer units, and the complete income reporter subsample includes 1797 consumer units. The weighted sample of consumer units particpating in four consecutive Interviews represents approximately 28,000,000 consumer units. The percentage distribution of the sample, weighted and unweighted, and Gini coefficients for the demographic subgroups for the primary sample are presented in Table 2. Expenditure inequality effects by expenditure components are presented in Tables 3.

The overall Gini coefficient based on annual expenditures for the total sample in 1987 is .33, as shown in Table 1. For complete income reporters, the total expenditures Gini coefficient is .327, while the Gini coefficients based on income are .448 and .435 for income before taxes and income after taxes, respectively. The Gini coefficient for 1987 based on income from the Current Popuation Survey (CPS) is .392 (U.S. Census 1987). The difference in income Gini coefficients is likely to be related to the fact that income is imputed for the CPS and it is not for the CEX.

The lower value for the total expenditures estimate could be due to the relative stability of consumption expenditures relative to income, or to the fact that total expenditures are used for the estimate rather than income. Kakwani (1986), using Australian data, reported a Gini of total expenditures to be .256 compared to .331 for disposable income for 1975-76. He explained the difference in terms of the inequality of savings:

> Since income is the sum of expenditures and savings, and since households with higher incomes tend to save a greater proportion of the incomes, inequality of saving will be high. This is an important reason why the inequality of income is higher than that of expenditures. (p. 99)

TABLE 1. COMPARISON OF POPULATION GINI COEFFICIENTS BASED ON TOTAL EXPENDITURE AND INCOME

Sample and Measure	Gini Coefficient 1987Q1-1988Q1
All Consumer Units	
Total Expenditures	.330
	(n=2071)
Complete Income Reporters Only	
Total Expenditures	.327
Family Income Before Taxes	.448
Family Income After Taxes	.435
	(n=1797)

The distributions of the weighted and unweighted sample and Gini coefficients based on total weighted expenditures are presented in Table 2. These results reveal that the greatest percentage of sample consumer units live in two person households (.29). The most prevalent household composition type is the husband and wife with children (.34). The majority of consumer units have a non-black reference person (.89) and the reference person is most likely to be less than 65 years of age (.77). The majority of consumer units live in the South (.28), while the urbanization category most descriptive of the area of residence is large urban (.44).

Pooling all consumer units with different characteristics into a single distribution could hide significant differences in inequality trends, if substantial differences among inequality estimates of consumer units with different demographic profiles exist. Thus, when evaluating the effect on inequality of changes in expenditures, it would be better to produce separate Gini estimates for demographic subgroups to identify which consumer units will be most affected. Results from this study reveal such differences. Gini coefficients presented in Table 2 for the different demographic subgroups represent varying degrees of consumption expenditures inequality. Within the consumer unit size groups, the greatest degree of inequality is among one person consumer units (G=.345). Among the household composition groups, one parent with children households experience the most inequality of expenditures (G=.348). Inequality is lowest among husband and wife with children households (G=.265). Inequality did not differ much by race. Inequality among total expenditures is also greatest between consumer units in which the reference person is age 65 years or over (G = .344). Consumer units living in the West appear to have total expenditures which are more equally distributed (G=.292) than do consumer units living in other regions. Inequality in expenditures is also lower for rural consumer units (G=.309) relative to consumer units living in urban areas. These results substantiate the claim by others (e.g., Dagum and Grenier 1984: Jorgenson and Slesnick 1984; Kakwani 1986; Ray 1985) that inequality in economic well-being differs by the demographic characteristics of the units.

Decomposition of the Gini provides specific information concerning the concentration of consumption expenditures by budget components, and information about how marginal changes in particular expenditures affect overall inequality. Being able to predict these impacts can be useful for policymakers interested in the effect that certain programs may have on the spending patterns of consumers. Results from the decomposition of the Gini coefficient are presented in Table 3. The first column in Table 3 presents the contributions of each budget component to total

TABLE 2. PERCENTAGE DISTRIBUTION OF SAMPLE AND POPULATION GINI COEFFICIENTS
BASED ON TOTAL EXPENDITURES 1987 QUARTER ONE - 1988 QUARTER ONE

| Characteristics | Relative Frequency | | Gini Coefficient |
	Unweighted (n=2071)	Weighted (n=27,841,802)	
All consumer units	1.00	1.00	.330
Size			
One person	.24	.25	.345
Two persons	.29	.30	.307
Three persons	.18	.18	.288
Four persons	.16	.15	.265
Five or more persons	.13	.12	.288
Household Composition			
Singles	.24	.25	.345
One parent with children	.05	.05	.348
Husband and wife only	.22	.24	.291
Husband and wife with children	.34	.32	.265
Other husband and wife consumer units	.05	.05	.268
Other consumer units	.10	.09	.307
Race			
Black	.11	.11	.322
Non-black	.89	.89	.324
Age			
< 65	.77	.75	.301
≥ 65	.23	.25	.344
Region			
Northeast	.23	.23	.338
Midwest	.27	.26	.328
South	.28	.31	.336
West	.22	.20	.292
Degree of Urbanizaiton			
Large urban area	.44	.42	.327
Small urban area	.31	.31	.350
Rural, farm and non-farm	.25	.27	.309

inequality as identified by C_k in the table. This measure is the product of three terms: the Gini correlation between the budget component and the rank of total exenditures (R_k), the component's Gini (G_k), and its share of total expenditures (S_k). The higher the value of these factors, the greater the contribution of the budget component to total inequality. The sum of these statistics by components equals the overall Gini.

The greatest amount of inequality in consumption expenditures is contributed by expenditures for shelter. Expenditures for shelter are highly correlated with total expenditures ($R_k=.765$), they seem to be somewhat concentrated ($G_k=.463$), and they represent approximately 23 percent of total consumption expenditures (see S_k in column 4).

Gini correlations are presented in column 2 of Table 3. All of the correlations are positive indicating that each of the expenditure components is an increasing function of total consumption expenditures. Components most highly correlated with total expenditures are food, apparel and services, household operations, and entertainment.

Gini coefficients for the budget components (column 3 of Table 3) are expected to be higher, for the most part, than the overall Gini because, with the exception of food, not all consumer units have expenditures for each of the budget components (see Table 4). For example, approximately 49 percent of the sample does not have expenditures for public transportation, which is reflected in the high budget component Gini coefficient of .852. This indicates that public transporation expenditures are highly concentrated among consumer units in the sample. In contrast, expenditures for food and for fuel and utilities are the most equally distributed of all budget components, with Gini coefficients of .324 and .286, respectively. These low Gini estimates result from the high proportion of consumer units with these expenditures as well as from their relatively even distribution among those consumer units which do have these expenditures.

In order to determine the contribution of each budget component to the overall Gini, the fifth column in Table 3 presents the proportion of inequality of total expenditures attributable to the component.

TABLE 3. EXPENDITURE INEQUALITY EFFECTS BY EXPENDITURE COMPONENT1987 QUARTER ONE - 1988 QUARTER ONE

Expenditure Component	Contribution to Total Inequality (C_k)	Correlation with Rank of Total Expenditures (R_k)	Gini of Component (G_k)	Expenditure Share (S_k)	Share Expenditure Inequality (I_k)	Relative Expenditure Inequality (I_k/S_k)	Relative Marginal Effect ($I_k - S_k$)
Food	.057	.829	.324	.213	.173	.814	-.040
Shelter	.080	.765	.463	.225	.241	1.074	.016
Fuel & Utilities	.017	.616	.286	.097	.052	.534	-.045
Household Operations	.036	.789	.634	.072	.109	1.517	.037
Apparel & Services	.030	.819	.531	.068	.089	1.320	.022
Private Transportation	.034	.724	.427	.110	.104	.937	-.007
Public Transportation	.008	.646	.852	.015	.026	1.670	.010
Medical Care & Services	.012	.366	.518	.064	.037	.574	-.027
Entertainment	.026	.800	.555	.059	.079	1.348	.021
Other	.030	.726	.530	.077	.090	1.167	.013
TOTAL	.330	1.000	.330	1.000	1.000	1.000	.000

TABLE 4. BUDGET CATEGORIES BY FREQUENCY OF ZERO EXPENDITURES

Budget Categories	Percentage of Consumer Units with Zero Expenditures
Food	.00
Shelter	.01
Fuel and Utilities	.01
Household Operations	.06
Apparel and Services	.02
PrivateTransportation	.07
PublicTransporation	.49
Medical Care and Services	.05
Entertainment	.06
Other	.01

This proportion is given by the ratio of each component's contribution to total inequality to the overall Gini (C_k divided by G). As expected from the earlier discussion, the distribution of shelter expenditures contributes the largest proportion to the expenditure inequality of consumer units represented in this study (24.1 percent). In contrast, expenditures for public transportation contribute only 2.6 percent to overall expenditure inequality. For most components, the contribution to inequality is similar to their share of total expenditures.

Relative measures of inequality are presented in the last two columns of Table 3. Lerman and Yitzhaki (1985) have suggested that "relative measures offer more appropriate comparisons" (p. 153). Column six includes the inequality for components as a percentage of expenditure shares. Relative expenditure inequality estimates are calculated as the ratio of the proportional contribution to the share of total expenditures. Expenditures for shelter, household operations, apparel and services, public transportation, entertainment, and other items contribute greater proportionally to the inequality in total expenditures than they contribute to total expenditures in terms of their shares. The opposite is true for food, fuel and utilities, private transportation, and medical care and services. This result is primarily related to the concentration of expenditures. Expenditures for the former categories are relatively more concentrated among consumer units than are expenditures for the latter. The exception is medical care and services expenditures. These are only moderately more concentrated than are expenditures for shelter for example; however, shelter expenditures are more hightly correlated with the rank of total expenditures than are those for medical care and services.

The relative effects of a marginal increase in each budget component are presented in column seven. Changes in expenditures which would lead to reductions in inequality are associated with expenditure categories for which the expenditure shares are greater than are the shares of expenditure inequality. As noted earlier, the direction of the marginal relationship indicates the effect at the margin of an increase in an expenditure component on overall inequality. This means that a component would exert a negative effect on inequality if the relative marginal effect is negative. For example, the negative value for food indicates that a one percentage

increase in food expenditures, holding all else constant (e.g., prices, taxes) would decrease the inequality for total consumption expenditures at the margin by .04 percent. Increases in expenditures for fuel and utilities, private transportation, and medical care and services would also decrease overall inequality. These results seem to indicate, for example, that programs providing cash for the purchase of additional quantities of these goods and services would achieve a goal to reduce expenditure inequality among a population such as the one upon which these results are based.

CONCLUSIONS

The material well-being of the population, as defined in terms of consumption expenditures, is evaluated in terms of the inequality of these expenditures across consumer units in the United States in 1987. The Gini coefficient is used as the measure of inequality. Gini coefficients are produced for the total sample and for demographic subgroups of the population. The Gini coefficient is decomposed to examine relationships between the characteristics of the budget components and the overall inequality of total consumption expenditures. The Lerman and Yitzhaki covariance method appears to be a valid procedure to use when evaluating the inequality in expenditures across consumer units.

An overall Gini coefficient of .33 is produced as a population estimate based on consumption expenditures. This coefficient is slightly lower than estimates based on income. There are differences in Gini coefficients across demographic subgroups of the sample, indicating that changes in total expenditures will unequally affect different groups of consumer units. One-person consumer units exhibit the most inequality in expenditures among the consumer unit family size groupings. Single parents with children households, consumer units with reference persons aged 65 or over, those living in the Northeast, and those living in small urban areas also exhibit greater inequality in expenditures relative to other consumer units to which they are being compared.

The analysis by budget components reveals that certain expenditures contribute more to total inequality, while others contribute less. The distribution of shelter expenditures accounts for the largest contribution to overall inequality of expenditures. Results indicate that increases in expenditures for food, fuel and utilities, private transportation, and medical care and services, holding all else constant, would lead to reductions in the overall inequality of consumption expenditures.

Future research includes two additional studies. For one, flow of service values would be assigned to durables and "implicit rent" would be included for homeowners' payments to determine consumption expenditures. For the other study, out-of-pocket expenditures, including expenditures for savings and taxes paid, would be analyzed using the framework specified in this paper. Results from the latter study would provide information more related to permanent income.

Results presented in this study substantiate the importance of evaluating the differential impacts of proposed policies on subgroups of the population and differences in inequality which can result when expenditures for budget components change. Without adequate evaluation, policies and programs intended to decrease inequality could lead to the opposite result in the distribution of material well-being across consumer units in the population.

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ANALYZING THE CONSUMER EXPENDITURE SURVEY DATA: RESULTS FROM THREE
DIFFERENT ANALYTICAL APPROACHES: A DISCUSSION

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The three papers, which are all based on the
Consumer Expenditure Survey, demonstrate the
diversity of topics which can be analyzed with
this data set and the variety of methodological
approaches which can be applied.

I would like to thank the authors for the
opportunity to discuss their papers; I learned a
lot from their research. Please note that the
following comments are based on the papers which
were sent to me before the ACCI conference.

DeWeese

Gail DeWeese's objective was to analyze whether
type of family structure is a determining factor
in different categories of household expenditures
for clothing.

Data never are the way one would like them to be,
which was also the case in Gail DeWeese's study.
The Consumer Expenditure Survey aggregates
expenditures for clothing into fairly large
categories. Accordingly, the author
distinguished four types of clothing expenditures
in her study:
(1) clothing expenditures for women - meaning the
    mothers,
(2) clothing expenditures for boys between the
    ages of 2 and 15,
(3) clothing expenditures for girls between 2 and
    15, and
(4) clothing expenditures for children under 2.

This categorization implies that several family
types had to be excluded from the study. In
particular, households with family members 16
years of age or older, in addition to a single
mother or two parents, were not considered. As a
consequence, over 55 per cent of the female-
headed families in the original sample and 37.5
per cent of the two-parent families were not part
of the final sample. This restriction is
especially unfortunate given the author's
statement in the introduction that "female-headed
households often are multi-generational;
consisting (usually) of a mother, her daughter,
and her daughter's children." The subsampling
done in this study seems to exclude those very
families. This comment might not be worthwhile,
if either
(1) there were an explanation why only
    expenditures on mother's clothing are of
    interest, or
(2) if the sample was not reduced drastically by
    the subsampling, or

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(3) if it was pointed out in the presentation and
    discussion of the results that they only
    apply for the particular household types in
    the final sample.

If the goal of this study is to determine the
influence of household structure on household
expenditures for clothing, an equally informative
clothing expenditure category that does not
exclude a large part of the sample may be
clothing expenditures for female adults, instead
of clothing expenditures for mothers alone.

Maybe the following comment is too picky, but the
phrase "so the bias resulting from this
relationship between the dependent and one of the
independent variables, is of less concern than if
clothing constituted a larger percentage of total
expenditures", is misleading. From this sentence
one might conclude that the results of a study
are biased whenever there is a relationship
between a dependent and an independent variable,
which is clearly not so. I suspect that the
potential problem referred to here is that of
simultaneous equations bias. Simultaneous
equations bias occurs if, for example, variables
are at the same time a dependent variable in one
equation and an explanatory variable in another
equation and if the respective equations are
related. When this system of equations is
simplified through substitution, it becomes
apparent that one or more of the explanatory
variables are correlated with the error term.
This correlation violates one of the basic
assumptions of ordinary least squares (OLS),
according to which the explanatory variables
either have to be nonstochastic, or if
stochastic, have to be distributed independently
of the disturbance term. If that is not the
case, the resulting parameter estimates will be
biased and inconsistent (Gujarati, 1978).

Why is simultaneous equations bias a potential
problem in this study? It has been argued that
total expenditures and income are not independent
of each other, since all expenditures must add up
to income, and any one expenditure category could
be derived as the residual between total income
and the remaining expenditures. Income,
therefore, enters the clothing expenditure
equation twice: once indirectly as a component of
the dependent variable, and a second time as an
explanatory variable, which, depending on how the
measures were constructed, may result in
simultaneous equations bias.

A second potential problem arises, in this
context, if total expenditures are used as a
proxy for income, which was done in this study
for a good reason. It has been shown that
permanent income is a more appropriate variable
in understanding consumer expenditures than is