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STAFF PAPER

ANALYSIS OF KANSAS FARM HOUSEHOLD EXPENDITURES

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ABSTRACT

The economic stability and viability of farmers are issues of great concern to rural communities. Employing data from the Kansas Farm Management Association data bank, farm household income and price elasticities are estimated in this study. Results indicate that as consumption expenditures decrease, those items for which farm households are most likely to reduce expenditures include gifts, charitable contributions, recreation, education, and furniture.

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The economic stability and viability of farm families are issues of great concern to rural communities, business owners, and policy makers. As has been witnessed in recent years, declining farm numbers, coupled with periods of low farm income and high farm debt, have contributed to a decline in the economic stability of many rural communities.

Figure 1 exhibits the wide fluctuations in average net farm income and relatively stable average farm family consumption expenditures that Kansas Farm Management Association member farms have realized in recent years. This pattern of stable expenditures relative to volatile incomes is consistent with findings of other studies (Friedman; Girão et al.; Langemeier and Patrick). In six of the most recent years (1980-1987), average net farm income was lower than average consumption expenditures. Thus, many of these farm families were using nonfarm income, farm business equity, farm and nonfarm capital depreciation, and/or family savings to finance their consumption expenditures.

Fluctuations in net farm income and aggregate rural consumption patterns dramatically affect the well-being of rural main-street businesses. In order to help main-street businesses anticipate and adjust to the economic instability created by widely fluctuating farm income, there is a need to examine how farm household consumption decisions are impacted by changes in farm family income. This study examines farm household consumption expenditures by commodity aggregates. Income and own-price elasticities are estimated using an almost ideal demand system (AIDS) model. These price and income elasticities should help rural businesses anticipate inventory needs and make rational pricing decisions as farm incomes change.

This paper first discusses the demand model used in the study. A description of the data follows. The estimated elasticities are discussed in

the results section. Implications of the study are summarized in the final section of the paper.

Demand Theory and Methods

Consumer demand theory provides the base on which empirical work is done. However, demand theory does not suggest a functional form for empirical work. Two well developed and frequently estimated demand systems, the linear expenditure system (LES) and the almost ideal demand system (AIDS) models were considered for our analysis.

The appropriateness of the linear expenditure system with respect to the imposed restrictions has been a subject of discussion (King, 1979, 1981; Green and Hassan). In particular, the proportionality between the income and price elasticities and that income elasticities must be greater than the absolute price elasticities, imposed by the model's functional form, have been criticized. Additionally, the assumption of an additive utility function excludes the possibilities of inferior and complementary goods. However, the empirical elasticity relationships between commodities has generally been found to vary little from one model to the next (Deaton and Muellbauer 1980b; Green et al.; Green and Hassan).

Deaton and Muellbauer (1980a,b) present a method of modeling consumer preferences that overcomes many of the complications involved with the LES model. The AIDS model is based on a constrained utility maximizing household expenditure (cost) function of the form

$$(1) \qquad \ln m(u,p) = \alpha_0 + \Sigma_k \alpha_k \ln p_k + \tfrac{1}{2}\Sigma_k\Sigma_j \gamma^*_{kj} \ln p_k \ln p_j + u\beta_0\Pi_k p_k^{\beta_k},$$

where α_i, β_i, and γ_{kj} are parameters and u is the utility level achieved from expenditure level m given prices p_k (j,k = 1, 2, . . ., n). Demand equations,

in budget share form, are derived by the Hotelling-Shephard lemma from Equation (1) as

$$(2) \quad w_i = \alpha_i + \Sigma_j \gamma_{ij} \ln p_j + \beta_i \ln(m/P), \quad (i,j = 1, 2, \ldots, n),$$

where α_i, γ_{ij}, and β_i are parameters; w_i , p_j and m are as defined earlier; and P is a price index defined as

$$(3) \quad \ln P = \alpha_0 + \Sigma_k \alpha_k \ln p_k + \tfrac{1}{2}\Sigma_k\Sigma_j \gamma^*_{kj} \ln p_k \ln p_j.$$

Theory-based conditions of adding up, homogeneity, and symmetry may be statistically imposed on Equation (2) as

$$(4a) \quad \Sigma_i\alpha_i = 1 \ , \ \Sigma_i\gamma_{ij} = 0 \ , \ \Sigma_i\beta_i = 0 \qquad \text{(Adding Up)},$$

$$(4b) \quad \Sigma_j\gamma_{ij} = 0 \qquad \text{(Homogeneity), and}$$

$$(4c) \quad \gamma_{ij} = \gamma_{ji} \ \text{ for } i \neq j \qquad \text{(Symmetry)}.$$

Essentially, the intercept term in Equation (2) is composed of a "true" intercept and a weighted-average hybrid index of household demographic attributes (Deaton and Muellbauer, 1980a, pp. 314-18). Excludion of variables for demographic characteristics in the model specification assumes that all households have the same tastes. Thus, decomposing the intercept term, following Capps et al. and Heien and Wessells, is accomplished by respecifying α_i in Equation (2) as

$$(5) \quad \alpha_i = \alpha^*_i + \Sigma_k a_{ik}d_k, \quad (i = 1, 2, \ldots, n \text{ and } k = 1, 2, \ldots, m),$$

where α^*_i is the "true" intercept, a_{ik} are parameters, and d_k are demographic attributes of the household. Substituting (5) into (2) results in an AIDS demand equation

$$(6) \quad w_i = \alpha^*_i + \Sigma_k a_{ik}d_k + \Sigma_j \gamma_{ij} \ln p_j + \beta_i \ln(m/P).$$

The adding-up conditions consistent with (4a) now become

(7) $\Sigma_i \alpha_i^* = 1, \ \Sigma_i a_{ik} = 0, \quad \Sigma_i \gamma_{ij} = 0, \ \Sigma_i \beta_i = 0.$

Income (total expenditure) and uncompensated own-price elasticities (ϵ_{im} and ϵ_{ii}) may be calculated from the parameter estimates as

(8) $\epsilon_{im} = 1 + (\beta_i / w_i)$ and

(9a) $\epsilon_{ii} = -1 + (\gamma_{ii} - \beta_i(\alpha_i + \Sigma_j \gamma_{ij} \ln p_j))/w_i$ or

(9b) $\epsilon_{ii} = -1 + (\gamma_{ii} - \beta_i(\alpha_i^* + \Sigma_k a_{ik} d_k + \Sigma_j \gamma_{ij} \ln p_j))/w_i.$

Compensated price elasticities, ϵ_{ii}^*, can be derived using the Slutsky decomposition, i.e., $\epsilon_{ii} = \epsilon_{ii}^* - w_i \epsilon_{im}$.

One distinct advantage of the AIDS model is the fact that the homogeneity and symmetry conditions are not a priori imposed on the system. This provides the opportunity for testing the statistical validity of restriction (4b) and/or (4c).

Data

Primary farm household expenditure data for the years 1976 through 1987 were acquired for a cross section of farms from the Kansas Farm Management Association Data Base. Since not all farms continuously provided data for the twelve-year period, those households that provided data for less than five of the twelve years were not included in the analysis. The farm household expenditure data were categorized into nine groups: medical, food, clothes, household operations, education, furniture and household equipment, nonfarm utilities, nonfarm automobile, and other. The "other" category includes gifts, charitable contributions, and recreation expenditures. Kansas farm family total

real expenditures, per-family member real consumption expenditures by commodity group, and expenditure share by commodity group are reported in Table 1. Aggregate expenditures are deflated by the general Consumer Price Index (CPI) to 1987 dollars.

Real total farm household consumption expenditures averaged about $21,529 annually (1987 dollars), or $4,936 per family member per year, over the study period 1976 to 1987. Average total consumption expenditures were fairly stable over the period, ranging from $19,162 in 1986 to $24,919 in 1976. The variation of consumption expenditures in any given year (both total and per family member) was fairly large, with coefficients of variation of consistently greater than 35 over the period. Food expenditures, the largest budget share item, accounted for approximately 24 to 26 percent of the total budget. Other expenditures, the second largest budget share item, accounted for between 21 and 24 percent of total annual real expenditures. Medical expenditures were the third largest budget item, accounting for roughly 16 percent of total real expenditures. The smallest consumption budget shares were for automobile (3-5%) and utilities (3-5%) expenses.

Price indices (Table 2) were obtained from the U.S. Department of Labor and are aggregate U.S. indices. The index series for other expenditures was obtained by backward solving the price index defined by Stone (see Deaton and Muellbauer, 1980a, p. 316) as

$$(10) \quad \ln P_t^* = \Sigma_i \bar{w}_{it} (\ln p_{it}) \quad , (i = 1, 2, \ldots, 9),$$

where P_t^* is the general CPI in year t, $\bar{w}_{it}$ is the mean household budget share for expenditure item i in year t, and p_{it} is the price index for budget item i in year t.

Over the study period, the average annual increase in the CPI was 6.5 percent. Medical, education, and other costs had mean annual increases higher

than the general cost of living. Food, clothes, and furniture and equipment had lower price increases than the general index.

Three household demographic variables (K=3) were included in the model. The household demographic data included dummy variables for the operator's age, the organizational type of the farm, and whether or not consumption expenditures exceeded accrued net farm income.[1] The farm operator was 50 years old or less ($d_{i1} = 1$, else $d_{i1} = 0$) on 50 percent of the sampled farms. In approximately 37 percent of the cases, family living expenditures exceeded disposable income ($d_{i2} = 1$, else $d_{i2} = 0$). Finally, about 2 percent of the sampled farms were organized as partnerships or corporations ($d_{i3} = 1$, else $d_{i3} = 0$). The expected relationships between the last two binary variables and expenditure shares are unclear.

Results

Expenditure shares, per-family member total expenditures, and the price indices were utilized to estimate two almost ideal demand system models. The first model specification excluded household demographic attributes, thereby assuming homogeneous households; the second specification included the variables, allowing for demographic differences between households. The equations for the other expenditures category were arbitrarily dropped from both models for estimation purposes; this category was more aggregated and, therefore, less homogeneous in nature than the remaining categories. The parameter values for the other expenditure equations were determined by employing restrictions (4a) and (7). Additionally, the models were estimated with and without the homogeneity and symmetry conditions, (4b) and (4c), being statistically imposed; in the latter case, the validity of the restrictions was tested. As has been the case

[1] If consumption expenditures exceed accrued net farm income, then consumption expenditures are being made out of non-farm income and non-taxable cash farm income that would normally be used to offset non-cash expenditures, depreciation for example.

in similar studies (Deaton and Muellbauer, 1980a), the restrictions were rejected on statistical grounds. The coefficient estimates for the two models are presented in the appendix tables; coefficient standard errors for the other expenditures equations were obtained by restricting the coefficients, arbitrarily dropping the medical equation, and reestimating the system.

Elasticity estimates (Table 3) were obtained from Equations (8), (9a), and (9b), using the 1987 values for p_i and w_i (Tables 1 and 2). In general, the ordering of expenditures by income and price elasticities are very similar under both model specifications.[2] The results indicate that education, furniture, and other expenditures are luxuries, with total expenditure elasticities greater than 1; as expected, other expenditures (gifts, charitable contributions, and recreation) are the most responsive to changes in income, with an income elasticity of 1.55. The remaining categories may be considered necessities with expenditure elasticities of less than 1. As one might expect, food expenditures are the least responsive (ϵ_{im} of 0.57 and 0.55) and utilities the second least responsive (ϵ_{im} of 0.61 and 0.60) to changes in the total consumption budget.

The uncompensated own-price elasticities indicate that utilities, other, and food expenditures are the least sensitive to price changes; household operations, non-farm automobile, and education expenditures are the most responsive to price changes. One of the utilities elasticity estimates is positive; however, it is close enough to zero to deem it inconsequential.

The price elasticity orderings differ slightly between the compensated and uncompensated price elasticities in that non-farm utilities and other expenditures switch ordering, whereas the ordering of the remaining expenditure categories remains unchanged. In three instances, the compensated price elasticities

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[2] The only exception in the between-model consistency of orderings by elasticities is a change in the relative magnitude of the income elasticities for medical, household operations, and clothing.

are positive but close enough to zero to not warrant concern. The compensated and uncompensated price elasticities seem reasonable and are comparable to those presented by Green et al. (p. 105) in a summary of previous demand system estimates.

The effects of each demographic characteristic on the own-price elasticities are presented in Table 4.[3] Farm families in which the age of the operator is 50 years old or younger appear to be more responsive to the prices of medical, household operations, education, automobile repairs, and other goods than farm families in which the operator is older than 50 years. This seems reasonable since younger operators are more likely to be aggressive participants in these markets. Additionally, the younger farm family seems to be less responsive to the price of food and clothes; this may indicate that the older farm family is more budget-conscious on these items than the younger farm family. When family consumption exceeds accrued net farm income, the responsiveness of farm expenditures to the prices of household operations and education increases but decreases for furniture and other expenditures. It would be expected that the own-price response for both necessity and luxury goods would be more elastic under this scenario, as it is for household operations and education. No explanation, other than possible complications from expenditure aggregation, is offered for the effects of this household characteristic on the own-price elasticities of clothes, furniture, and other expenditures. Finally, the own-price elasticities for food, household operations, education, and utilites decrease if the farm is organized as a partnership or corporation. It seems that a corporate or partnership farm would probably not participate in these markets as often as a sole proprietorship, thereby not responding to price changes as often.

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[3] None of demographic characteristics changed any own-price elasticity by more than ±0.014.

Implications and Summary

Several things can be learned from this study about Kansas farm household consumption patterns. The first is that consumption expenditure patterns do not change greatly as farm incomes vary. Secondly, as consumption expenditures increase or decrease, those items for which farm households are most likely to reduce expenditures include gifts, charitable contributions, recreation, education, and furniture, whereas food expenditures are the least responsive to income changes. Changes in the costs of non-farm automobile repairs, education, and household operations will lead to relatively large responses in farm household expenditures, whereas changes in food and utility prices will have little impact on expenditures.

These results have implications for rural communities. Those businesses that are primarily involved in recreational activities and supplies will likely face difficulties when farm incomes decrease. Also those organizations that rely heavily on gifts and charitable contributions are more likely to face adverse consequences when incomes decline. Expenditures on education are very responsive to price and income changes. This may have implications for Land Grant University enrollments. Ceteris paribus, businesses involved in food sales, utility services, and, to a lesser extent, clothing sales and automobile repairs should experience less dramatic changes in sales volume as farm incomes vary.

The implications of these results are conditional on the representiveness of the data employed. The farm households included in the data are not a random sample and may not be representative of the farm population as a whole. However, our results are consistent with previous household demand studies. In addition, concerns about aggregation are present. These include use of U.S. price indices as opposed to specific rural Kansas indices, commodity expenditure aggregations, and aggregation across individuals and households.

A natural extension of our results would be to estimate a full demand system accounting for sources and uses of income. Estimating marginal propensities to consume, save, and invest would elicit further information useful to those groups and individuals concerned with policy formulation and the direction of rural economies.

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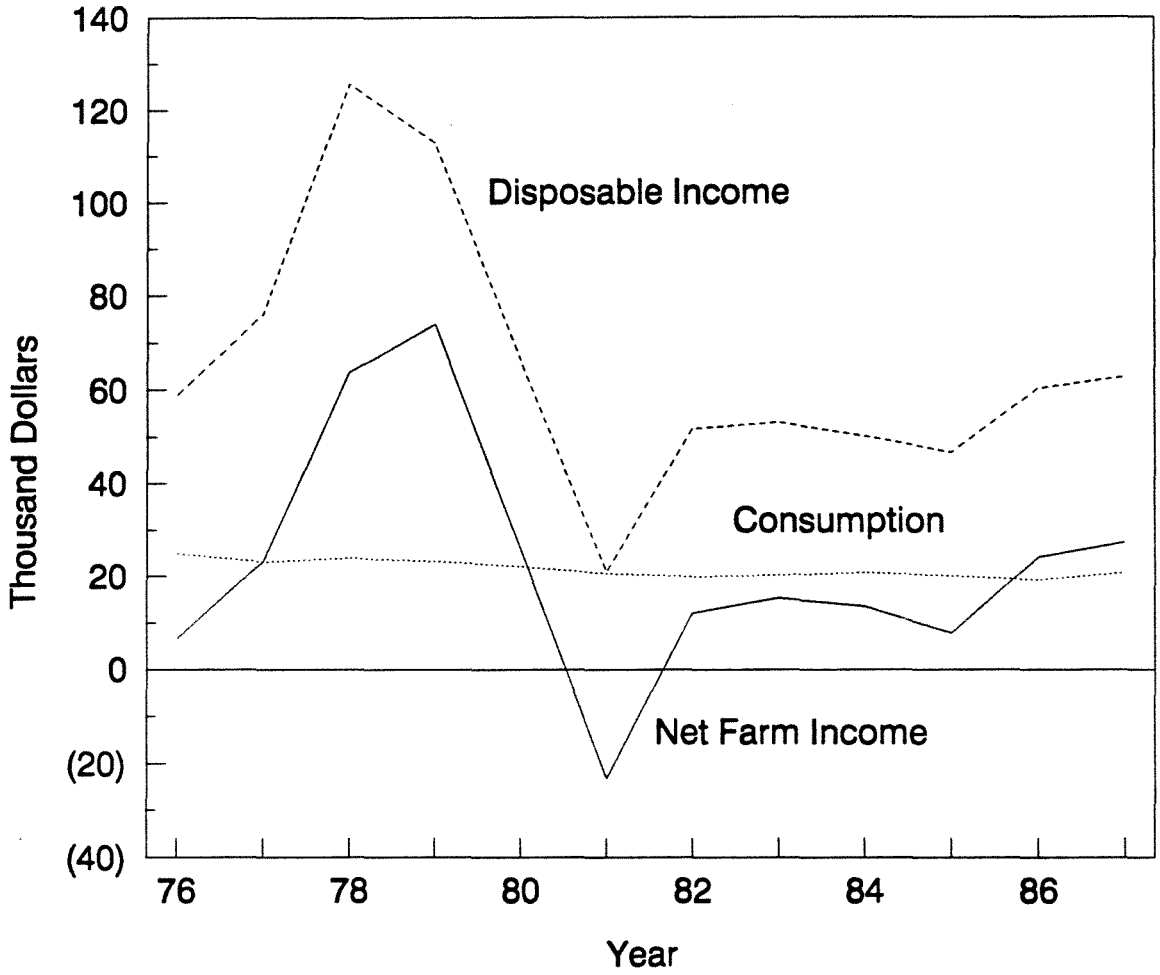

Source: Kansas Farm Management Association Data Bank, Dept. of Agricultural Economics, Kansas State University

Figure 1. Average Real Accrued Net Farm Income, Disposable Cash Income, and Family Consumption Expenditures for Kansas Farm Management Association Farms, 1976-1987

Table 1. Average Annual Kansas Farm Family Living Expenditures by Expenditure Item, 1976-1987[a]

EXPENDITURE ITEM	YEAR												
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1976-87
	1987 dollars												
Mean Expenditures[b]	$24,919	$23,148	$23,885	$23,294	$22,071	$20,648	$19,903	$20,159	$20,714	$20,004	$19,162	$20,661	$21,529
Std. Deviation	8,787	8,649	8,580	10,617	10,541	10,564	8,397	8,310	8,995	8,331	7,660	7,900	9,240
	average per family member												
Medical	$761	$733	$736	$706	$718	$746	$792	$805	$915	$953	$944	$1,013	$808
Food	1,213	1,201	1,243	1,234	1,176	1,094	1,182	1,110	1,137	1,094	1,064	1,151	1,158
Clothes	467	435	483	480	411	430	399	388	386	373	371	369	417
Operations	370	444	397	387	312	303	305	324	354	338	317	393	351
Education	245	305	326	275	260	258	276	231	220	236	199	273	259
Furniture/Equipment	417	323	427	418	393	300	282	276	302	283	258	293	332
Utilities	148	155	189	182	174	171	170	180	195	193	195	188	178
Automobile	175	167	162	173	180	185	194	197	188	219	177	194	184
Other	1,168	1,024	1,200	1,310	1,322	1,210	1,267	1,242	1,237	1,261	1,328	1,446	1,248
Mean Expenditures[b]	$4,966	$4,787	$5,162	$5,165	$4,946	$4,697	$4,867	$4,752	$4,934	$4,950	$4,854	$5,322	$4,936
Std. Deviation	2,000	1,979	1,998	2,403	2,445	2,404	2,556	2,180	2,517	2,621	2,446	2,557	2,351
	average expenditure shares												
Medical	0.1490	0.1507	0.1466	0.1412	0.1456	0.1659	0.1678	0.1755	0.1873	0.1878	0.1958	0.1850	0.1655
Food	0.2622	0.2665	0.2597	0.2604	0.2606	0.2588	0.2620	0.2526	0.2520	0.2485	0.2452	0.2414	0.2564
Clothes	0.0961	0.0936	0.0962	0.0948	0.0871	0.0912	0.0851	0.0846	0.0791	0.0786	0.0756	0.0735	0.0867
Operations	0.0761	0.0900	0.0771	0.0775	0.0647	0.0668	0.0682	0.0686	0.0698	0.0704	0.0665	0.0745	0.0722
Education	0.0502	0.0576	0.0561	0.0491	0.0493	0.0516	0.0488	0.0432	0.0406	0.0448	0.0364	0.0501	0.0483
Furniture/Equipment	0.0816	0.0669	0.0804	0.0760	0.0816	0.0594	0.0591	0.0599	0.0635	0.0550	0.0482	0.0546	0.0659
Utilities	0.0313	0.0336	0.0376	0.0369	0.0378	0.0400	0.0374	0.0414	0.0426	0.0439	0.0461	0.0392	0.0390
Automobile	0.0350	0.0350	0.0318	0.0343	0.0383	0.0419	0.0406	0.0413	0.0409	0.0485	0.0416	0.0396	0.0391
Other	0.2184	0.2060	0.2146	0.2298	0.2350	0.2245	0.2310	0.2330	0.2243	0.2226	0.2447	0.2420	0.2269
Total Expenditures[b]	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Avg. Family Size	5.4	5.1	4.9	4.8	4.8	4.7	4.5	4.6	4.6	4.5	4.3	4.2	4.7
No. of Farms	88	105	108	118	129	139	118	124	116	101	84	80	1310

a. All real values calculate by deflating nominal values by the general CPI.

b. Summation of individual expenditure items may not equal total due to rounding.

Table 2. Consumer Price Index (All Items, 1987 = 100) and Selected Categorical Price Indices, 1976 to 1987

YEAR	CPI	Medical	Food	Clothes	House-hold Opera-tions	Educa-tion	Furni-ture/ Equip-ment	Util-ities	Auto-mobile	Other
1976	50.1	54.3	52.7	42.8	54.6	50.9	44.3	53.7	55.7	47.0
1977	53.3	59.5	55.9	44.5	57.1	54.1	46.0	59.4	59.8	49.0
1978	57.4	64.5	61.8	45.7	60.6	58.2	45.3	63.5	64.8	55.0
1979	63.9	70.4	68.4	47.3	65.2	62.8	47.9	70.3	71.3	66.9
1980	72.5	78.1	73.9	50.3	72.2	69.4	51.2	81.8	78.8	85.6
1981	80.0	86.5	79.3	52.2	79.2	78.1	54.4	93.8	86.3	97.1
1982	84.9	96.6	82.0	53.2	84.3	88.4	56.9	103.1	92.8	100.0
1983	87.7	105.0	82.9	54.2	87.0	97.9	58.0	108.8	96.9	100.0
1984	91.4	111.5	86.0	54.9	89.1	107.4	58.5	113.8	100.3	103.8
1985	94.7	118.4	87.2	56.3	92.1	116.7	58.8	115.6	103.2	106.2
1986	96.5	127.4	89.7	56.4	93.9	126.0	59.1	113.0	106.7	99.9
1987	100.0	135.8	93.5	59.0	96.7	135.7	59.9	111.8	111.0	102.1
1976-87[a]	77.4	91.0	76.0	51.3	77.4	85.4	53.3	90.6	85.2	84.9

Source: U.S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review, various issues.

a. Weighted mean.

Table 3. Expenditure and Own-Price Elasticity Estimates from Two Almost Ideal Demand System Models

Expenditure Category	Expenditure Elasticities ϵ_{im}		Uncompensated Price Elasticities ϵ_{ii}		Compensated Price Elasticities ϵ^{*}_{ii}	
	1[a]	2	1	2	1	2
Medical	0.977	0.861	-1.903	-1.991	-1.742	-1.831
Food	0.566	0.549	-0.354	-0.289	-0.205	-0.156
Clothes	0.862	0.943	-1.803	-2.062	-1.727	-1.993
Household Operations	0.950	1.051	-4.191	-4.054	-4.122	-3.976
Education	1.398	1.485	-3.391	-3.335	-3.324	-3.260
Furniture/Equipment	1.135	1.163	-0.749	-0.503	-0.675	-0.440
Utilities	0.609	0.601	-0.035	0.042	-0.013	0.065
Automobile	0.832	0.724	-3.608	-2.268	-3.575	-2.239
Other	1.548	1.530	-0.270	-0.179	0.081	0.192

[a] Elasticitiy estimates in the columns headed 1 are those derived from the AIDS model specification which does not include independent variables for household demographic attributes. Elasticities in the columns headed 2 are those derived from the AIDS model specification in which three binary variables were used to differentiate between households; these variables were set to their most frequent value (0 or 1).

Table 4. Effects of Individual Demographic Characteristics on Uncompensated Own-Price Elasticities

Expenditure Category	Operator's Age ≤ 50 Years	Consumption Exceeds Income	Partnership or Corporation
Medical	0.0073[a]	0	0
Food	-0.0038	0	-0.0149
Clothes	-0.0010	0	0
Household Operations	0.0008	0.0003	-0.0011
Education	0.0036	0.0040	-0.0175
Furniture/Equipment	0	-0.0012	0
Utilities	0	0	-0.0062
Automobile	0.0028	0	0
Other	0.0063	-0.0116	0

[a] A positive value indicates that own-price elasticities are more elastic given the demographic characteristic; a negative value indicates that they are less elastic; a "0" indicates that the demographic variable is not statistically significant in the equation.

APPENDIX

Table A-1. Coefficient Estimates for the Kansas Farm Family Expenditures AIDS Model, 1976-1987, Demographic Variables Excluded[a,b]

EXPENDITURE CATEGORY	α_i	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	γ_{i7}	γ_{i8}	γ_{i9}	β_i
Medical	0.1432	-0.1503	0.0149	-0.1808	0.1719	0.1478	0.0141	-0.0072	0.0080	-0.0184	-0.0038
	(0.060)	(0.310)	(0.162)	(0.129)	(0.210)	(0.182)	(0.135)	(0.077)	(0.303)	(0.057)	(0.006)
Food	1.2194	0.0149	0.0340	0.0606	-0.0561	-0.0152	0.0028	0.0129	-0.0432	-0.0106	-0.1113
	(0.042)	(0.162)	(0.130)	(0.094)	(0.137)	(0.095)	(0.091)	(0.048)	(0.210)	(0.037)	(0.004)
Clothes	0.1826	-0.1808	0.0606	-0.0718	0.0955	0.0545	0.0140	0.0149	0.0630	-0.0499	-0.0120
	(0.033)	(0.129)	(0.094)	(0.118)	(0.135)	(0.082)	(0.099)	(0.047)	(0.106)	(0.034)	(0.003)
Household Operations	0.1350	0.1719	-0.0561	0.0955	-0.2307	-0.0743	0.0569	0.0419	0.0195	-0.0246	-0.0036
	(0.051)	(0.210)	(0.137)	(0.135)	(0.301)	(0.128)	(0.150)	(0.070)	(0.207)	(0.054)	(0.003)
Education	-0.1136	0.1478	-0.0152	0.0545	-0.0743	-0.1177	-0.0200	-0.0113	0.0294	0.0069	0.0192
	(0.043)	(0.182)	(0.095)	(0.082)	(0.128)	(0.124)	(0.083)	(0.048)	(0.115)	(0.038)	(0.004)
Furniture/Equip.	0.0141	0.0141	0.0028	0.0140	0.0569	-0.0200	0.0164	-0.0754	-0.0305	0.0217	0.0089
	(0.039)	(0.135)	(0.092)	(0.099)	(0.150)	(0.083)	(0.120)	(0.047)	(0.107)	(0.035)	(0.004)
Utilities	0.1432	-0.0072	0.0129	0.0149	0.0419	-0.0113	-0.0754	0.0350	0.0174	-0.0282	-0.0152
	(0.019)	(0.077)	(0.048)	(0.047)	(0.070)	(0.048)	(0.047)	(0.035)	(0.065)	(0.021)	(0.002)
Automobile	0.1085	0.0080	-0.0432	0.0630	0.0195	0.0294	-0.0305	0.0174	-0.1026	0.0390	-0.0066
	(0.029)	(0.303)	(0.210)	(0.106)	(0.207)	(0.115)	(0.107)	(0.065)	(0.591)	(0.030)	(0.002)
Other	-0.8325	-0.0184	-0.0106	-0.0499	-0.0246	0.0069	0.0217	-0.0282	0.0390	0.0641	0.1243
	(0.055)	(0.057)	(0.037)	(0.034)	(0.054)	(0.038)	(0.035)	(0.021)	(0.030)	(0.031)	(0.006)

a. Coefficient estimates are for the AIDS model specification

$$w_i = \alpha_i + \Sigma_j \gamma_{ij} \ln p_j + \beta_i \ln(m/P)$$

where w_i = Share of total family living expenditures spent on category i, i = 1, 2, . . ., 9;

p_j = Price index for expenditure category j, j = 1, 2, . . ., 9;

m = Per family member total family living expenditures;

P = CPI, 1987 = 100; and,

α_i, γ_{ij}, β_i = parameters to be estimated, i,j = 1, 2, . . ., 9.

b. Coefficient standard errors are in parentheses. Underlined coefficients are statistically significant at the α = 0.10 level.

Table A-2. Coefficient Estimates for the Kansas Farm Family Expenditures AIDS Model, 1976-1987, Demographic Variables Included[a,b]

EXPENDITURE CATEGORY	α_i^*	a_{i1}	a_{i2}	a_{i3}	γ_{i1}	γ_{i2}	γ_{i3}	γ_{i4}	γ_{i5}	γ_{i6}	γ_{i7}	γ_{i8}	γ_{i9}	β_i
Medical	0.3642	-0.0527	0.0070	-0.0012	-0.1929	0.0196	-0.1485	0.2147	0.1621	-0.0113	-0.0016	-0.0147	-0.0272	-0.0257
	(0.063)	(0.005)	(0.005)	(0.016)	(0.309)	(0.161)	(0.129)	(0.209)	(0.182)	(0.134)	(0.076)	(0.300)	(0.057)	(0.006)
Food	1.1903	0.0085	0.0020	0.0329	0.0196	0.0447	0.0603	-0.0466	-0.0113	-0.0058	0.0171	-0.0589	-0.0191	-0.1089
	(0.046)	(0.004)	(0.004)	(0.012)	(0.161)	(0.130)	(0.093)	(0.135)	(0.094)	(0.091)	(0.048)	(0.208)	(0.038)	(0.005)
Clothes	0.0989	0.0177	0.0042	-0.0018	-0.1485	0.0603	-0.0785	0.0813	0.0363	0.0132	0.0143	0.0793	-0.0576	-0.0042
	(0.035)	(0.003)	(0.003)	(0.008)	(0.129)	(0.093)	(0.117)	(0.135)	(0.082)	(0.098)	(0.046)	(0.106)	(0.034)	(0.003)
Household Operations	0.0560	0.0149	0.0055	-0.0206	0.2147	-0.0466	0.0813	-0.2275	-0.0970	0.0596	0.0394	0.0072	-0.0310	0.0038
	(0.053)	(0.003)	(0.003)	(0.010)	(0.209)	(0.135)	(0.135)	(0.299)	(0.128)	(0.149)	(0.070)	(0.205)	(0.054)	(0.004)
Education	-0.1623	0.0074	0.0082	-0.0360	0.1621	-0.0113	0.0363	-0.0970	-0.1208	0.0047	-0.0154	0.0323	0.0091	0.0243
	(0.047)	(0.004)	(0.004)	(0.013)	(0.182)	(0.094)	(0.082)	(0.128)	(0.124)	(0.082)	(0.048)	(0.114)	(0.038)	(0.005)
Furniture/Equip.	0.0212	0.0022	-0.0075	0.0141	-0.0113	-0.0058	0.0132	0.0596	0.0047	0.0270	-0.0762	-0.0443	0.0330	0.0089
	(0.043)	(0.004)	(0.004)	(0.011)	(0.134)	(0.091)	(0.099)	(0.149)	(0.082)	(0.119)	(0.046)	(0.107)	(0.035)	(0.004)
Utilities	0.1448	0.0003	0.0009	0.0156	-0.0016	0.0171	0.0143	0.0394	-0.0154	-0.0762	0.0381	0.0166	-0.0323	-0.0157
	(0.020)	(0.002)	(0.002)	(0.005)	(0.076)	(0.048)	(0.046)	(0.070)	(0.048)	(0.046)	(0.035)	(0.065)	(0.022)	(0.002)
Automobile	0.1503	-0.0101	0.0015	0.0032	-0.0147	-0.0589	0.0793	0.0072	0.0323	-0.0443	0.0166	-0.0517	0.0342	-0.0109
	(0.029)	(0.002)	(0.002)	(0.005)	(0.300)	(0.208)	(0.106)	(0.205)	(0.114)	(0.107)	(0.065)	(0.585)	(0.030)	(0.002)
Other	-0.8634	0.0118	-0.0218	-0.0062	-0.0272	-0.0191	-0.0576	-0.0310	0.0091	0.0330	-0.0323	0.0342	0.0910	0.1284
	(0.061)	(0.006)	(0.006)	(0.019)	(0.057)	(0.038)	(0.034)	(0.054)	(0.038)	(0.035)	(0.022)	(0.030)	(0.031)	(0.007)

a. Coefficient estimates are for the AIDS model specification

$$w_i = \alpha_i^* + \Sigma_k\, a_{ik} d_k + \Sigma_j\, \gamma_{ij} \ln p_j + \beta_i \ln(m/P)$$

where w_i = Share of total family expenditures spent on category i, i = 1, 2, . . ., 9;

d_k = Binary variables for demographic attributes, k = 1, 2, 3;

p_j = Price index for expenditure category j, j = 1, 2, . . ., 9;

m = Per family member total family living expenditures;

P = CPI, 1987 = 100; and,

α_i^*, a_{ik}, γ_{ij}, β_i = parameters to be estimated, k = 1, 2, 3 and i,j = 1, 2, . . ., 9.

b. Coefficient standard errors are in parentheses. Underlined coefficients are statistically significant at the $\alpha = 0.10$ level.