Who Wears the Pants in the Family: Power Distribution in Family Consumption.

Selected Paper, AAEA Summer Meetings July-August 2000

David Just
Graduate Researcher
Department of Agricultural and Resource Economics
University of California
Berkeley, CA 94720-3310
just@are.berkeley.edu

Amir Heiman
Assistant Professor
Department of Agricultural Economics
Hebrew University
Rehovot Israel

David Zilberman
Professor
Department of Agricultural and Resource Economics
University of California
Berkeley, CA 94720-3310

Abstract

This paper combines the Becker family production model with a cooperative bargaining model to analyze power distribution within the family. Family consumption decisions are often made by one person, but for several people, suggesting traditional decision theory is inadequate. Using data gathered in Israel, we show the significance of family relationships in purchasing behavior.

Subject Codes: 4, 6

Please direct correspondence to David Just.

Who Wears the Pants in the Family: Power Distribution in Family Consumption.

Traditional demand theory emphasizes the role of prices and income in determining consumption of a product. Michael and Becker [7] criticized demand theory as placing too little weight on preferences, time, and effort required to use products. They proposed a model of family consumption based on a family production function, and utility function. However, a family usually involves several people with heterogeneous preferences, which raises the question: how do individual preferences within the family influence family purchases. Do individuals purchasing for a family make decisions biased toward their own preferences? Or, is there evidence that these purchases are a result of power struggles within the family?

Manser and Brown [5] and McElroy and Horney [6] proposed cooperative models to explain household resource allocation decisions. These models were based on the idea that noncooperation would result in divorce. More recently Lundberg and Pollak [4] based their model on the possibility of noncooperation within a marriage not resulting in divorce. The model I construct allows all members of the family to influence decisions affecting resource allocation. More importantly my approach allows for direct estimation of each individuals power within the family. Further, this approach allows for childrens' power to differ across parents. Thomas [8] found that mothers' income tended to favor children more than fathers' income. This study emphasizes the importance of the decision-maker within the family. The analysis further demonstrates that traditional demand theory is inadequate as a model of family consumption. Given the volume and percentage of purchases made within a family or other group setting, particularly in agricultural consumption, it is very worthwhile to explore the differences between individual and group purchasing decisions.

To address these issues a survey was conducted of 407 households in Israel. The survey includes data on preferences of each family member over meat products, percent of meals in which each product is used, which family member regularly makes food purchases and the enjoyment received from cooking. The survey also included demographic data such as income level and religious status. These data provide the information necessary for estimation of family members' relative power within the family.

Using these data, family purchasing is modeled as a cooperative game by combining components of Becker's model of family consumption and a bargaining model similar to Zusman's [9]. Specifically this approach allows the one who is making decisions for the family to be affected by others' power and influence. The advantage of this approach is that it allows for estimation of the strengths of influence of each family member, and testing whose preferences are best represented by purchases made for the whole family.

I find, as did Thomas [8], that there are strong differences between power relationships in families where the husband is shopping and families where the wife is shopping. The husband tends to have more power over purchasing decisions when shopping than otherwise. I find that fathers tend to favor the smaller children when shopping, while mothers tend to favor the older children. These results show that social factors play an important role in determining family consumption decisions. Sociological principles are understood and utilized by advertisers, but as of yet not well understood in economic theory.

1 The Model

I begin by considering a family of K members. Member c does all of the cooking, and member s does all of the shopping. Note that it is possible for c to equal s. I can then specify each individuals utility of food consumption as:

$$v_k(y), \qquad \text{for } k \neq c$$

$$v_c(y,t), \tag{1}$$

where y is a vector of meals, and t is the time used to prepare the meals in vector y. This model assumes that the decision as to who is shopping is predetermined and shopping requires the same amount of time no matter which meats are purchased. According to the Becker model, the family uses income to buy goods like meats and then combines these goods with time to produce commodities, or in this case meals. Thus the family production function for each meal can be specified as

$$y = f(x, t),$$

where x is the vector of goods, and t is a vector of time used in production of each meal. For simplicity I will assume that family production is additively separable in inputs, and one and only one meal can be produced from each meat, so

$$y = y(y_1, \ldots, y_M)$$

where

$$\begin{aligned} y^1 &= f_1(x^1, t^1) \\ y^2 &= f_2(x^2, t^2) \\ \vdots & \qquad \vdots \\ y^M &= f_M\left(x^M, t^M\right) \\ t &= \left(t^1, \ldots, t^M\right). \end{aligned}$$

where M is the number of meals that are possible to make. Thus, within the framework of the Becker family production model, the family must solve the problem

$$\max_{x,t} U(f(x,t), t_0) \qquad \text{subject to} \qquad \sum_{m=1}^{M} [(P^m x^m) + wt^m] + wt_0 = I + wT, \quad (2)$$

where U, is the family utility function, P^m is the price of the mth good, x^m is the amount of the mth good used, M is the number of goods available, w is the wage rate where I assume only one uniform wage rate for each member of the family, t_0 is the amount of time used in leisure, and t^m is the amount of time used to produce y^m, I is the endowment of income, and T is the endowment of time.

This leaves the question of how to formulate the function U. Zusman [9] used cooperative game theory to model decisions made by a single agent but influenced by others' actions. In this case the shopper is the single decision-maker who may be affected by others threats of noncooperation in other aspects of life. This might be a spouse withholding affection or money from the other members of the family. It may also be a child who refuses to eat or who causes problems for the family in other ways. It could also be that the shopper buys food to win the affection of his or her spouse. Although no explicit assumptions are neccessary regarding noncooperative equilibria, it seems unlikely that poor food shopping decisions would result in divorce. By using Zusman's model, a coefficient of power can be estimated for each family member. Applying Zusman's model utility can be represented as

$$U\left(y\left(t\right), t_0\right) = \sum_{k=1}^{K} \beta_k v_k \tag{3}$$

where β_k is the influence the kth member of the family has over member s, and v_k is individual k's utility function over meat consumption and time as defined earlier in (1). Substituting equation (3) into (2) and stating the problem as a

LaGrangian

$$L = \sum_{k=1}^{K} \beta_k v_k + \lambda \left[I + wT - \sum_{m=1}^{M} [(P^m x^m) + wt^m] - wt_0 \right]. \qquad (4)$$

Differentiating (4) obtains the first order conditions for the constrained maximum:

$$\frac{\partial L}{\partial x^m} = \sum_{k=1}^{K} \beta_k \frac{\partial v_k}{\partial y^m} \frac{\partial y^m}{\partial x^m} - \lambda P^m = 0, \qquad \text{for } m = 1, \ldots, M \qquad (5)$$

$$\frac{\partial L}{\partial t^m} = \sum_{k=1}^{K} \left(\beta_k \frac{\partial v_k}{\partial y^m} \frac{\partial y^m}{\partial t^m} \right) + \beta_c \frac{\partial v_c}{\partial t^m} - \lambda w = 0, \qquad \text{for } m = 1, \ldots, M \qquad (6)$$

$$\frac{\partial L}{\partial t_0} = \beta_c \frac{\partial v_c}{\partial t_0} - \lambda w = 0 \qquad (7)$$

$$\frac{\partial L}{\partial \lambda} = I + wT - \sum_{m=1}^{M} [(P^m x^m) + wt^m] - wt_0 = 0 \qquad (8)$$

Combining equations (6) and (7) above yields

$$\sum_{k=1}^{K} \left(\beta_k \frac{\partial v_k}{\partial y^m} \frac{\partial y^m}{\partial t^m} \right) + \beta_c \frac{\partial v_c}{\partial t^m} = \beta_c \frac{\partial v_c}{\partial t_0}. \qquad (9)$$

This requires that marginal benefit from time used by the cook in meeting family agreements must equal marginal benefit from increased leisure time. Combining equations (5) and (7) obtains

$$\sum_{k=1}^{K} \left(\frac{\beta_k}{P^m} \frac{\partial v_c}{\partial y^m} \frac{\partial y^m}{\partial x^m} \right) - \frac{\beta_c}{w} \frac{\partial v_c}{\partial t_0} = 0 \qquad \forall j. \qquad (10)$$

Combining (9) and (10) and rearranging obtains

$$\frac{\sum_{k=1}^{K} \left[\beta_k \frac{\partial v_k}{\partial y^m} \left(\frac{w}{P^m} \frac{\partial y^m}{\partial x^m} - \frac{\partial y^m}{\partial t^m} \right) \right]}{\beta_c \frac{\partial v_c}{\partial t^m}} = 1 \qquad (11)$$

In order to make these conditions useful for estimation, some assumptions are required. I make the following simplifying assumptions:

1. Individual's preferences can be represented as

$$v_k(x) = \sum_{m=1}^{M} \alpha_m^k \log(x^m - \nu^m), \qquad \text{for } k \neq c \tag{12}$$

$$v_c(x,t) = \alpha_c^c \log\left(\sum_{m=1}^{M} t^m\right) + \alpha_0^c \log t_0 + \sum_{m=1}^{M} \alpha_m^c \log(x^m - \nu^m). \tag{13}$$

where ν^m is a parameter common to all in a family.

2. Time required to produce one unit of any particular meal is fixed.

3. Each meal requires exactly identical amounts of meat (no matter which meat).

Assumption 3 requires that $\frac{\partial y^m}{\partial x^m} = \gamma$. Assumption 2 requires that $\frac{\partial y^m}{\partial t^m} = \xi_m$. These assumptions allow me to rewrite (8) and (11) as

$$I + wT - \sum_{m=1}^{M}(P^m x^m + wt^m) - wt_0 = 0 \tag{14}$$

$$\frac{\sum_{k=1}^{K}\left[\beta_k \frac{\partial v_k}{\partial y^m}\left(\frac{w}{P^m}\gamma - \xi_m\right)\right]}{\beta_c \frac{\partial v_c}{\partial t_j}} = 1 \tag{15}$$

Assumption 1 implies preferences are of a modified Stone-Geary form. The parameter ν^m allows family members to experience positive utility despite not consuming one of the meats. Substituting the functional form in Assumption 1 back into equations (14) and (15) yields

$$I + wT - \sum_{m=1}^{M}(P^m x^m + wt^m) - wt_0 = 0 \tag{16}$$

$$\frac{\sum_{k=1}^{K}\left[\beta_k \frac{\alpha_m^k}{x^m - \nu^m}\left(\frac{w}{P^m}\gamma - \xi_m\right)\right]}{\beta_c \frac{\alpha_c^c}{\sum_{m=1}^{M} t^m}} = 1 \tag{17}$$

Equation (17) can be rearranged to yield the demand equation

$$x^m = \nu^m + \frac{\sum_{k=1}^{K}\left[\beta_k \alpha_m^k \left(\frac{w}{P^m}\gamma - \xi_m\right)\right]}{\beta_c \frac{\alpha_c^c}{\sum_{m=1}^{M} t^m}} \tag{18}$$

which will be the object of my estimation.

2 Data and Estimation

The data was collected in a survey of 407 households in Israel. Survey households were chosen and interviewed face to face. The response rate was high (93%), and demographics of respondents (sex, religion, and income) is quite representative of Israel's shoppers as a whole. The survey itself took 12 to 18 minutes to complete. For each family, the member of the household who did more of the shopping was interviewed about several factors influencing meat purchases. Among these factors are number of family members, each members' preference for each meat, income level, the cooks preference for cooking, time used in cooking, and leisure. Families were also asked about the age of each child.

In order to measure consumption of each meat, respondents were asked about the number of meals they eat each week including (unprocessed) chicken, (unprocessed) turkey, processed chicken, processed turkey, beef, and ready-to-eat meals. Table 1 contains summary statistics for shares of each meat calculated from the frequencies for each family. I present shares here because they are easier to interpret than actual consumption. In estimation I used the recorded frequency of each meat for each family.

Table 1: **Summary Statistics for Shares of Meat Consumed**

Meat	Mean	Standard Deviation	Minimum	Maximum	Observations
Chicken	.2913	.1562	.0000	1.0000	407
Turkey	.1219	.1131	.0000	.5000	407
Processed Chicken	.1936	.1155	.0000	.5714	407
Processed Turkey	.1140	.1002	.0000	.5000	407
Beef	.1586	.1190	.0000	1.0000	407
Ready-to-eat	.0583	.0863	.0000	.4000	407

The shoppers were asked about the preferences of each member of the family over the meats. Because only the shopper was surveyed, it may be that other family members preferences are not well represented in our survey results. However, these survey results should represent the shopper's perception of preferences, which is more important when measuring the power relationship between the shopper and each family member. These are the preferences the shopper uses when deciding what to buy to satisfy any compromises or agreements (stated or unstated) within the family. Children were broken into three groups by age in years: under 10, 10 to 14, and 15 to 19. For each member, each meat was ranked on a scale from 0 to 5, 5 representing a preference for the meat, and 0 representing a dislike of the food. If more than one child was included in a category, then preferences were to represent an average of the childrens' preferences. If no children were included in a category a zero was recorded. Both of these conventions of the survey may cause some degree of measurement error.

A share of preference was calculated for each individual for each meat by dividing that individuals rank for meat m by the sum of that individuals rank over all meats, this share was then weighted in the following way

$$\alpha_n^k = \frac{a_n^k}{\left(\sum_{m=1}^{M} \left(a_m^k - \overline{a}^k\right)^2\right)^{\frac{1}{2}}}$$

where a_n^k is person k's calculated share of preference for meat n, and $\overline{a}^k$ is person k's average preference share over all meats. This transformation constrains all individuals preferences to have the same standard deviation. In this way interpretation of the survey scale will not be a factor in determining significance of an individual's influence. In the case of a missing individual α_m^k was again set to zero. Table 2 displays summary statistics for each family members' preferences.

Data was also collected on income level of families. Of those who responded, 151 respondents said their families' income was above average, 152 had average income, and 98 had below average income.

All observations were used to estimate the demand system in (18) and (16). Each respondent was asked to rank their cook's enjoyment of cooking. I set $\alpha_c^c = 1/b$, where b is the cooks enjoyment of cooking on a scale of 1 to 5, 5 being interpreted as hating to cook. Income is used as a proxy for w. Respondents were asked the number of hours spent cooking each week. Because respondents were not asked quantitatively how much time was alotted to leisure and other chores,

Table 2: **Summary Statistics for Family Members' Preferences**

Member	Meat	Mean	Std. Dev.	Min	Max	Obs.
Husband	Chicken	.5241	.4769	.0000	1.0955	407
	Turkey	.2162	.3974	.0000	1.0955	407
	Processed Chicken	.2898	.4291	.0000	1.0955	407
	Processed Turkey	.1647	.3600	.0000	1.0955	407
	Beef	.3488	.4545	.0000	1.0955	407
	Ready-toEat	.0583	.2116	.0000	1.0955	407
Wife	Chicken	.5418	.4841	.0000	1.0955	407
	Turkey	.1588	.3547	.0000	1.0955	407
	Processed Chicken	.2648	.4213	.0000	1.0955	407
	Processed Turkey	.1114	.3070	.0000	1.0955	407
	Beef	.2518	.4184	.0000	1.0955	407
	Ready-to-Eat	.06216	.2245	.0000	1.0955	407
Child: 0 to 9	Chicken	.2847	.4415	.0000	1.0955	407
	Turkey	.0778	.2619	.0000	1.0955	407
	Processed Chicken	.1859	.3721	.0000	1.0955	407
	Processed Turkey	.0840	.2697	.0000	1.0955	407
	Beef	.0644	.2411	.0000	1.0955	407
	Ready-to-Eat	.0592	.2310	.0000	1.0955	407
Child: 10 to 14	Chicken	.2190	.4058	.0000	1.0955	407
	Turkey	.0935	.2922	.0000	1.0955	407
	Processed Chicken	.1857	.3814	.0000	1.0955	407
	Processed Turkey	.0927	.2898	.0000	1.0955	407
	Beef	.1068	.3043	.0000	1.0955	407
	Ready-to-Eat	.0689	.2445	.0000	1.0955	407
Child: 15 to 19	Chicken	.1462	.3354	.0000	1.0955	407
	Turkey	.0739	.2506	.0000	1.0955	407
	Processed Chicken	.1287	.3187	.0000	1.0955	407
	Processed Turkey	.0429	.1896	.0000	1.0955	407
	Beef	.0857	.2695	.0000	1.0955	407
	Ready-to-Eat	.0487	.1998	.0000	1.0955	407

any time not used in cooking is assumed to be leisure. Thus (16) collapses to

$$I - \sum_{m=1}^{M} P^m x^m = 0 \tag{19}$$

Note that in (18) times used in cooking meals only appear when summed together. Thus I can substitute $t_c = \sum_{m=1}^{M} t^m$.

In the survey only five members were considered: husband, wife, child age 0–9, child age 10–14, and child age 15–19. If there was not a child in a category, their responses were recorded as 0, which has the effect of making the utility constant over all bundles of meat for that individual (i.e. the individual is considered indifferent). I did the same for any missing parents. Israel's cultural background made it such that there were no problems with multiple parents of the same sex. There were six groups of meats that were asked about: chicken, turkey, processed chicken, processed turkey, beef, and ready-to-eat meals. Average prices per pound were obtained for each of the categories from the Israeli Meat Commission. I normalized all prices, dividing each price by the price of chicken.

While most families allot shopping duties to the wife (69%), there were a large number of families in which the husband is primarily responsible for the shopping (31%). Accordingly I estimate two sets of power coefficients, one where husbands are shopping, and one where wives are shopping. The survey did not ask which member of the family was responsible for the cooking. Because of the sociological background in Israel, and for simplicity's sake, I assume the wife is primarily responsible for cooking in all households.

Note in (18) that the variable γ multiplies the wage in every instance they appear. This makes it impossible to estimate them separately. Thus I have set γ equal to 1, allowing this variable to be incorporated in the estimates of coefficients on wage. Thus the equations to be estimated are:

$$x^m = \nu^m + \frac{\sum_{k=1}^{K} \left[\left(\beta_k + \beta_k^h h \right) \alpha_m^k \left(\frac{I_0 + w^{low} I_1 + w^{high} I_2}{P^m} - \xi_m \right) \right] t_c}{\alpha_c^c} + \epsilon_{mt} \tag{20}$$

$$\left(I_0 + w^{low} I_1 + w^{high} I_2 \right) I - \sum_{m=1}^{M} \left(P^m x^m \right) = u_t \tag{21}$$

$$\sum_{k=1}^{K} \beta_k = 1 \tag{22}$$

$$\sum_{k=1}^{K} \beta_k^h = 0 \tag{23}$$

Where h is a dummy variable that takes on a value of 1 if the husband did the shopping and 0 otherwise, and β_k^h is the difference in power for individual k between when the wife is shopping, and when the husband is shopping, w^{low} is a dummy variable indicating below average income, and w^{high} is a dummy variable indicating above average income, ϵ_{mt} is a normal disturbance term for meat m and family t, and u_t is a normal disturbance term for family t. Both disturbance terms arise from possible measurement error in x^m. The respondents were asked about their average frequency of meat consumption and could have poor memories. All disturbance terms may be correlated. I set I equal to 40, the average length of a work week. The last two equations are restrictions that allow all power coefficients to be estimated. They basically require that total power always remain the same no matter who is shopping. The variables requiring estimation are:

$$\beta_1, \ldots, \beta_K, \beta_1^h, \ldots, \beta_K^h, \xi^1, \ldots, \xi^M, \nu^1, \ldots, \nu^M, I_0, I_1, I_2.$$

In all there are 7 equations and 24 parameters.

My estimation is complicated by the fact that all of the dependent variables are censored from the left, because only values above 0 are observed. Heckman [3] derived a method for obtaining consistent estimates of a single dependent variable censored on one side, by using an inverse Mills ratio. Since that time others have applied his method to the multivariate censored case.[1] Here I use the estimation technique outlined in Ham [2] for the case of the multiple censored regression. Most families (more than 240) had at least one meat for which they reported a zero. Thus I calculate the Mills ratio for censoring from the left. To estimate the inverse Mills ratio, we first must estimate the probit model using (20), but replace x^m with a variable that takes on the value one if the true value of x^m is observed and 0 if the value is censored. The inverse Mills ratio is calculated for each observation as $\rho = \frac{\Phi(Q)}{\phi(Q)}$, where Φ if the standard normal cumulative density function, ϕ is the standard normal probability density function, and Q is the estimated value of the right hand side of the equations. An Inverse Mills ratio could not be computed for the chicken equation because the variables exactly predict unobserved variables. There were only seven instances

[1] See for example Grossman and Joyce [1].

Table 3: **Summary of Inverse Mills Ratios**

Meat	Average Mills Ratio	Standard Deviation
Turkey	-1.479×10^{-8}	.747
Beef	-8.677×10^{-9}	.691
Processed Chicken	4.485×10^{-9}	.642
Processed Turkey	7.423×10^{-9}	.759
Ready-to-Eat	1.391×10^{-8}	.766

of a zero chicken observation so it is not likely that much bias will be introduced ommitting the Mills ratio for chicken. Thus 5 series of inverse Mills ratios (one for each meat aside from chicken) was obtained. The summary statistics for the Mills ratios are shown in table 3. These ratios are added to the regression as additive regressors. I then estimated the system using non-linear three stage least squares. The results of estimation are presented in table 4. The use of Mills ratios introduces heteroskedasticity, so a white heteroskedasticity consistent matrix was used to estimate the variance covariance matrix. Lagrange Multiplier tests for heteroskedasticity reject the null of no heteroskedasticity at any reasonable significance level. The regressions report R-squares of .04, .57, .56, .63, .67 and .73 for chicken, turkey, beef, processed chicken, processed turkey, and ready-to-eat respectively. Considering that all estimation was conducted using survey data, these results are quite good. The coefficient I_1 is small and negative (but not significantly). This makes sense as it suggests that families categorized as low income by our survey earn less money than do those classified as average income. The coefficient I_2 is significantly positive suggesting those classified as high income earn significantly more than do those clasified as average income. The variables ξ^m represent the amount of one meal that can be produced in one hour. These estimates seem a little low as most meals probably take less than two or three hours to make. Some of the relative sizes make sense as it appears to take less time to make a meal with processed meats than it does with unprocessed. The coefficient is very low for ready-to-eat food, which is disturbing. The significance and sign of most parameters are reasonable.

From the estimates above it is clear that different preferences are represented when the wife shops than when the husband shops. This is consistent with Zusman's model in that family members' threat points (strategies under non-cooperation) will have heterogeneous impacts on the members of the family. In other words, a 10 to 14 year old (henceforth "upper-bound" year old) may be able to have a larger impact trying to appeal to their father than their mother, as above (testing the null $\beta_{14} \geq \beta_{14} + \beta_{14}^h$ rejects at the .05 level, however β_{14}^h is significantly positive only at the .12 level). I next conduct a series of tests with null hypothesis $H_0 : \beta_k \leq \beta_k + \beta_k^h$ against the alternative $H_1 : \beta_k > \beta_k + \beta_k^h$. These tests are conducted using a Wald chi-squared statistic. The test rejects the null for the mother (any significance level), the father (.05 significance level), and the 14 year old (.05 significance level). I fail to reject the null for the 9 and 19 year olds. For the 19 year olds the converse test is easily rejected at any significance

Table 4: **Results of Estimation**

Variable	β_w	β_w^h	β_h	β_h^h	β_9	β_9^h	β_{14}	β_{14}^h	β_{19}	β_{19}^h
Estimate	.502	.309	.022	1.260	.255	.499	.163	1.096	.0588	-3.163
t-stat	6.781	1.064	.275	1.876	3.824	.8076	2.467	1.201	5.645	-3.213

Variable	$\nu_{chicken}$	ν_{turkey}	ν_{beef}	$\nu_{proc.chicken}$	$\nu_{proc.turkey}$	ν_{ready}
Estimate	3.292	1.618	1.994	2.523	1.577	.739
t-stat	55.375	28.835	32.723	50.642	31.548	19.898

Variable	$\xi_{chicken}$	ξ_{turkey}	ξ_{beef}	$\xi_{proc.chicken}$	$\xi_{proc.turkey}$	ξ_{ready}
Estimate	.289	.367	.163	.447	.327	.184
t-stat	45.629	46.318	45.241	43.496	34.030	9.928

Variable	I_0	I_1	I_2
Estimate	.294	-.003	.013
t-stat	48.368	-1.115	2.943

Variable	M.R. Turkey	M.R. Beef	M.R. Pr. Chicken	M.R. Pr. Turkey	M.R. Ready
Estimate	1.125	.554	1.427	1.039	1.005
t-stat	19.415	10.567	22.866	23.325	23.219

level. While it seems reasonable that the father should gain power when he is the one shopping, it seems strange that the mother would also gain. The estimates suggest the father ignores the older children and distributes the remaining power to the other members of the family. Neither parent appears to give too much power to the 19 year old children, but the mother gives significantly more power to them.

Next I perform a series of tests to see if the father is more powerful than other family members under both regimes. All tests have a null hypothesis that the father is less (more) powerful. I find that when the mother is shopping, the husband's power is not estimated with enough precision to reject any hypothesis about the husband's relative power. When the father is shopping I find that the father is more powerful than the mother (at the .10 level) the 9 year olds (at the .10 level) and the 19 year olds (at any level). A test comparing the father to the 14 year old fails to reject either way.

I now perform similar tests comparing the power of the mother to each family member. When the mother is shopping I find that she is more powerful than the 9 year olds (at any significance level), and the 14 year olds (at any significance level). A test comparing the mother to the father or the 19 year olds fails to reject either way. When the father is shopping I find that the mother is more powerful than the 19 year olds (at any significance level). Comparing the mother to the 9 and 14 year olds fails to reject either way.

3 Conclusion

In this paper I use cooperative game theory and Becker's theory of family production to evaluate family power distributions in consumption of meat. I find that husbands, when shopping, tend to have more power when they shop than when their wives shop. It appears that husbands tend to give more power to their wives, taking power from the older children. I also find that parents decisions are affected in different ways by their childrens influences– the mother favoring older children, and the father favoring younger children. The possibility that family consumption decisions are a result of bargaining within the family has a profound effect on traditional demand theory, introducing sociological influences. Demand cannot be determined solely by income and price, but factors of group purchases such as who is shopping and outside social factors determining bargaining outcomes are also important in describing purchasing variability.

Some weaknesses in the data set I am working with suggest that these results can be improved upon. A future survey in the U.S. will include data on who is cooking as well. Experience will also allow the design of meat categories that are easier to price and allow specification of complete systems. There is also the possibility that utility is incorrectly modeled in the form I have chosen. Better utility measures may lead to more accurate modeling of individuals utility of food and cooking. Data on income may be gathered on a finer scale as well.

Despite the data problems, the results are significant and reasonable. This is further evidence that some bargaining mechanism is driving consumption decisions. Given the large proportion of consumption decisions made in the family context some more effort should be made to fuse family bargaining theory and demand analysis. More research must be done to find what factors determine relative power of family members (like relative incomes, age, religion, etc.). Marketing firms often take social factors into account when designing advertising. Similarly economics needs to take social factors into account when analyzing why purchases are made.

References

[1] M. Grossman and T. J. Joyce. Unobservables, pregnancy resolutions, and birth weight production functions in new york city. *The Journal of Political Economy*, 98(5):983–1007, October 1990.

[2] J. C. Ham. Estimation of a labor supply model with censoring due to unemployment and underemployment. *The Review of Economic Studies*, 49(3):335–354, July 1982.

[3] J. J. Heckman. Sample selection bias as a specification error. *Econometrica*, 47:153–161, 1979.

[4] S. P. R. Lundberg. Separate spheres bargaining and the marriage market. *Journal of Political Economy*, 101, 1993.

[5] M. Manser and M. Brown. Marriage and household decision-making: A bargaining analysis. *International Economic Review*, 21, 1980.

[6] M. M. H. McElroy. Household decisions: Towards a generalization of the theory of demand. *International Economic Review*, 22, 1981.

[7] R. Michael and G. Becker. On the new theory of consumer behavior. *Swedish Journal of Economics*, pages 378–396, 1973.

[8] D. Thomas. Intra-household resource allocation: An inferential appraoch. *Journal of Human Resources*, 25, 1991.

[9] P. Zusman. The incorporation and measurement of social power in economic models. *International Economic Review*, 17, June 1976.