

U.S. Department of Agriculture, Human Nutrition Information Service (1986, 1987). "Nationwide Food Consumption Survey, Continuing Survey of Food Intakes by Individuals," Report No. 85-2, 86-2.

U.S. Department of Agriculture, Human Nutrition Information Service (1987). "Nationwide Food Consumption Survey, Continuing Survey of Food Intakes by Individuals," Report No. 86-1, pp. 72-73.

TIME USE IN DUAL EARNER HOUSEHOLDS: A STUDY OF
PRICE INFORMATION SEARCH AND FOOD EXPENDITURE PATTERNS

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A model combining aspects of household production, the economics of information, and the notion that time spent in an activity may yield satisfaction directly is formulated to explain variation in time spent searching for lower prices and in meal preparation, and expenditures on convenience foods, non-convenience foods, and fast and full-service food away from home. Shares of full income spent on each time and food use are estimated using a Tobit analogue to Two Stage Least Squares.

Two characteristic changes of households over the past few decades have caused complexities in the allocation of time and goods to the meal production process: an increase in the number of working wives and corresponding increases in incomes (Hagye 1983; U.S. Bureau of the Census 1986a). Consequently, these households are faced with both an expanding array of choices about how to allocate money to food expenditures and a decreasing amount of discretionary time to allocate to meal production. This study examines the allocation of time and purchased inputs used in meal production. This is an activity where both time and purchased inputs have a fair amount of substitutability and the productivity of time may be improved. Meal production is defined as all the activities leading up to and including preparation of food for family consumption. Thus, it includes time spent in procuring groceries, grocery expenditures, and time spent in actual meal preparation.

Three frameworks are relevant when examining allocation of resources to meal preparation: household production theory (Becker 1965), the economics of information (Stigler 1961), and the notion that time spent in an activity may yield satisfaction directly and thus influence time and goods allocation (Juster and Dow 1980; Wilkie and Dickson 1980). This study incorporates aspects of these three frameworks to formulate a more complete model of consumer demand for time and goods used in meal production.

REVIEW OF LITERATURE

Previous research in the area of food shopping and preparation, and expenditures on various types of foods has concentrated on the demand for time spent shopping or searching for lower food prices, or the demand individual types of food used in meal production that may decrease preparation time. More often than not, the simultaneous decision of how to allocate goods and time to food preparation has not been accounted for.

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Several studies examined the demand for convenience foods and food away from home (Prochaska and Schrimper 1973; Goebel and Hennon 1981; Kinsey 1983; McCracken 1984; Lee and Brown 1986; Douglas 1976; Redman 1980; Reilly 1982, Hull, Capps, and Havelcek 1982). A general result of the studies of expenditures for food away from home have found it to be a normal good. Presence of young children, older adults, and large family size have negative effects on food away from home expenditures, while increasing educational levels have positive effects. Some studies have found positive effects of increasing prices of time, while others have found negative effects. These discrepancies are due to differences in measurement of the price of time and estimation methods used.

Results of studies that examined convenience food expenditures have found conflicting results of the effects of income on expenditures. Some report convenience foods as normal goods, while others report them as inferior. Family size and presence of older children have positive effects on convenience food expenditures, while increasing education levels and presence of a female meal preparer have had negative effects.

Two researchers specifically modelled the simultaneous demand for shopping and search time and food expenditures, though meal preparation time or specific types of foods were not included (Doti and Sharir 1981; Carlson and Geiseke 1983). Doti and Sharir (1981) found that wife's employment decreased time spent shopping and increased grocery expenditures. Carlson and Geiseke (1983) found search to be a normal good and that increases in grocery expenditures are positively linked to increases in the number of searches.

Utilizing pieces of previous research to examine the simultaneous decisions of time allocation to food shopping and preparation, and goods allocation, including purchases of convenience foods, non-convenience foods, and food away from home, may provide a more complete picture of the factors that influence a household's choices concerning meal production.

THEORETICAL FRAMEWORK

In household production theory time and money allocation are based on the assumption of utility maximization. Time may be spent in leisure, home production, or market work. Money earned in the market facilitates purchases of goods and services used in meal preparation. Time spent in home production is combined with purchased goods meals are produced. Utility is obtained from meals. The economics of information indicates that consumers utilize time and purchased inputs, such

as food advertisements in newspapers and clipping coupons, to locate lower food prices. Thus, information search is a home production process. Search results in increased purchasing power equivalent to an increase in money income. Increases in money income allow increased purchases of goods and services to be used in meal production, suggesting the possibility of the substitution of goods for time in meal production. Finally, the notion that time may yield utility directly can be incorporated to better describe the factors that influence consumer satisfaction and determine how time and goods are allocated to meal production.

Utilizing a household production framework and integrating into it information as a home produced good where time spent searching for lower prices may yield utility¹ indicates that satisfaction is a function of meals produced with various food goods and time, and time spent in search, given preferences and productivity shifters. The following utility function is maximized subject to a time and income constraint²:

$$(1) \quad U = U(M(X_{mi}, H_m; k), H_s; P)$$

subject to

$$(2) \quad T = H_m + H_s$$

and

$$(3) \quad wT + v = \sum_{i=1}^N P_{mi}(X_s, H_s; PD) - P_s X_s$$

where

- U - utility
- X_{mi} - purchased input used in meal production
i = 1, 2, ..., N
- H_m - time used in meal production
- k - productivity shifters
- H_s - time spent in price information search
- P - preference shifters
- w - market wage rate
- T - time available for meal production
- v - non wage income
- P_{mi} - price of purchased inputs used in meal
production; i = 1, 2, ..., N prices
- X_s - purchased inputs used in price
information search
- PD - price dispersion
- P_s - price of X_s

Assuming the utility function in (1) is twice continuously differentiable and the second order conditions for a maximum satisfied, the demand for each good and time use in meal production is a function of prices, wages, and income, given taste and productivity shifters, and price dispersion. The demand for a purchased food input, X_{mi} , for example, is represented

$$(4) \quad X_{mi} = \phi(P_{mi}, w, P_s, v; P, k)$$

where

$$(5) \quad P_{mi} = f(H_s)$$

and

$$(6) \quad P_s = g(X_{mj}, \partial P_{mi} / \partial H_s, w)$$

Because the price of goods and the price of search time are not exogenous the derived demand for each good and time input used are expressed

$$(7) \quad X_{mi} = \phi(H_s, X_{mj}, \partial P_{mi} / \partial H_s, w, v; T, k) \text{ for } i/j$$

and

$$(8) \quad H = (X_{mi}, \partial P_{mi} / \partial H_{sm} w v; T, k)$$

Note that the marginal change in prices of goods used in meal preparation remain endogenous. Therefore, in order to obtain the final demand equations where goods and time uses are solely a function of exogenous prices, wages, and income, given taste and productivity shifters, an estimate must be obtained for the marginal change in prices of food inputs given a change in search time.

EMPIRICAL FRAMEWORK

Data

The data for the study were collected using a telephone and mail survey of dual earner households in Onondaga County, New York. Dual earners were singled out as a large and growing proportion of the American population (U.S. Bureau of the Census 1986). Considered a population in itself, inferences may be made about this large and growing market segment.

A telephone survey was used to screen the sample to ensure inclusion of only dual earners and to collect data on perceptions of savings on groceries, expenditures on food, both at and away from home, and general demographic information. The follow-up mail survey collected information on actual food expenditures. A final sample of 95 respondents was included in the analysis³.

Variable measurement

A summary of the theoretical constructs included in the model and the variables chosen to represent these constructs appear in Table 1. The dependent variables include the demand for four different goods used in meal preparation during a one week period: convenience foods⁴, non-convenience foods, fast food, and full-service food away from home and two demands for time: time spent in meal preparation and time spent in price information search. These variables were each measured as the share of full income spent on food for a one week period⁵.

Time spent in meal preparation is calculated as the total number of hours spent per week in meal preparation by the major shopper. Because the time spent in search is relatively time intensive, time spent shopping, clipping coupons, and reading the food ads are used as a proxy for information produced with time and goods.

The independent variables include measures of prices, income, price dispersion of groceries, and taste and productivity shifters. The price of time spent in information search is equal to the wage rate minus the total marginal savings obtained when a consumer engages in information search⁶. Marginal savings are estimated by use of Ordinary Least Squares since their value is a function of the savings available in a market and the amount of search a consumer engages in⁷. The price of time spent in meal preparation is equal to the market wage rate. Price dispersion is measured as savings respondents believed they could obtain on both convenience foods and non-

convenience foods. Non-wage income is measured as the dollar value of all income from sources other than wages of the major shopper in a household for a one week period.

TABLE 1. Choice and Measurement of Variables.

THEORETICAL CONSTRUCT	VARIABLE	DEFINITION	MEAN	s ²
ENDOGENOUS VARIABLES				
Purchased input, X_{m1}	EXCONV	Weekly Expenditures on convenience foods.	30.88	14.51
Purchased input, X_{m1}	EXNCONV	Weekly expenditures on non-convenience foods.	39.89	18.04
Purchased input, X_{m1}	EXFFAFH	Weekly expenditures on fast food away from home.	11.11	12.96
Purchased input, X_{m1}	EXFSAFH	Weekly expenditures on full-service food away from home.	11.57	13.11
Time input, H_m	MEALTIME	Hours spent in weekly meal preparation.	7.65	3.68
Time input, H_s	SRCHTIME	Hours spent in weekly price information search.	2.33	4.19
Purchased input, X_{m1}	CONSH	Share of full income spent on convenience foods.	.179	.07
Purchased input, X_{m1}	NGONSH	Share of full income spent on non-convenience foods.	.233	.10
Purchased input, X_{m1}	FFAFHSH	Share of full income spent on fast food away from home.	.060	.05
Purchased input, X_{m1}	FSFAFHSH	Share of full income spent on full service food away from home.	.064	.06
Time input, H_m	MEALSH	Share of full income spent in meal preparation.	.374	.15
Time input, H_s	SRCHSH	Share of full income spent in price information search.	.091	.11
EXOGENOUS VARIABLES				
Price dispersion, $PD_{1-1,2}$	CONVSAVE	Perceived weekly savings on convenience foods.	5.40	4.72
Price dispersion, $PD_{1-1,2}$	NCONVSAVE	Perceived weekly savings on non-convenience foods.	.25	.54
Total marginal savings, $-X_{m1}(\partial P_{m1}/\partial H_s)$	MARSAVE	OLS estimate of marginal savings on convenience foods.	5.88	2.54
Non-wage income, v	NWING	Total household non-wage income ^b .	460.43 ^c	225.81
Price of time, w	WAGESHOP	Wage of major shopper	9.11	4.18
Quality measure,	BRANDED	Percentage of nationally branded convenience foods in weekly shopping basket.	.47	.22
Preference shifter, $P_j, j=1,2,\dots,J$	BUSINESS	Reason a shopper eats full service food away from home ^d .	.21	
experience, $k_i, k=1,2,\dots,K$	COLL	Measure of whether a respondent completed college ^d .	.44	
Preference shifter, P_j	ENJOY	Index of enjoyment obtained from engaging in search.	0.00	1.14
Technology, k_i	MICRO1	Measure of frequency of use of a microwave oven ^d .	.56	
Productivity shifter, k_i	OLDKIDS	Children over the age of twelve in a household.	.64	.93
Preference shifter, P_j	SOCIAL	Reason a shopper eats fast food away from home ^d .	.82	
Productivity shifter, k_i	TIMOTHER	Minutes other adult in household spends daily in meal production.	.38	.64
Productivity shifter, k_i	TRIPSW	Measure of how frequently major shopping is done in a household ^d .	.78	
Productivity shifter, k_i	YNGKIDS	Children twelve and under in a household.	.73	.92

^cIncludes salary of other adult in the household as well as income from all non-wage sources.

^dThe proportion of the sample satisfying the specified condition is presented instead of the mean.

Previous research indicates the need for several productivity and taste shifters to be present in the demand equations (Prochaska and Schrimper 1973; Goebel and Hennon 1981; Kinsey 1983; McCracken 1984; Lee and Brown 1986; Redman 1983; Reilly 1983; Doti and Sharir 1983; Belizzi et al. 1981; Muellbauer 1976). The number of children over and age twelve and under are present in the equations measuring the demand for meal time and search time. An experience shifter is measured by educational attainment, measured as a dummy variable with a value of one if the major shopper completed college. Quality differences in convenience foods are measured as the percentage

of nationally branded convenience items in a respondent's market basket. Inclusion of quality variation allows the disaggregation of effects on expenditures due to quality differences from those due to savings from search. Planning may affect the productivity of time spent in meal production and is expected to influence demand for non-convenience foods. This is measured by the frequency of the major shopping trip and takes on a one if shopping is done once per week. Those shoppers who purchase most or all of their groceries in a once a week trip may plan meal preparation time and meals differently than those who shop more or less frequently. More frequent shoppers might be expected to purchase more non-convenience items such as fresh produce and meats because these foods are highly perishable. Less frequent shoppers might be expected to stock up on items which can be stored, including packaged convenience items. The reason the major shopper eats away from home can affect preferences for the type of restaurant frequented. The demand for fast food is expected to be positively influence by respondents indicating they eat out to save time. The demand for full service restaurants might be positively influenced if the major reason for eating away from home is for business reasons. Effect of time saving durables on meal preparation time is measured as a dummy variable with a value of one indicates the presence and use of a microwave oven daily. Meal production time is also expected to be influenced by the time spent in meal preparation weekly by the adult who is not the major shopper in a household. This variable can give an indication of whether meal preparation time is a substitute or complement between household members.

Finally, the model includes a measure of whether or not a respondent enjoyed spending time in price information search is hypothesized to affect the amount of time spent in the activity. Previous empirical work is available to give guidance in the choice of variables that measure a "taste" for search time (Dow and Juster 1980; Doti and Sharir 1981). An index measuring the enjoyment obtained from search is calculated using Principal Components Analysis. The approach was selected because often a respondent's statement about their feelings in inaccurate. By including a better of behavioral and demographic factors that are associated with a respondent's statement about their feeling about search time, a continuous enjoyment index can be computed. The resulting factor loadings indicated that the time of day a respondent shopped, the number of stores shopped at, the reason for choosing a store, age, and an answer indicating they enjoyed searching for lower prices were significant.

Estimation

The percentage of the sample reporting expenditures are: 100 percent for convenience foods, and 93.6, 78.9, and 83.2 percent for non-convenience foods, fast food away from home, and full-service food away from home, respectively. The model of meal production is operationalized as a system of six simultaneous demand equations. Both the reduced form and structural equations are

estimated using a Tobit analogue to Two Stage Least Squares if not all respondents reported expenditures on a specific food category, or Two Stage Least Squares, depending (Amemya 1979; Maddala 1983)⁸. Reduced form estimates of the time and expenditure shares were generated. These predictions were used as instrumental variables in the second stage of estimation.

TABLE 2. Results of Structural Equation Estimation (Marginal Effects on Expenditure Shares.

INDEPENDENT VARIABLE	DEPENDENT VARIABLES		FAST FOOD ^C	FULL-SERVICE FOOD ^C	MEAL TIME	SEARCH TIME
	CONVENIENCE FOOD ^B	NON-CONVENIENCE FOOD ^C				
INTERCEPT	.4845***	.9048***	-.0873	.3240	.6592	.4939
WAGESHOP	-.0008	-.0028	.0006	.0021	.0087	-.0124*
MARGSAVE	.00235	.0026	.0014	-.0002	.0056	.0051
NWINC	.1080E-05	.9028E-06	-.1166E-05	-.1746E-06	.29E-05	.10E05
NWINC2	-.8547E-11	-.8354E-11	.1285E-10	-.1069E-10	-.20E-10	.36E-10
YNGKIDS	-.00269	-.0076	.0031	.0015	-.0003	-.0169
OLDKIDS	-.0050	-.0034	.0049	-.0032	-.0070	-.0052
COLL	.0129	.031	.0027	-.0075	.0107	-.0444
BRANDPROP	-.0130					
TRIPSWK		.0112				
SOCIAL			0.211			
BUSINESS				.0033		
MICRO1					.0315	
TIMOTHER					-.0019	
ENJOY						.0347**
ECONSH		-1.177**	.2813	-.3404	-1.3249**	-.0650
ENCONSH	-.2740		-.2844E-01	-.2769	-.1080	-.8098*
EFFAFHSH	.2264	.8193E-01		.3791***	-.5578*	-.4799*
EFSAFHSH	-.5857*	-1.1411**	.9728***		-.8135	.1152
EMEALSH	-.4586*	-.8199*	.4926E-01	-.3914*		.0523
ESRCHSH	-.5462**	-1.00***	.9762E-01	-.3431*	-.7906	
SIGMA		.9279E-01***	.5066E-01***		.5280E-01***	
ADJ R ²	.25				.40	.13
LOG LIKELIHOOD			98.05	92.17	104.12	
N = 95						
*** p < .01 level						
** p < .05 level						
* p < .15 level						
B Estimated by OLS						
C Estimated by Tobit						

RESULTS

Examination of coefficients in structural equations offers a way to test the appropriateness of the economic theory used to develop the empirical model. Expected are negative own price effects. The complementarity or substitutability of goods for time in meal preparation can also be obtained from the structural model coefficients. Results are presented in Table 2. Because the Tobit analogue to Two Stage Least Squares causes upwardly biased standard errors, significance levels up to the fifteen percent level are utilized (Nelson and Olson 1978). The results give some support to the economic theory used to derive the empirical framework. The finding of a negative own price effect of search time as measured by the wage rate minus the total marginal savings obtained from search is robust, as is the direct effect of enjoyment of search time on the share of full income spent in price information search. Given the significance of the sign on the price of search time in this study, strong support is given to the theoretical assertion of negative own price effects.

Results also indicate that food inputs and time uses may be normal goods, that meal preparation time and expenditures on goods used in meal preparation may be substitutes, as are search time and expenditures on goods used in meal production.

Although individual effects do not have highly significant effects on the demand for expenditures and quantities, R² and log likelihood results indicate that the included variables explain a fair amount of variation in data concerning time and goods used in meal production.

Results of reduced form equation estimation are of interest to consumers and marketers, as they incorporate changes which affect the entire system of equations, not simply one equation in isolation from the others (Goldberger 1964, p. 369).

For variables measured as 0/1 dummy variables the reduced form coefficients are useful without modification. However, because expenditure shares contain prices and quantities in both the numerator and denominator, changes in continuously measured exogenous variables cause changes in both the numerator and denominator, making interpretation difficult. Therefore, the estimated coefficients are used as a starting point in calculating the effect of marginal changes in exogenous variables on expenditures or quantity demanded⁹. Several pieces of information are needed to perform the necessary calculations. $\partial y/\partial X$ is the estimated coefficient on the exogenous variable in question. F, y and $\partial F/\partial X$ are obtained from the data. For example, for a change in the wage rate $\partial F/\partial X$ is simply the number of hours spent in meal preparation plus the number of hours spent in search. If savings on inputs

used in meal production change, the quantity of inputs demanded is the necessary piece of information. Because measurement of comparable quantities of individual convenience foods and non-convenience foods are impossible to identify, the measure used is the average number of convenience items purchased (20.43).

Furthermore, a simple calculation using the coefficients on the wage rate and on total marginal savings can isolate the effect of a change in the price of meal preparation time from the effects of a change in the price of search time. This is necessary because the wage rate is the price of meal preparation time, and the wage rate plus total marginal savings (a negative number) is the price of search time¹⁰. Results presented in Table 3 represent transformed coefficients.

TABLE 3. Transformed Marginal Effects:
Reduced Form Equations

INDEPENDENT VARIABLES	EXPENDITURES ON:				QUANTITIES OF:	
	CONVENIENCE FOODS	NON- CONVENIENCE FOODS	FAST FOOD	FULL- SERVICE FOOD	MEAL TIME	SEARCH TIME
WAGESHOP	.71***	.50***	.33	.22	.80**	.29
CONVSAVE	-1.47	-4.74	-.148	-1.83*	-.70	.61
NCONSAVE	-4.25	2.10	-1.95	-3.99*	-.13	-.33
NWINC	.001	.002	.0003	4.6E-04	.0004	.0003
YNGKIDS	.56	-.92	.98	1.01	.17	-.73
OLDKIDS	-.28	.37	1.19	.56	.29	-3.13
BRANDED	-8.39*	-2.59	4.76	3.19	.35	-.80
ENJOY	-1.92	-2.69	-.64	-1.15	-.152	.64***
COLL	5.26*	2.04	-2.3	-3.67*	.11	-3.01**
TRIPSW	-4.35	4.26	-4.95**	-6.46**	1.16**	-1.02
SOCIAL	.62	-1.10	3.18	-1.20	-.24	-1.09
BUSINESS	3.87	-1.50	-4.75**	4.16*	-.90*	-1.00
MICRO1	.41	7.74	.55	.27	-.10	-1.16
TIMOTHER	-2.16	-.61	-.38	.48	.09	.61

* p < .10 level; ** p < .05 level; *** p < .01 level

Educational attainment (COLL) and time spent in price information search are negatively related. The negative relationship between having a college education and food away from home expenditures and a positive relationship between having a college education and convenience food expenditures was not anticipated. Planning as measured by frequency of the major shopping trip (TRIPSW) may be negatively associated with all food away from home expenditures and positively associated with time spent in meal preparation. Eating away from home for business reasons (BUSINESS) appears to be an important explanatory variable in the model. It is positively associated with full-service food away from home expenditures and negatively associated with meal preparation time and fast food expenditures. The data do not support the hypotheses that use of a microwave oven (MICRO1) should decrease time spent in meal preparation, that college education affects convenience food expenditures, or that eating out for social reasons (SOCIAL) affects fast food expenditures. Enjoyment of search time is positively associated with time spent in search, even when accounting for the effects of all other variables. Both the presence and number of older and younger children was not found to affect either time use or expenditures on food significantly.

Examination of structural price, enjoyment and income coefficients offer some evidence that economic theory used to derive a joint production model of consumer information search that incorporates the assertion that time spent in search may yield utility directly is appropriate. Positive wage effects on expenditures for food away from home have been found by Prochaska and Shrimper (1973), McCracken (1984), and Lee and Brown (1986). Positive effects of the wage rate on the demand for convenience foods have been found by Hull et al. (1982).

Several coefficients in reduced form equations were found to be significant in this study. Educational attainment was negatively associated with search time, a result similar to that found by Doti and Sharir (1983). The relationships found between having a college education and food away from home expenditures and between having a college education and convenience food expenditures are contrary to previous findings (Reilly 1982; Redman 1980). One explanation is that persons who have increased time demands due to occupational choice may simply purchase more time saving goods for use in meal preparation. Previous research has found a positive relationship between having a college education and food away from home demand for both full-service and fast food (Redman 1980). Since food away from home expenditures include a price and quantity component, perhaps the highly educated do not decrease quantity of food away from home, but instead eat at lower priced restaurants or take advantage of quantity discounts. These factors may explain the negative relationship between COLL and full service food away from home expenditures without refuting the assertion that quantity of full-service food demanded may actually increase. The negative effect of meal planning on food away from home expenditures may indicate that consumers who plan meals may spend less on food away from home for reasons such as "there is nothing to eat in the house." However, the data collected for this study unfortunately do not allow the testing of this assertion. The positive effect of increases in purchases of nationally branded items was expected, as the prices of branded items are usually more expensive than non-branded counterparts (Belizzi et al. 1981).

Reduced form equation estimates also indicate that the prices of time are important explanatory variables when examining time and goods allocation to meal production. Though not expected, the result that increases in the price of time increase time spent in meal preparation could signify the importance of family interaction or increases in the amount of entertaining done in households with increased market time demands. Kooremand and Kapteyn (1987) found this may be true for females.

The results that food at home use, including convenience foods, increase as the price of time increases is opposite of the result found by Goebel and Hennon (1982) who used hours of work as a proxy for the price of time. These are seemingly contradictory results. However, economic theory indicates that the price of time is the correct labor market participation variable to include in a household production model and results of previous studies are not directly comparable.

REFERENCES

- Alcaly, Roger, (1976), "Information and Food Prices," Bell Journal of Economics, 7, 658-71.
- Amemya, Takeshi, (1979), "The Estimation of a Simultaneous Equation Tobit Model," International Economic Review, 2(11), February, 169-181.
- Becker, Gary, (1965), "A Theory of the Allocation of Time," The Economic Journal, 75, September, 493-517.
- Bellizzi, J. A., H. F. Krueckebery, J. R. Hamilton, and W. S. Martin, (1981), "Consumer Perceptions of National, Private, and Generic Brands," Journal of Retailing, 57(4), Winter, 56-70.
- Brown, Kevin, (1986), "Food Industry Challenged by Changing Times," Advertising Age, December, s1-s40.
- Carlson, J., and R. Gieseke, (1983), "Price Search in a Product Market," Journal of Consumer Research, 9, 357-365.
- Doti, James L. and Samuel Sharir, (1981), "Households' Grocery Shopping Behavior in the Short Run: Theory and Evidence," Economic Inquiry, 19(2), April, 196-208.
- Douglas, Susan, (1976), "Cross National Comparisons and Consumer Stereotypes: A Case Study of Working and Non-working Wives in the U.S. and France," Journal of Consumer Research, 3, 12-20.
- Dow, Greg, and E. Thomas Juster, (1980), "Goods, Satisfaction with Activities, and Well-being," Working Paper, Institute for Social Research, Survey Research Center, University of Michigan.
- Gallo, Anthony, E. (1982), Coupons: Part I, National Food Review, NFR 18, Spring, 11-15.
- , (1982), Coupons: Part II, National Food Review, NFR 19, Summer, 12-26.
- Goebel and Hennon, (1982), "An Empirical Investigation of the Relationship Among Wife's Employment Status, Stage in the Family Lifecycle, Meal Preparation Time, and Expenditures for Meals Away from Home," Journal of Consumer Studies and Home Economics, 6, 63-78.
- Goldberger, Arthur, (1964), Econometric Theory. NY: John Wiley and Sons.
- Hacklander, Effie, (1978), "Do Working Wives Shop Differently for Food?," National Food Review. Economic Research Service, April, 20-23.
- Handy, Charles, (1985), "Surveying Private and National Brands," National Food Review, Winter-Spring, 14-17.
- Huang, C., and R. Ruanikar, (1983), "Household Fluid Milk Expenditure Patterns in the South and United States," Southern Journal of Agricultural Economics, December, 27-33.
- Hull, D., O. Capps, and J. Havelcek, (1982), "Demand for Convenience Foods in the United States," 1982 Proceedings of the American Council on Consumer Interests, 44-50.
- Judge, G., W. Griffiths, R. Hill, H. Lutkepohl, and T. Lee, (1985), The Theory and Practice of Econometrics, NY: John Wiley and Sons.
- Kaitz, Evelyn, (1979), "Getting the Most from Your Food Dollar," National Food Review, Economic Research Service, Winter, 26-29.
- Kinsey, Jean, (1983), "Working Wives and the Marginal Propensity to Consume Food Away from Home," American Journal of Agricultural Economics, 65(1), February, 10-19.
- Kooreman, Peter, and Arie Kapteyn, (1987), "A Disaggregated Analysis of the Allocation of Time Within the Household," Journal of Political Economy, 95(2), 223-49.
- Kurland, J., and D. Dunham, (1985), "Smaller Share of Income Goes for Food," National Food Review, NFR-31, Fall, 26-27.
- Lee, J.Y., and M. Brown, (1986), "Food Expenditures at Home and Away from Home in the United States: A Switching Analysis," Review of Economics and Statistics, 68(1), February, 142-147.
- Maddala, G.S., (1985), Limited Dependent and Qualitative Variables in Econometrics. Cambridge: Cambridge University Press.
- McCracken, Victoria, (1984), Econometric Analysis of the Away from Home Food Market, Unpublished Doctoral Dissertation, Purdue University.
- McDonald, J.F., and R.A. Moffitt, (1980), "The uses of Tobit Analysis," The Review of Economics and Statistics, 52(3), May, 318-321.
- Mitchell, Arnold, (1983), The Nine American Lifestyles, NY: MacMillan and Company.
- Muellbaur, John, (1976), "Household Production Theory, Quality, and the 'Hedonic Technique'," American Economic Review, 64(6), 977-994.
- Nelson, Forrest, and Lawrence Olson, (1978), "Specification and Estimation of a Simultaneous Equation Model with Limited Dependent Variables," International Economic Review, 19(3), October, 695-709.
- Ohl, J.N., (1983), "Cents-Off Coupons: Boon or Boondoggle for Consumers?," The Journal of Consumer Affairs, 16(1), Summer, 161-165.
- Pepper, Audrey, (1980), "The Relationship Between Fast Foods and Convenience Foods: Definitions and Developments," Journal of Consumer Studies and Home Economics, 4, 249-255.
- Prochaska and Schrimper, (1973), "Opportunity Cost and Other Socio-economic Effects on Away from Home Food Consumption," American Journal of Agricultural Economics, 554(pt.1), November, 545-68.
- Redman, Barbara, (1980), "The Impact of Women's Time Allocation on Expenditure for Meals Away from Home and Prepared Foods," American Journal of Agricultural Economics, 62(2), May, 234-237.
- Reilly, Michael, (1982), "Working Wives and Convenience Consumption," Journal of Consumer Research, 8, 407-418.
- Stigler, George, (1961), "The Economics of Information," Journal of Political Economy, 69(3), June, 213-225.

Strober and Weinberg, (1980), "Strategies Used by Working and Non-working Wives to Decrease Time Pressures," Journal of Consumer Research, 6, March, 338-48.

Tauber, Edward, (1972), "Why Do People Shop?," Journal of Marketing, 36, October, 46-49.

Traub, L. and D. Odland (1979), Convenience Foods and Home Prepared Foods: Comparative Costs, Yield, and Quality, Washington D.C.: USDA.

U.S. Bureau of the Census, "Current Population Reports, Consumer Income (1986)," Earnings in 1983 of Married-Couple Families, by Characteristics of Husbands and Wives, Washington D.C.: Department of Commerce.

U.S. Bureau of the Census (1971), Classified Index of Industries and Occupations, Washington D.C.: Department of Commerce.

U.S. Bureau of the Census (1986), Selected Characteristics of Families, Washington, D.C.: Department of Commerce.

Wilkie, William, and Peter Dickson, (1980), "Consumer Information Search and Shopping Behavior," Unpublished research paper.

ENDNOTES

¹For simplification and testing of the model, only time spent in price information search is permitted to yield utility.

²Weak separability is imposed. A consumer is assumed to engage in a two stage budgeting procedure in which total expenditures are allocated to broad groups of commodities first, including food, and then to specific commodities used in meal production.

³The final response rate was thirty percent (including non-respondents, ineligible households, and refusals). A comparison of the sample to the general dual earner population in the U.S. revealed that it was fairly representative of the general dual earner population.

⁴Convenience foods include canned and frozen fruits and vegetables, dry mixes, canned soups and sauces, cold and instant cereals, baked goods, meats already boned, skinned, canned, or cooked, frozen dinners and entrees, and ready to eat dairy products. This definition is adapted from those used in previous research (Traub and Odland 1978; Pepper 1980). Full service restaurants are differentiated from fast service restaurants by the presence of table service.

⁵Full income spent on food is defined as the value of time spent in price information search (includes shopping time) and meal preparation, and the value of expenditures on groceries and food away from home.

⁶Marginal savings from search are represented by

$$-Mx_i \frac{\partial Pm_i}{\partial Hs} + \frac{\partial U}{\partial Hs} = w; \quad i = 1, 2, \dots, N$$

The first term on the left hand side of the equation represents savings obtained from search and the second represents the psychic benefits gained from enjoyment of search. The sum equals the wage rate.

⁷The results of the estimation are

$$\text{MARSAVE} = 3.16 - .08 \text{SRCHTIME} + .538 \text{CONSAVE}$$

(.09) (.08)

$$(R^2 = .39)$$

Standard errors are presented in parentheses.

⁸The Tobit technique is necessary given that the measures of the dependent variables are continuous and fall between 0 and 1. Two Stage Least Squares is necessary given the simultaneous nature of the allocation of time and goods to meal production.

⁹The transformation is

$$\frac{\partial(yF)}{\partial X} = \left[\frac{\partial y^*F}{\partial X} + \frac{\partial F^*y}{\partial X} \right]$$

where

P*Q = expenditures on time or goods
 X = exogenous variable which changes
 y = expenditure share
 F = full food income

This equation is useful when examining the demand for expenditures on convenience foods, non-convenience foods, fast food away from home, and full service food away from home because the data does not permit the price of these variables to be isolated from total expenditures to obtain quantity demanded. Because the prices of search and meal production time are known, marginal changes in demand can be derived from the equation

$$\frac{\partial Q}{\partial X} = 1/P \left[\frac{\partial y^*F}{\partial X} + \frac{\partial F^*y}{\partial X} \right]$$

¹⁰A typical structural equation is written

$$z_i = \sum z_j \beta_{ij} + \sum x_k \alpha_{ik} + e_i \quad i \neq j$$

where Z_i is a dependent variable ($i=1,2,\dots,N$), Z_j are right hand side dependent variable ($i/$), β are coefficients, x_k ($k = 1,2,\dots,R$) are independent variables, α are coefficients, and e is an error term. To examine just the coefficients on the price of search time and the price of meal preparation time the relevant part of the above equation should read

$$\alpha_1 [Ps] + \alpha_2 [w] \\ = \alpha_1 [w + X m_i (\partial P m_i / \partial X_s)] + \alpha_2 [w] \\ = [\alpha_1 + \alpha_2] w + \alpha_1 [X m_i (\partial P m_i / \partial X_s)]$$

where Ps is the price of search time, w is the wage rate, and $X o_i (\partial P o_i / \partial X_s)$ are total marginal savings on goods searched for. However, the coefficients actually estimated are

$$\delta_1 [X m_i (\partial P m_i / \partial X_s)] + \delta_2 w.$$

Therefore, the coefficient on the wage rate in the equation estimated really measures the effect of a change in the price of search time on expenditure shares because δ_2 is the sum of α_1 and α_2 . To isolate the effect of a change in the price of meal production time, the coefficient on total marginal savings must be subtracted from the coefficient on the wage rate.

DISCUSSION: TIME USE IN DUAL-EARNER HOUSEHOLDS
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Understanding purchase behavior for foods is an increasingly complex topic. While economic factors such as price and income are important determinants of food purchase behavior, changes in demand over time indicate other factors are significant as well. In particular, economists have been unable to explain fully why significant changes have occurred in the composition of food groups and the type of products which households consume. Among factors which researchers have cited are changing lifestyles, increased women's labor force participation, changing composition of the food supply including the introduction of convenience foods, and health concerns. The "new" economic theory of the household provides a structure incorporating these factors to explain food acquisition, preparation, and intake. Jane Kolodinsky introduces such a model, and utilizes a specifically designed data set to estimate parameters related to food price information search and meal preparation. The questions addressed are important for understanding consumer behavior, factors effecting changes over time, implications for the marketing and processing of food, as well as public food policies particularly related to labeling and packaging. She is to be commended for developing such a structure which can address many of these important issues.

Kolodinsky's model sets the allocation of time and goods to information search and meal preparation within the household production framework, extended to include the process of search for information as a productive activity. It allows some search time to yield utility directly, and the search for information to yield direct savings associated with the search. The theoretical framework is one of a utility maximizing household, in which one household member specializes in search behavior. The model yields a system of equations for the demand for four different types of food (convenience foods, nonconvenience foods, fast-foods and full-service food away from home), and demand for time input in meal preparation and search. In general, the findings support the household production model, finding search time to enhance the household production process. An important contribution is the specification of variables such as enjoyment from search, and estimated returns to these activities.

In way of comment on the paper, I will make several observations both about the structure of the model as well as empirical findings. They relate particularly to trying to better understand the implications of the model structure, as well as identify key contributions of the research.

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First, several comments related to the structure of the model. In its simplest form, Becker's household production model includes the time and money resource allocation of a single decision-maker within the household. For example, the labor force participation decision of females is traditionally modeled as the decision process of the woman alone. However, given the dual earner households to which this model was applied, it is likely that decisions with respect to allocation of time to meal preparation, food purchases, and search for information on the products themselves involve a joint decision process for the two spouses.

The implication of not including a dual decision process is that there is no substitution of time between the two household members in meal preparation and product information search. Also, because the model is estimated for dual earner households, we are observing a subset of households for which the marginal value product of time in the market is greater for both than the marginal value of their time at home. While the model adds richness to understanding the allocation process among food prepared at home, convenience foods, fast food away from home, and full service food away from home, there is no allocation of time inputs among household members. This is a central issue to understanding the process of the household's resource allocation to food acquisition for dual earner households today.

The model considers the second stage of the budget allocation process only. This also is an important assumption. In the first stage, the household allocates resources to food preparation and everything else. The second stage models the alternative types of food search and preparation. As set up, it is not clear that the choice of inputs for the food preparation production technology are independent (separable) from the choice the use of other inputs. Particularly when looking at the contribution to utility of time spent in search, one might question whether other activities such as type of job or leisure time activities affect the allocation of time in the preparation of food.

The survey sample which was used to estimate the model is unique. In addition to collecting information about household use of time related to meal preparation and search, it includes information on how the search was conducted and the household member's enjoyment of search. While it is a unique data set, one of the limitations of such a survey is the small sample size. Only 95 households were used. This limits the extent of estimation possible, and confidence in the estimated parameters.

Furthermore, the sample included only dual earner households observed during the summer months.

What type of households were these? The average nonwage income, which includes the wage income of the spouse who does not shop for food, was \$24,000. For the shopper spouse, the average number of weeks worked per year was 35 and the average hours of work per week was 44. Part-year work may be an especially important feature of the household participation in the labor force. This particularly could affect shopping and food purchase behavior, particularly during the weeks in which they were observed.

The particular selection of households may have affected some estimated results which were inconsistent with expectations. For example, both nonconvenience and convenience meals prepared at home increased with the value of time. This may be a factor of the time of year in which the survey was taken. Without careful attention to the effects of the sample, it is tempting to interpret these anomalous findings when in fact the findings are a product of model specification and limited data.

The work does suggest several important applications and extensions. For example, food behaviors may be very different for part-time or part-year households relative to others. They may be different for individuals of different income levels or of different age groups. Partitioning the sample, and evaluating the estimated effects between partitions could have significant marketing and policy applications. Also, what is the value of time in search? Do the findings indicate whether one is better served to clip coupons, read labels, or buy convenience foods? What will the impact of increasing uncertainty about food product characteristics be on both the type of market food purchased, as well as time spent in search? Kolodinsky's model would lend itself quite well to providing such information.

One of the important contributions of this study is to suggest ways of developing or expanding existing data sets. For example, in the last ten years marketing firms have used new technologies to gather information on product movement, price, advertising exposure, new product introduction, and household characteristics. These data sets often lack information about attitudes to search, shopping, and food products in general. This study suggests several ways in which information on household attitudes could be incorporated in such data sets. Taking advantage of more automated data to document household purchases, such as the scanner data sets, allows greater attention and resources directed to gathering information on other household parameters. This dissertation provides an excellent resource for identifying methods by which the information search process can be included in consideration of food purchase behavior.

COMMENTS

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The 1989 ACCI Student Research Awards Committee is to be applauded for its M. S. Thesis selection. I do not know how difficult the choice was, but an excellent M. S. thesis has been identified. Ms. Yang and her Advisory Committee should be very pleased with this thesis. In my opinion it contains all of the essential elements. A thorough grasp of the current literature/state of the art of a specific topic is displayed. Recently developed statistical tools are used in the empirical work. Furthermore, the discussion provides a clear presentation of the theory and statistical issues involved in modeling consumer expenditures and testing associated hypotheses. The explanation of the household production model, the tobit regression model, and the statistical tests employed are very well done. Altogether, they provide an excellent discussion of the steps and procedures taken to analyze FAFH expenditures.

My comments fall into two broad areas. One pertains to the household production model and its use in the analysis of FAFH expenditures. The other focuses on some data limitations. These comments do not detract from the research described in the thesis. Rather, they have more to do with limitations and possible areas of future research, common to all the work in this area.

The Model

Two issues need to be kept in mind with respect to the use of the household production framework. First, the focus on FAFH expenditures necessitates the assumption of separability of this category of commodities from others that generate utility. How restrictive is this condition? Since there are no substitutes for the food category and most of the household's utility is derived from food is through food at home, the notion of separability here may be acceptable. However, I am not as convinced that FAFH can be considered separable. If this is the case, then we need to begin to develop models of consumer behavior, including derived demand models, that incorporate the substitution.

The other issue has to do with the assumption of no joint production. FAFH may generate utility in terms of both leisure and food. To the extent that this occurs, the decision making, as depicted in the household production model, may need to be restructured.

The average household FAFH expenditure for these data is \$8.37 per week, and the corresponding income is \$172, so approximately five percent of the disposable income is spent of FAFH. This means that we are looking at a small part of the budget. Furthermore, only 5.6 percent of these households are classified as "restaurant only," whereas nearly 62 percent are "at home only." Perhaps, for these low-income households, joint production is less prevalent, so there is some merit in considering this group. Application to higher income groups is more tenuous because these households are more inclined to frequent restaurants and be involved with the joint production of leisure and food consumption.

The Data and Results

The nature of the data imposes two restrictions. First is the arbitrary cut-off of 130 percent of the federal poverty level. It is not clear that this is the appropriate cut-off level for low income households, although there are no criteria that can generate a best group. An adjustment for regional price variation is made, but within-region price variation may be as significant as those among regions. Thus, the selection of households may have included some households incorrectly and omitted others. These considerations suggest that an important research issue centers on the sensitivity of the results to alternative definitions of low income households.

A closely related point is that some households are only temporarily below the federal guidelines. The Panel Study of Income Dynamics data suggest there are two distinct groups of low-income households: temporary and permanent. I would expect that FAFH expenditures would be quite different for a household if it is temporarily or permanently below the cut-off. Thus, it would be useful to incorporate a measure of the duration of the low income status.

Multicollinearity may also be present. The results, as reported, do not provide any indication. Although many coefficients are significant, the insignificance of others could be affected. Given this low-income subset, there is bound to be some multicollinearity, such as between the age-sex composition and the presence of a child between one and five. Consequently, I am glad to note that variables were not deleted based upon their significance.

Average weekly household expenditures on FAFH during the preceeding two months is the dependent variable. A set of independent variables included in the regression is the type of eating place frequented yesterday. The

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coefficients are positive and significant. This suggests a great deal of habit persistence on the part of these low income households. It is an indication that future work ought to consider this feature in modeling FAFH demand.

Similarities among the elasticities across functional forms are surprising. The forms imply different causal relationships. These could be due to a lack of variation in the variables and/or the use of mean values. An interesting extension would be to conduct a sensitivity analysis for households within the low income category but at the lower and higher ends of the distribution. For example, households could be ranked on the basis of their per person disposable income, and the average household for the lowest 20 percent used vis-a-vis the highest.

As my comments indicate, this thesis represents an excellent piece of research. No research project is able to answer all the questions and issues on a given topic. Rather, research that is well done, including the preparation of a thesis, points to questions and issues that go beyond the work being addressed. Such is the case at hand. Ms. Yang's thesis is very good. As a result my comments have centered on possible extensions of her work.

ESTIMATED EFFECTS OF HIGHER DAY CARE STANDARDS
ON THE PRICE OF DAY CARE

Michael L. Walden, North Carolina State University¹

Concern about quality of child care has prompted many states to consider increasing minimum standards for licensed day care centers. This has sparked debate about impacts of minimum standards on day care fees. Using data from a sample of day care centers operating in North Carolina, estimates of relationships between day care fees and day care center characteristics are presented. Results strongly indicate that higher minimum standards will increase fees of centers required to upgrade.

ESTIMATED EFFECTS OF HIGHER DAY CARE STANDARDS ON THE PRICE OF DAY CARE

Concern about the quality of pre-school child care has prompted many states to consider legislatively increasing the minimum standards for state licensed day care centers. Typically, the standards focus on three factors: size of the child groups in the center, the staff to child ratio, and the training of the staff in the center [Coelen, 1979]. However, a hotly debated topic between supporters of increased standards and many day care operators concerns the effects of standards on day care fees. Supporters of increased standards frequently argue that raising standards will not significantly raise fees; instead, raising standards will simply lower day care center profits. In contrast, many day care operators argue that higher standards will necessarily result in higher fees if the day care center is to remain in business.

The purpose of this paper is to present evidence which addresses the question of whether standards for day care centers affect day care fees. Specifically, the paper examines the relationship between characteristics of day care centers, including those characteristics affected by standards, and day care fees. The relationships are measured using data from North Carolina day care centers.

Theoretical Model

The effect of raising day care standards can be modeled in a simple supply/demand framework. In Figure 1, let Q be the units of day care purchased, where, for example, the units are the numbers of weeks. Let P be the price by unit, for example, the price per week. $S(\text{Std}_1)$ is the supply of weeks of day care with average standard level Std_1 . $D(\text{Std}_1)$ is the demand curve for units (weeks) of day care when the average standard level is Std_1 . The original equilibrium point is at 1.

Higher mandated day care standards, such as smaller group sizes and better trained staff, which increase the average standard level to Std_2 , will shift the day care supply curve upward to $S(\text{Std}_2)$. Each unit (week) of day care supplied is now more costly due to the higher standards. However, the direction of shift in the demand curve is uncertain. If day care quantity (number of weeks of care) and day care quality (level of standards) are (income complemented) complements, then the demand curve for day care quantity (weeks) will shift upward and the new market equilibrium will be 2_B . In this case price per unit will definitely increase. As the demand and supply curve shifts are depicted in Figure 1, equilibrium point 2_B also results in a lower equilibrium quantity (weeks) of day care. However, as Figure 2 shows, the supply and demand curves could shift in such a way as to result in both a higher price and higher quantity of day care consumed.

Figure 1. Market effects of higher day care standards.

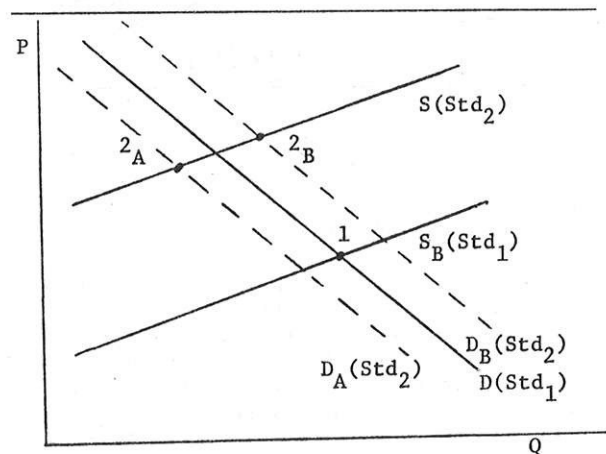
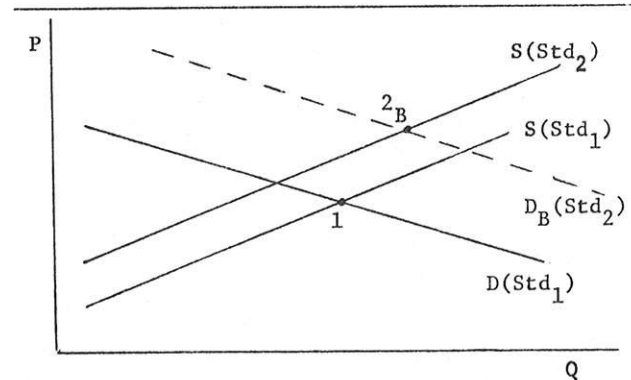


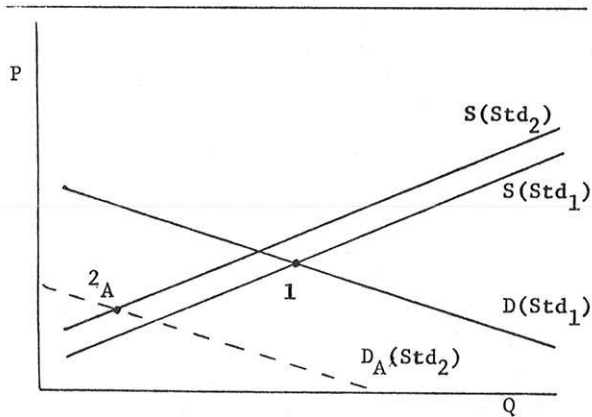
Figure 2. Higher standards result in higher price and higher quantity.



¹ Professor of Economics and Business

If day care quantity and day care quality are (income compensated) substitutes, then the demand curve for day care quantity (weeks) will shift downward and the new equilibrium point will be 2_A (Figure 1). As drawn in Figure 1, equilibrium point 2_A also results in a higher price. However, as shown in Figure 3, if higher standards result in a modest upward shift in the supply curve but a major downward shift in the demand curve, then the equilibrium per unit price could fall. Thus, we cannot unambiguously predict the direction of the change in the per unit price of day care as a result of mandated higher standards.

Figure 3. Higher standards result in lower price.



Empirical Model

The effect of day care standards on the per unit price of day care is analyzed via an hedonic model. In such a model, price is regressed on measures of characteristics of the product or service. Estimated coefficients of the characteristics are implicit prices of the characteristics. The implicit price shows the change in the product or service equilibrium market price when the amount of the characteristic changes. The implicit price is a combination, or summary, of changes in supply and demand relationships which occur when the amount of the given characteristic changes [Lancaster, 1966; Rosen, 1974]. This study is most interested in the implicit prices of three "standard" characteristics of day care centers: size of the child care groups, the staff-child ratio in each group, and the training of the day care staff.

Data for the analysis are taken from day care centers operating in North Carolina. This is advantageous, because the more homogenous the study area is with respect to exogenous factors such as wage levels and the local cost of living, the easier it is to isolate the effects of day care center characteristics on day care prices. The characteristics of 143 randomly selected day care centers in North Carolina are used to

estimate the implicit prices of day care standard variables.

The price for day care (FEE) is measured as the average typical weekly fee per child as reported by the center. Average group size (GPSIZE) is measured as the average number of children assigned to groups in the center. To avoid introducing statistical problems (collinearity) with the group size variable, the staff-child ratio is measured as the average number of staff per group in a center (STAFF/GP). This means that the effect on fees of the staff variable STAFF/GP is the effect of changing the average number of staff per group for a given average group size in the center. Staff training is measured as the average number of years of education of the staff in a center (STAFFED). Descriptive statistics for these variables are listed in Table 1.

Table 1. Descriptive statistics.

Variable	Mean	Std. Dev.	Min.	Max.
Avg. typical (FEE) \$	24.78	8.75	4.17	48.50
Avg. group size (GPSIZE)	12.03	4.44	4.00	31.00
Avg. # staff per group (STAFF/GP)	0.62	0.46	0.14	2.43
Avg. yrs. staff education (STAFFED)	12.89	1.96	4.00	18.00

Other characteristics of centers may also be expected to affect fees. Parents may prefer more space for children in day care centers, and, if the marginal cost of space is positive, then the implicit price of space will be positive. Two space variables were available from the data, the indoor square footage per child (INSPACE) and the outdoor square footage per child in the center (OUTSPACE). Three categorical variables were available in the data indicating the presence of services: COUNSEL (COUNSEL = 1 if parent counseling sessions were provided and included in the fee), TRIPS (TRIPS = 1 if transportation was provided and included in the fee), and BREAKFT (BREAKFT = 1 if breakfast was provided and included in the fee). Since rents and labor costs are higher in urban areas, centers located in urban areas (URBAN = 1) are expected to have higher fees, controlling for other relevant characteristics. Lastly, a variable SUBSIDY was created from the data measuring the average subsidy per child at a center. SUBSIDY equals total cash subsidies (from government agencies, special grants, civic groups, and the Day Care Feeding Program) plus the center's estimated value of non-cash contributions (for personnel, building space, materials and supplies, and food)

divided by the total number of children served in the center. If SUBSIDY has the effect of increasing a center's supply (that is, shifting the supply curve rightward), then the implicit price of SUBSIDY will be negative. However, if the supply curve of subsidized centers cannot be shifted in the short run, then subsidized centers will simply earn quasi-rents and the implicit price of SUBSIDY will be zero.

Empirical Results

A linear relationship between FEE and characteristics of day care centers was estimated using the standard regression technique of ordinary least squares.² The results are presented in Table 2. The coefficient estimates can be interpreted as implicit prices of one unit of the explanatory variable. The t values indicate the statistical significance of the coefficient estimates. Two-tail tests are used in the statistical tests.

Table 2. Estimated effects of day care center characteristics on average fees, all ages.

Explanatory Variable	Dependent Var. = FEE		Dependent Var. = FEE	
	Coeff.	t-value	Coeff.	t-value
Constant	15.710	3.063***	13.989	1.537
GPSIZE	-0.300	-1.875*	-0.423	-1.941*
STAFF/GP	6.144	3.913***	6.341	2.594***
STAFFED	0.688	1.911*	1.058	1.715*
INSPACE			-0.014	-0.338
OUTSPACE			-0.002	-0.556
COUNSEL			-6.096	-2.733***
TRIPS			0.862	0.386
BREAKFT			3.347	1.568
URBAN			0.115	0.062
SUBSIDY			0.004	0.319
N	143		74	
R ²	0.15		0.29	
F-value	8.02		2.511	
Prob>F	0.0001		0.0131	

*** significant at .01 level, 2 tail test
 ** significant at .05 level, 2 tail test
 * significant at .10 level, 2 tail test

The implicit prices of GPSIZE, STAFF/GP, and STAFFED are negative, positive and positive, respectively, and are statistically significant. In the equation with other center characteristics included, the average weekly fee per child is estimated to decrease 42 cents with every increase of one child in the average group size (GPSIZE); the average weekly fee per child is estimated to increase by \$6.34 with every increase of one staff person per group; and the average weekly fee per child is estimated to increase by \$1.06 for every increase of one year in a center's average number of years of staff education (STAFFED). These results are in the range found by Hall [1978] in a study of day care centers in Seattle and Denver.

Regarding other center characteristics, the implicit prices of the space variables INSPACE and OUTSPACE are not statistically different from zero. COUNSEL has an unexpected negative implicit price which is statistically significant. The implicit price of the transportation provision variable TRIPS is not statistically different from zero. The provision of breakfast by a center (BREAKFT) results in a higher average fee, although the parameter estimate is not quite significant at the .10 level. The results indicate that centers in urban locations (URBAN) and the amount of subsidy per child (SUBSIDY) have little effect on fees. Hall also found a statistically insignificant effect for a variable similar to SUBSIDY. Thus, the three "standard" characteristics have the strongest effect on FEE.

In some states, such as North Carolina, standards are applied according to age of the child, with standards being much stricter for younger children. In fact, in the 1985 debate over day care standards in North Carolina, stricter standards were proposed only for children under 2 years old. Consequently, the price effects of day care center characteristics on average fees charged to children aged 0-1 (FEE 0/1) and children aged 1-2 (FEE 1/2) were also examined. Due to the small number of cases involved when all day care center characteristics were included, only the relationships between fees and GPSIZE, STAFF/GP, and STAFFED are presented (Table 3). The results are the same as in Table 2. Increases in average group size reduce average fees, increases in the staff-group ratio increase fees, and increases in staff training increase fees.

Table 3. Estimated effects of day care center characteristics on average fees for 0-1 and 1-2 year olds.

Variable	Dependent Variable=FEE 0-1		Dependent Variable=FEE 1-2	
	Coeff.	t-value	Coeff.	t-value
Constant	1.156	0.134	1.773	0.196
GPSIZE	-0.769	-3.228***	-0.351	-1.619*
STAFF/GP	2.900	2.074**	2.396	3.794*
STAFFED	2.831	4.188***	2.538	3.699***
N	69		80	
R ²	0.39		0.26	
F-value	14.00		8.95	
Prob>F	0.0001		0.0001	

*** significant at the .01 level, 2 tail test
 ** significant at the .05 level, 2 tail test
 * significant at the .10 level, 2 tail test

Implications and Extensions

This analysis has examined the relationships between day care fees and day care center characteristics. Of particular interest were the relationships between fees and average group size, average staff to group ratio, and average staff training. Group size, the staff to group

ratio, and staff training are often the characteristics of day care centers which legislators attempt to influence through minimum standards.

Using data from a sample of day care centers in North Carolina, the relationships between fees and group size, the staff to group ratio, and staff training were estimated. The results indicated that a higher average group size is associated with a lower average fee, a higher average staff to group ratio is associated with a higher average fee, and higher average staff training is associated with a higher average fee. These relationships were not changed when other day care center characteristics were added and were consistent for age specific fees.

NOTES

1. $S(\text{Std}_1)$ and $S(\text{Std}_2)$ are drawn as upward sloping, reflecting increasing marginal cost associated with supplying additional units (weeks) of day care. Day care supply curves may be upward sloping if, for example, day care labor supply curves are upward sloping. However, horizontal day care supply curves will yield the same result.

2. Log-log, semilog, and log-linear functional forms were also estimated with no significantly different results.

REFERENCES

Coelen, Craig, Frederic Glantz, and Daniel Calore (1979). Day Care Centers in the U.S.: A National Profile 1976-1977, Cambridge, MA. Abt Books.

Hall, Arden (1978). "Estimating Cost Equations for Child Care," in Phillip K. Robbins and Samuel Weiner (eds.), Child Care and Public Policy, Lexington, MA. Lexington Books.

Lancaster, Kelvin J. (1966). "A New Approach to Consumer Theory," Journal of Political Economy, 74 (February), 132-157.

North Carolina Department of Administration (1983). North Carolina Day Care Cost Study: Day Care Centers, Final Report, April.

Rosen, Sherwin (1974). "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," Journal of Political Economy 82 (February), 34-55.

CONSUMER RESPONSE TO DEREGULATED MARKETS: THE TIMING OF INTERSTATE LONG-DISTANCE TELEPHONE CHOICES

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Using a statewide panel of households, this research examines the timing of consumer choice of a long-distance telephone carrier before and after the equal access selection process. This choice situation has three special features: (1) the possibility of selecting from among interstate carriers where only one, AT&T, had been historically available; (2) a government-mandated process by which all consumers were asked to designate a primary long-distance carrier; and (3) the consumer option of being randomly assigned to a carrier. A net benefit framework is used to model the timing of consumer response to deregulation-induced choices. The empirical results indicated that early choosers were distinguished from those who elected random assignment by differences in their knowledge of available carriers. In contrast, differences in market perceptions differentiated those who choose a carrier at the time of equal access from those who were randomly assigned to a carrier.

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Many current deregulatory policies in the United States encourage consumers to alter long-standing choices. For example, banking deregulation replaced the fixed-rate passbook account with an array of new accounts, thereby giving depositors an incentive to rethink their selection of a bank. Similarly, airline deregulation, by initially stimulating price and quality competition among carriers, pushed consumers toward considering new factors in selecting an airline.

The success of deregulatory policies may well depend, at least in part, on the extent to which consumers are willing to alter their decision-making patterns. If consumers fail to perceive and select new market alternatives that offer superior combinations of price and quality, the purported efficiency gains of industry deregulation will not be fully realized.

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Given the key role of consumers in deregulated markets, it is important to investigate how they are responding to deregulation-induced decisions. The tendency of consumers to minimize the costs of information search and to use simplifying mental rules ("heuristics") in evaluating alternatives is well documented in consumer research. Will consumers use heuristics to resist additional information search and processing, or will they eagerly accept the challenge of altering traditional decision making patterns in light of new options?

An extreme case in which deregulation forced consumers to consider new options and reevaluate the basis of their past behavior involved the choice of an interstate long-distance carrier. Initially, consumers were offered the possibility of using a carrier other than AT&T. To do so, however, they had to search out information about alternative carriers and, once having signed up with one, dial a multidigit access code in order to use it. Later, as part of the agreement to break-up AT&T, all residential consumers went through an "equal access" process whereby they were asked to designate which interstate long-distance carrier they wished to use without dialing an access code. Consumers failing to designate a specific carrier would be randomly assigned to a carrier, with the probability of receiving any particular carrier being equal to its market share. The equal access process was accompanied by massive advertising campaigns as well as attempts by organizations like Consumers Union to provide consumers with impartial information about various carriers (Gannes 1986; Gold 1985; "Long Distance Phoning..." 1986; Mier and Bush 1984; "Should You Make..." 1984).

Thus, choice of an interstate long-distance carrier provides a unique setting in which to study the consumer's propensity to change established patterns of decision making (although not necessarily the carrier ultimately chosen) in light of new options offered by industry deregulation. It includes the uncommon situation in which all consumers were forced to decide whether to make a formal decision (i.e., designate a carrier or opt for random assignment). This paper analyzes the different times at which consumers appeared to respond to the options presented in the deregulated long-distance telecommunications market.

PREVIOUS RESEARCH AND THEORY

The limited amount of research pertinent to the timing of interstate long-distance carrier choice falls into two categories: (1) consumer understanding of changes in the structure of the telecommunications industry, including the equal

access process; and (2) consumer choice of a long-distance carrier either prior to or at the time of equal access.

Two national and one statewide survey provide data on consumers' understanding of the breakup of AT&T and the equal access decision in particular. An August 1985 survey conducted by the Gallup Organization for the United States Telephone Association found that 49 percent of a representative national sample felt that they understood the Bell System breakup at least fairly well (Shriver 1985). In the same study, 62 percent of respondents indicated that they understood the choice of a long-distance carrier at least fairly well. The correlates of differences in consumer understanding were not reported.

A 1985 study of 499 Pennsylvania households provides additional insight into consumer awareness of the changing structure of the telecommunications industry (Hyman 1986; Hyman et al. 1986). At the time data were collected in April-June, only 47 percent of the respondents were able to identify correctly both their interstate long-distance carrier and their local telephone company. Of the several socio-demographic variables included in the study, only respondent education differentiated consumers with more and less knowledge.

In 1986, the Consumer Federation of America, the American Association of Retired Persons, and AT&T jointly sponsored a national study of 3,300 residential telephone customers. Data were collected in mid-1986 at which point 57% of respondents lived in areas that had been through the equal access process. In the total sample, 90 percent of consumers knew that more than one long-distance carrier existed. Of the respondents living in these areas, 86 percent recognized that their household had indeed been asked to choose a long-distance company, 89 percent of whom said they had designated a carrier rather than be randomly assigned to one. People with higher incomes and more education were more likely to know that residents of their area were being asked to select a carrier as part of the equal access process. However, socio-demographic differences by carrier chosen were not reported.

In sum, research indicates that consumers vary widely in their level of knowledge, with many consumers having little understanding of the new structure of the interstate long-distance market. It is likely that some minimum level of knowledge is necessary before a consumer will consider reacting to deregulation-induced choices. Thus, one can expect that many consumers would be reluctant to compare carriers before the encouragement provided by the equal access process.

In addition to consumer knowledge of industry structure and the equal access process, a number of studies have focused on consumer use of long-distance carriers prior to equal access. A

nationwide telephone poll of 1,462 adults conducted in late-1985 found that about three-quarters of respondents used AT&T for long-distance calls, with MCI and GTE-Sprint accounting for six and five percent of the market respectively (Kilman 1986). In some states, AT&T's dominance was even stronger. In Utah, for example, AT&T was the primary interstate long-distance carrier for 85 percent of the 810 households surveyed (Harrie 1985).

Using a consumer innovation model, Warren, Abercrombie and Berl (1987) compared adopters and nonadopters of alternative long-distance carriers in a southern metropolitan area prior to the equal access process. The researchers obtained their sample of adopters from the subscriber lists of two non-AT&T long-distance suppliers. These adopters were compared with a random sample of telephone subscribers, the vast majority of whom were AT&T customers. A discriminant analysis of the two groups revealed that adopters of alternative services were younger, had more education, were more likely to be a member of a dual income family, and had higher reported monthly long-distance bills than nonadopters. In addition, psychographic variables distinguished between the two groups, with adopters being more price conscious, more convenience prone, more community concerned, and more fashion conscious than nonadopters.

A survey sponsored by NBC News and the Wall Street Journal (NBC News 1986) supports the idea that choosing a non-AT&T carrier reflects an effort to select the carrier offering the best combination of price and quality. The study was conducted in August 1986, at which point the vast majority of American households had gone through the equal access process. Of the 1,565 respondents, 74 percent had either chosen or planned to choose AT&T. Asked to cite the most important influence on their choice, 50 percent mentioned familiarity with AT&T, with an additional 17 percent pointing to past experience as the most important influence. In response to a slightly different question, 47 percent of respondents said that quality of service was the most important factor for them in choosing a long-distance carrier; cost was a distant second with 25 percent, followed by convenience with 19 percent. Users of AT&T's competitors tended to be slightly younger, were more likely to earn more than \$50,000 a year, and were heavier users of long-distance service than AT&T's customers.

The studies of consumer choice suggest that people choose long-distance carriers to maximize economic returns (that is, achieve a particular combination of price and quality) and/or to experience the satisfactions of being a consumer innovator. Nevertheless, most studies stop with the presentation of bivariate results. In addition, virtually all analyses of long-distance carrier choice were conducted in the pre-equal access period, meaning that many consumers, perhaps the majority, had not yet consciously considered the new options available in the deregulated long-distance market.

From the point of view of analyzing the role of consumer behavior in deregulated markets, it may be more important to understand differing levels of consumer participation in choosing a long-distance carrier than to predict the particular carrier selected by different types of consumers. Accordingly, this analysis focuses on the factors that predispose consumers to respond quickly, slowly, or not at all to new choices induced by industry deregulation. We use a net benefits approach as a way of integrating the economic returns and consumer innovation perspectives on the timing of choice. This combined perspective should be able to explain why some consumers were willing to choose early among newly established carriers while other consumers were unwilling to designate a carrier even after massive publicity campaigns and a government-run equal access process.

In sum, the goal of the analysis that follows is to understand the nature of consumer response to deregulation in the interstate long-distance telephone market. It seeks to differentiate consumers, not so much by the carrier they selected, but by the timing of their choice. Consumers are grouped into three categories according to the timing of their choice of a long-distance carrier: (1) people who first chose a carrier prior to equal access, (2) people who first chose a carrier at the time of equal access, and (3) people who opted for random assignment at the end of the equal access, thereby further postponing any designation of a particular carrier. The underlying assumption is that the success of deregulatory policies depends on the extent to which consumers become actively engaged in decisions regarding new options.

METHODS

The purpose of the data analysis was to differentiate consumers in terms of the timing of their choice of an interstate long-distance telephone carrier. The precise analytical strategy adopted was strongly influenced by the nature of the data available. The data were taken from three waves of an omnibus statewide panel study of households in a western state. The primary goal of the telecommunications portion of the survey was to collect data relevant to local and state-level telephone service (Hinton 1986; deleted for anonymity 1986). A few questions regarding interstate long-distance service were added to the survey in exchange for the authors assisting state officials in data analysis. As a result, the operationalization of the concepts pertaining to interstate long-distance choice is limited by the extent and quality of data available.

Sample

The first wave of the statewide household panel was conducted in July and August of 1985, shortly before the equal access process was to begin in selected areas of the state. The final sample of 810 adults represents a cooperation rate of 73.6

percent and is a random statewide sample. Data were collected using a computer-assisted telephone survey method.

The second wave was carried out in December 1985. Of the original panel participants, 698 (or 86.2%) were reinterviewed. To balance panel attrition, 195 randomly selected households were added to the panel. For the sample as a whole, 35.1% of the panel respondents reported having gone through the process of selecting a carrier or being randomly assigned to one at the time of the second wave.

The third wave of data collection took place in May 1987, approximately six months after the completion of the equal access process. Of the original 810 respondents, 565 were reinterviewed. The data analysis presented here is based only on these respondents, minus those for whom data on any variable was missing. The extent to which this final sample has unusual characteristics (for example, high levels of interest in telecommunications issues) is not known, but it does not differ significantly from the original, random sample in terms of the age, education, and sex of the respondent or the geographic location or income of the household.

Measures

The dependent measures in the analysis that follows are based on responses to the same question asked before and after the equal access period: What company serves as your primary long-distance carrier for calls outside of the state? In addition, third wave respondents were asked whether they (or someone else in the household) had selected a company or had been assigned to an interstate long-distance carrier. Given the size of AT&T's market share in the state (84.5% at the time of the first wave and 75.2% at the time of the third) and the small market shares of each of its competitors, all non-AT&T carriers were combined into a single group for the purpose of our analysis.

From first and third wave data on a respondent's primary long-distance carrier (i.e., pre- and post-equal access), a dependent measure was constructed to reflect the net benefit

⁵ Because the omnibus survey combined the interests of several different clients, respondents were randomly selected from among each household's members eighteen years old and above. As a result, the person chosen to answer the survey questions regarding telecommunications issues was not necessarily the person in the household who was most knowledgeable or most responsible for the household's telecommunications decisions (except in the case of single-person households). This method of respondent selection may create noise but not bias in the telecommunications results and as such exerts a conservative influence on the establishment of relationships among variables.

perspective based on information regarding the timing of any long-distance carrier designation. Respondents were divided into those who selected (1) a non-AT&T carrier prior to equal access, (2) either AT&T or a non-AT&T carrier but only at the time of equal access, and (3) random assignment at the end of equal access.

The independent measures consist of a variety of economic, sociodemographic, and attitudinal variables. All of the independent measures were taken from the first two of the three waves of data collection, thereby minimizing problems of causality based on unclear time orderings. The discussion of the independent variables is divided into those pertaining to the expected benefits and expected costs of choosing a carrier early.

Economic Returns

The higher a household's monthly bill for interstate long-distance calls, the more they stand to gain from early selection of a non-AT&T carrier. This is because price dispersion was high and quality of voice transmission differences were minimal in the period prior to equal access (Mier and Bush 1984; "Should You Make..." 1984). Similarly, at the time of equal access, heavier users of long-distance service had more reason than light users to designate the carrier they believed offered the best combination of price and quality. Accordingly, at the time of the first interview, respondents were asked to estimate the size of their most recent long-distance bill.

Controlling for the size of a household's monthly long-distance bill, household income should be negatively related to the perceived benefits of early selection. That is, households with relatively low incomes should be more motivated by the opportunity to save money on their long-distance bills (or improve the quality of their service) than more affluent households.

⁶ A basic assumption in this coding scheme is that only those people who chose a non-AT&T carrier in the period prior to equal access consciously chose their carrier. In reality, there were probably people who considered changing to a non-AT&T carrier prior to equal access but decided not to. Unfortunately, the data available do not allow us to identify how many households fall into this group. At the time of equal access, one can separate those households that preferred AT&T to alternative carriers. By virtue of our emphasis on the timing of choice, one would expect that equal access choosers of a non-AT&T carrier would more closely resemble equal access choosers of AT&T than those who chose a non-AT&T carrier before equal access. This turned out to be empirically supported (see footnote 9).

Given a particular level of household income and monthly spending on long-distance calls, some people are more price sensitive than others. Beginning with the introduction of non-AT&T carriers and continuing through the equal access period, the primary basis upon which non-AT&T carriers promoted themselves was price. These carriers claimed that they offered service equal in quality to AT&T's but at a lower price. (In fact, some non-AT&T carriers leased AT&T lines.) Therefore, price sensitive consumers had more to gain from search than did quality sensitive customers. Price versus quality sensitivity was measured with a question that asked respondents to indicate the single factor that would be most likely to make a person switch long-distance carriers. Although responses were open-ended, virtually all answers could be collapsed into either price or quality factors.

The expected benefits of early selection are also increased when a respondent perceives a high degree of price and quality variation in the marketplace. Quality variation was measured with a four-point ordinal scale, which was collapsed into a two-category dummy variable. A measure of perceived price variation was originally intended based on asking respondents to estimate the exact cost of a given number of calls using the most expensive carrier in their area if the same number of calls cost \$25 using the least expensive carrier. Despite pretesting the measure, a third of all respondents in the final sample said that they could not make such an estimate. Rather than eliminate a third of the sample from analysis or impute the mean estimate to such a large portion of the sample, a dummy variable was constructed reflecting simply whether a respondent could offer an estimate. One might assume that respondents who were able to make a price variation estimate were more likely to perceive a relatively high degree of price dispersion. An alternative interpretation of this measure is as an indicator of price sensitivity or perhaps knowledge of marketplace conditions.

In addition, since all customers in the sample began with AT&T as their interstate carrier, perceptions of AT&T's price and quality should also affect the perceived benefits of early selection. If AT&T is perceived as offering the highest quality and/or least expensive service, the incentive to gamble on a non-AT&T carrier or random assignment is lessened. These perceptions were measured based on questions that asked respondents to name the carrier with the highest prices, lowest prices, and "best combination of services including such things as line quality, customer relations, and billing options."

⁷ Given the coding of the dependent variable, we are forced to ignore the differences in perceptions of AT&T's relative price and quality between those who chose AT&T and those who chose a non-AT&T carrier at the time of equal access.

Several factors can be expected to affect the costs rather than the benefits of early choice. One such factor is a person's level of educational attainment. If education facilitates the acquisition and processing of information, then education should reduce the costs of early choice.

A second characteristic that bears on the expected costs of early choice is a person's area of residence. Because urban markets are more lucrative to interstate long-distance carriers than rural ones, promotional campaigns for subscribers were primarily waged in urban areas. For instance, urban newspapers were more likely to carry advertisements for the competing carriers than rural papers. As a result, the cost of obtaining information in urban areas was lower than that in rural areas. In addition, non-AT&T carriers had a longer history of service in urban areas than in rural ones, making it more likely that urban consumers would be familiar with them before the equal access process. As defined in this study, households were considered urban if they were located within one of the State's three standard metropolitan areas. All respondents living outside of this area were coded as non-urban.

A final potential influence on the costs of early selection is the value of a person's time. The more precious a person's time is, the higher are the costs of spending it searching out information and weighing alternatives. In this study, the value of an individual's time was approximated by a person's predicted wage rate. Predicted rather than actual wage rates were used because actual wage data were, by definition, not available for respondents who were not employed at the time of the survey. The predicted wage rates were computed in accordance with standard wage determination techniques used in labor economics (Ben Porath 1970).

⁸The predicted wage rates were generated in two steps. First, separate male and female wage rate regressions were estimated using only the data from employed respondents in the sample. The dependent variable was the respondent's actual wage rate, typically calculated by dividing their weekly salary by the number of hours they worked. The independent variables in these two regressions were the respondent's education, age, age squared, and a dummy variable that measured whether or not the respondent resided in an urban area. Second, the coefficients from the estimated equations along with each respondent's values on education, age, and area of residence were used to generate a predicted wage rate for each respondent. For individuals who choose not to be employed in the marketplace the ideal measure of the opportunity cost of their time is called the "shadow wage," and its computation requires types of data not collected in this survey (e.g., measures of an individual's productivity in nonmarket activities). The predicted wage rates used here provide a lower bound estimate of the true value of a person's time (Zick and Bryant, 1983).

In literature on the diffusion of innovations, the three variables that most consistently predict early adoption are knowledge, education, and income. Knowledge is a prerequisite for adoption and was measured in this study by asking respondents during the first wave of data collection (i.e., before equal access) to name, in an unaided fashion, as many interstate long-distance carriers as they could. The number of carriers named was used directly as a measure of knowledge.

A person's level of education also encourages early adoption, even beyond its influence on knowledge. Education appears to make people more interested in new things as well as less threatened by them. Similarly, income appears to encourage innovation if for no other reason than it reduces the relative financial risk of being an early adopter. Note that the direction of the relationship between income and timing of choice based on an innovation perspective is the opposite of that based on the an economic returns perspective. Therefore, the sign of the coefficient associated with this variable cannot be unambiguously predicted.

RESULTS

All of the independent variables described above were included in a multinomial logit equation (Maddala 1983) in which the dependent variable takes on three values: choosing a non-AT&T carrier prior to the equal access process, selecting either AT&T or a non-AT&T carrier only at the time of equal access, and opting for random assignment. Descriptive statistics for the variables used in estimating the three types of consumer response to the choice of an interstate long-distance carrier appear in Table 1.

Table 2 presents the results of multinomial logit estimation. The Chi-square score measures the overall goodness-of-fit of the equation. More important is the pattern of relationships (and non-relationships) for individual variables. There is a striking absence of relationships between consumer response to the opportunity to choose a carrier and the more narrowly construed economic variables such as income, wage rate, and monthly bill amount. Of the demographic variables, only area of residence was related to consumer response, with urban respondents being least likely to opt for random assignment.

⁹A second multinomial logit equation was estimated in which people who chose AT&T at the time of equal access were separated from those who chose a non-AT&T carrier at the time of equal access. The equation based on this four-way division of the dependent variable was not significantly different from the equation based on the three-way classification presented in the text. The results of the four-way specification are available upon request.

TABLE 1. Descriptive Statistics: Means and Standard Deviations

Variable	Full Sample		Sub-Samples					
	X	S.D.	Early Choosers		Equal Access Choosers		Random Assignment	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
EDUCATION (yrs)	13.8	2.19	13.9	2.06	13.8	2.13	13.6	2.19
URBAN (1=yes; 0=no)	.725	.447	.789	.411	.765	.425	.528	.501
INCOME (1000's \$)	27.4	13.6	28.5	14.1	27.2	14.5	26.9	12.8
WAGE (\$/hr)	9.42	3.54	10.1	3.79	9.57	3.56	9.10	3.31
L-D BILL (\$/mo)	26.1	49.4	29.0	22.7	29.0	55.1	25.3	35.6
COMPANIES NAMED (actual #)	3.75	1.19	5.24	.948	4.23	1.32	3.50	.997
QUALITY VARIES (1=yes; 0=no)	.427	.500	.493	.504	.453	.499	.384	.488
ATT BEST (1=yes; 0=no)	.592	.492	.437	.500	.520	.501	.512	.502
ATT HIGH ^a (1=yes; 0=no)	.459	.500	.620	.490	.503	.501	.424	.500
ATT MEDIUM ^a (1=yes; 0=no)	.429	.496	.366	.485	.430	.500	.448	.499
PRICE RANGE ESTIMATE (1=yes; 0=no)	.685	.465	.817	.390	.709	.455	.648	.480
PRICE SENSITIVE (1=yes; 0=no)	.603	.500	.732	.466	.637	.482	.704	.458
SAMPLE SIZE	465		71		179		125	

^a The omitted category in this sequence of dummy variables is composed of those respondents who said AT&T was the least expensive company.

TABLE 2. Multinomial Logit Estimates of Long-Distance Carrier Choice with Three-Category Dependent Variable (Random Assignment is the Comparison Group) Based on a Net Benefit Perspective (t-statistics in parentheses)

Independent Variables:	Dependent Variables:	
	Early Choosers/ Random Assign	Equal Access/ Random Assign
EDUCATION	0.0083 (0.11)	0.024 (0.31)
URBAN	1.1** (4.1)	1.5** (5.0)
INCOME	-0.0068 (-0.67)	-0.0028 (-0.27)
WAGE	0.016 (0.34)	-0.0083 (-0.17)
L-D BILL	0.00086 (0.29)	0.0014 (0.43)
COMPANIES NAMED	0.59** (5.0)	0.0046 (0.038)
QUALITY VARIES	0.22 (0.83)	0.18 (0.68)
ATT BEST	0.19 (0.70)	1.1** (3.8)
ATT HIGH	0.51 (1.1)	-0.30 (-0.73)
ATT MEDIUM	0.52 (1.15)	-0.059 (-0.059)
PRICE RANGE EST.	0.55 (0.20)	-0.054 (-0.194)
PRICE SENSITIVE	-0.26 (-0.96)	-0.71** (-2.6)
CONSTANT	-3.2** (-3.0)	-1.3 (-1.2)

$\chi^2 = 118$ (d.f. = 24, p \$.001)

The variables based on consumer knowledge and perceptions fared slightly better. Not surprisingly perhaps, the more long-distance companies a respondent could name in the first interview, the more likely he/she was to be a pre-equal access selector of a long-distance carrier relative to the other two categories. However, this measure of knowledge did not distinguish between people who waited to designate a carrier (AT&T or non-AT&T) until the time of equal access from those who selected random assignment.

The opinion that AT&T provides the best combination of services distinguished people who first chose a carrier at the time of equal access from both those who chose early and those who opted for random assignment. Similarly, quality-sensitive respondents were more likely than price-sensitive ones to designate a carrier at equal access rather than pick one early or be randomly assigned to one. This suggests that price considerations drove early choosers while quality considerations drove choices at the time of equal access.

CONCLUSIONS

In typical studies of innovation, the focus is on the diffusion through a society of a particular brand or new product category. The situation analyzed here is slightly different. The innovation involved in the case of interstate long-distance service was not so much the availability of cheaper and/or better service but the ability, for the first time, to choose among carriers. Thus, the innovation was adopted when a household deliberately selected from among competing long-distance carriers.

What can be said about the speed of diffusion of the innovation of carrier selection? For several years before the first wave of data collection occurred, the ability to choose a non-AT&T carrier gradually expanded throughout the United States and within the state studied. Yet, at the time of the first interview, only 15.3% of the respondents had selected a non-AT&T carrier (plus some unknown percentage who considered changing carriers but decided to stay with AT&T). Even after the media barrage attendant to equal access, and given the simplicity of designating a carrier at that time, 26.9% of the sample were still non-choosers.

There do not appear to be substantial differences among households in terms of the propensity to choose a long-distance carrier early. Early choosers were distinguished by their knowledge of available carriers and by their urban residence. The latter finding is not surprising given that non-AT&T interstate carriers were first available in the state's cities and then gradually introduced to rural areas. The role of knowledge is less clear, especially given that the estimation holds constant a respondent's area of residence. Nor can knowledgeability be attributed to narrowly defined economic considerations, since

income and monthly bill amount were controlled for in the analysis. To some extent, early use of non-AT&T carriers (i.e., before the first wave of data collection) may have influenced knowledge levels, but it is also possible that knowledge serves as a measure of interest in the broader subject of telecommunications.

Whereas relatively objective variables (with the exception of urban versus rural residence) failed to discriminate among all classes of respondents, a few of the perception variables distinguished between people choosing at the time of equal access rather than be randomly assigned. Respondents who selected a carrier at the time of equal access were more likely to identify AT&T as the best in terms of service quality and to be quality sensitive than people who opted for random assignment. This pattern of results suggests that, regardless of the motivations of early choosers, quality considerations drove consumers to choose a carrier at the time of equal access.

In terms of public policy, the results of this study raise several important questions. The relatively slow diffusion of new decision making patterns could be attributable to consumers correctly perceiving that the pre-deregulation market served them well and that deregulation was not going to improve things. Or, did consumers fail to respond quickly to the opportunities afforded by deregulation because of their own inertia and ignorance? An essential premise of deregulating the telecommunications market was that competition would be spurred by the response of rational, knowledgeable consumers in the residential and business sectors. For many consumers, the choice of a long-distance carrier does not appear to be highly involving. As a result, they are unlikely to incur the financial, time, and psychic costs of acquiring and processing information. The minority of consumers who are highly involved in telecommunications decisions may be sufficient to discipline the marketplace, but if not, the full benefits of deregulation will not be forthcoming.

If consumers indeed failed to do their part, what might be the reason, and what might be done differently in other deregulated markets? Many consumers claimed that choosing a long-distance carrier was too much hassle in light of the few dollars per month that might be saved. But consumers often expend a great deal of energy to save a lot less. In the case of long-distance choice, consumers may have been dissuaded by a lack of impartial, practical information. The advertising campaigns of the various long-distance companies relied heavily on puffery and contained very little usable information. What consumers really needed was comparative information on rates and services. Deregulating an industry does not mean that government can simply bow out of the marketplace. Instead, the government's role may need to change--from direct regulator of business behavior to aggressive provider of consumer information. Government

officials are waking up to this fact in the cases of the airline and banking industries, but it may be too late for the telecommunications industry.

REFERENCES

- Ben Porath, Yoram (1970). "The Production of Human Capital over Time," in Education, Income and Human Capital, vol. 35, W.L. Hansen, ed., Boston: National Bureau of Economic Research.
- Consumer Federation of America, American Association of Retired Persons, and AT&T (1987), "Joint Telecommunications Project," handout from presentation at the Consumer Assembly of the Consumer Federation of America, Washington, D.C., February 12.
- Gannes, Stuart (1986), "The Phone Fight's Frenzied Finale," Fortune, (April 14), 41-44.
- Gold, Howard (1985), "The Great Telephone Election," Forbes (November, 18), 183-90.
- Harrie, Dan (1985), "Most Long-Distance Callers Staying with AT&T," Deseret News, p.22D.
- Hinton, Gary B. (1986), "The Use of Public Opinion Surveys in the State Regulation of Telecommunications Services," paper presented at the Fifth Biennial Regulatory Information Conference, National Regulatory Research Institute, The Ohio State University, September 3-5.
- Hyman, Drew (1986), "Prosuming, Participation, Consumer Education and the Deregulation of Telecommunications," Journal of Voluntary Action Research, 15 (September), 7-23.
- Hyman, Drew, Laura Campbell, Jennifer Mastroski, Michael Wadsworth, Wayne Williams (1986), Telecommunications and Consumer Education: An Analysis of Consumer Attitudes, Practices, and Beliefs. University Park, PA: The Pennsylvania State University, CSIS Project, S-203 Human Development.
- Kilman, Lawrence (1986), "Poll Says Phone Service Same as Before AT&T Breakup," Salt Lake Tribune, January 3, p.A1.
- "Long Distance Phoning: Time to Get Fickle" (1986), Consumer Reports, 51 (May), 302-4.
- Maddala, G.S. (1983). Limited-Dependent and Qualitative Variables in Econometrics, Cambridge, England: Cambridge University Press.
- Mier, Edwin E. and John Bush (1984), "Rating the Long-Distance Carriers," Data Communications (August), 103-14.
- NBC News (1986), "Poll Results," press release #119 (August 26), 11-2.
- Porter, Thomas C., Robert A. Swerdlow, and William A. Staples (1979), "Who Uses Bank Debit Cards," Business Horizons, 22 (February), 75-83

Schwadel, Francine (1986), "Calling Long Distance: User Vote Shows Strong Support for AT&T But Phone Marketing War Continues, With Emphasis Now on Quality, Service," Wall Street Journal (August 22), 19.

"Should You Make the Break from AT&T?" (1984), Consumer Reports, 49 (September), 493-7.

Shriver, James III (1985), "Telephone Consumers: Has Divestiture Made a Difference?" IEEE Communications Magazine, 23 (December), 68-9.

Warren, William E., C.L. Abercrombie, and Robert L. Berl (1987), "Characteristics of Adopters and Nonadopters of Alternative Residential Long-Distance Telephone Services," Advances in Consumer Research, XV, ed., in press.

Zick, Cathleen D. and W. Keith Bryant (1983), "Alternative Strategies for Pricing Home Work Time," Home Economics Research Journal, 12 (December), 133-144.

CONSUMERS AND WELFARE LOSSES FROM MILK MARKETING ORDERS

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ABSTRACT

Federal milk marketing orders establish minimum prices for 80 percent of the Grade A milk sold in the U.S. The purpose of this study was to measure the consumer and welfare losses from milk marketing orders in 1985. Losses were based on the changes in prices and quantities when milk marketing orders replaced a competitive system.

The results indicated that consumers paid higher prices for fluid milk and lower prices for manufactured milk products than they would under a competitive system. The net loss in consumer surplus ranged from \$513 million to \$851 million while the absolute welfare loss ranged from \$343 million to \$626 million. The relative welfare loss ranged from 0.47 to 1.55. Finally, it was found that reconstituted milk policies would result in increased efficiencies in the milk marketing system and have many of the same effects as replacing milk marketing orders with a competitive system.

INTRODUCTION

Milk marketing has been highly regulated since the passage of the Agricultural Act of 1937. Grade A milk is priced according to its use and a higher price is charged for grade A milk used in fluid products than for grade A milk used for manufactured milk products. Individual prices are set for various regions of the United States. The regulations that set prices for specific regions are called milk marketing orders. They establish minimum prices for 80 percent of the grade A milk sold in the United States and also establish the methods by which farmers are reimbursed for grade A milk. Farmers receive a "blend price" which is a weighted average of prices paid for different classes of milk in their region.

The milk marketing system is further restricted by policies for reconstituted milk. Although the technology for reconstituting milk has been available since the 1950's, reconstituted milk is only used in a few areas because of USDA policies which make it more expensive than fresh milk.

The purpose of this study was to measure the consumer and welfare losses from milk marketing

orders in 1985. In addition, the effect of changing reconstituted milk policies was examined. The results of this study should be of use to consumer educators and consumer policy analysts who are concerned with the impact of regulation on consumers and the economy as a whole.

BACKGROUND: MILK MARKETING ORDERS

A federal milk order is a regulation promulgated by the Secretary of Agriculture, published in the Federal Register and codified in the Code of Regulations. It defines a particular geographic region which is to be subject to government regulation (MacAvoy 1977, p. 2).

Milk marketing orders only apply to grade A milk. Grade A milk is that milk which meets local sanitary and health requirements so that it may be used for fluid consumption. Ungraded or grade B milk is that milk which is not subject to local health regulations and can only be used in the production of manufactured milk products. Grade A milk which is produced in excess of fluid milk requirements can also be used in the production of manufactured milk products. Approximately 85 percent of all milk produced is grade A and of this only 45 percent is used for fresh fluid milk products. The remainder is diverted into manufactured uses (USDA 1984, p. 24).

In markets where producers (farmers) have chosen to be covered by Federal orders, milk marketing orders establish the minimum prices that handlers must pay for raw grade A milk and the prices that are received by the producers of milk. Milk handlers pay classified prices which are determined by the use (class) to which the handler ultimately puts the milk. Milk marketing orders may have two or three classes of milk established. Class 1 milk products include fluid forms such as fresh whole milk, skim milk and buttermilk. Class 2 products include soft manufactured products such as sour cream and cottage cheese. Class 3 products are the more solid manufactured products such as cheese, butter and milk powders.

Dairy farmers are not reimbursed at the classified (market order) prices. Farmers receive a single weighted average called a blend price. All of the income received in an order is "pooled" and all farmers receive the same unit price for deliveries. Thus if 60 percent of the total milk sold by the cooperative is used for Class 1 purposes and 40 percent is used for Class 2 purposes, each farmer would receive a unit price equivalent to 60 percent of the Class 1 price

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