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RURAL ECONOMY

Combining Stated and Revealed Preference Data to Construct an Empirical Examination of Intrahousehold Bargaining

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Staff Paper 02-01

Staff Paper

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Funding for this project was provided by the Social Sciences and Humanities Research Council of Canada (SSHRC).

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Abstract

The behavior of households has traditionally been explained by assuming that a single decision maker maximizes utility over all members of the household subject to a budget constraint. This unitary model of household behavior has been questioned and compared to models that assume that household decisions are made in a bargaining process. We examine household behavior in a bargaining framework by combining stated preference information from individual members of the household with revealed preference information on the household's actual choices. The context of the decision is determining the location of family recreation vacation choice. The resulting model, based on a bargaining framework, provides information on the factors affecting bargaining power as well as information on the degree to which the decision is the result of a bargaining process.

Introduction

Increasing recognition is being given to models of household behavior that incorporate bargaining between the individuals within the household unit. Intrahousehold resource allocations have been analyzed in unitary models, cooperative bargaining models and non-cooperative models. Empirical research has tested these models for Pareto efficiency, income pooling, and assumptions regarding the consistency of household choices with economic theory. These empirical assessments have used ex-post revealed preference data such as expenditure, labor supply agricultural production or nutritional intake (Browning and Chiappori 1998; Thomas 1990; Schultz 1990; Phipps and Burton 1992; Lundberg, Pollack and Wales 1997). While progress has been made in modeling the complexities of household decision making, there has been little advancement in understanding how individual preferences and the power dimensions come together to form a joint household decision. Manski (2000) and Katz (1997) both suggest that a more experimental approach that identifies the heterogeneity of the partners' preference is needed to begin to unravel the complexities of household decision making. Furthermore, there have been few examinations of the household approach in non-market

valuation, even though in some cases the household bargaining context has been identified as important (Smith and van Houtven, 1998).

The majority of the intrahousehold bargaining literature has primarily relied on relative income of the partners as a measure of bargaining power in household decisions. Recent analyses in the time use literature focusing on the division of household labor decisions have found that efficiency, bargaining and gender norms all play a role in these decisions (Brines 1994; Greenstein 2000; Bittman, England, Folbre and Matheson 2001). However, there has been limited analysis that has included aspects of gender ideology, relative levels of education, employment patterns or other household factors on a particular household decision. There is a growing recognition that a combination of experimental data (Manski 2000; Katz 1997) and more detailed information on division of labor, time use, gender ideology, earnings and consumption will enhance empirical analysis and inform theory (Katz 1997).

In this paper we examine intrahousehold bargaining using stated and revealed preference data. The stated preference data are employed to develop estimates of individual preferences while the revealed preference data provide the household preferences. Through the combination of these data types, via a calibration exercise, we develop estimates of the degree of bargaining and the factors influencing the bargained decision. The approach produces results similar to those developed in other papers on intrahousehold resource allocation, but allows for much more flexibility in the modeling of decisions made by households.

Theory

Over the past 2 decades there has been growing recognition that the unitary household model (Becker 1991) that assumes that a household has a single utility function that is subject to a single time and budget constraint does not adequately reflect the reality of household decision

making. The assumptions implicit in the unitary model have failed testing in a number of empirical analyses (Browning and Chiappori 1998; Thomas 1990; Schultz 1990; Phipps and Burton 1992). However for some types of decisions a cooperative model also failed testing due to the limitations of a single budget and time constraints, and the requirement of Pareto efficiency (Udry 1996). Non-cooperative bargaining models (Fleck 1997) and models that integrate elements of both cooperative and non-cooperative models have been utilized (Katz 1992; Konrad and Lommerud 1996). The collective model of Browning and Chiappori (1998) is a framework that captures both the unitary model and the cooperative model as special cases. For Browning and Chiappori (1998) household decisions are a result of an iterative process. They suggest that through this process partners have perfect and symmetrical information about each other and thus the collective model applies. They further suggest that their collective model encompasses all cooperative models in the intra-household bargaining literature. We frame our research for household preferences for a shared good using Browning and Chiappori's (1998) collective model. The indirect household utility function V(**p**,x,δ) is defined as:

$$\begin{aligned} &V(\mathbf{p}, x, \delta) = \max_{\mathbf{q}^f, \mathbf{q}^m, \mathbf{Q}} \delta\, u^f(\mathbf{q}^f, \mathbf{q}^m, \mathbf{Q}) + (1-\delta) u^m(\mathbf{q}^f, \mathbf{q}^m, \mathbf{Q}) \\ &s.t. \\ &\mathbf{p}(\mathbf{q}^f + \mathbf{q}^m + \mathbf{Q}) = M \end{aligned} \qquad (1)$$

where M is income, p is a vector of prices, δ is a parameter reflecting "bargaining power", individual utilities of member i are indicated by u^i , private goods are labelled q^i, and public goods Q. Browning and Chiappori (1998) allow for multiple members of the group. In our analysis we only examine 2 members of households and label these as i=m, f. The utility functions are weighted by the distribution function δ that "summarizes the decision process"

(Browning and Chiappori 1998). The household process is described by the maximization of the sum of the weighted u^i subject to a pooled income constraint.

Analysis of household bargaining, such as that carried out by Browning and Chiappori (1998), has employed aggregate expenditure and consumption data and has examined the pattern of consumption that arises with variation in the "power" function arising from changes in relative income (e.g. increasing proportion of household income from the female household member). The proportion of relative income is assumed to be exogenous and thus does not affect preferences directly, but affects household consumption via the bargaining process and power parameter. Examples of results include increasing household expenditures on food away from home when female income increases relative to male income.

Current models of intrahousehold behavior examine consumption of the household and infer the impact of bargaining and power by econometric specification and analysis over households with variation in relative income (power). They do not employ individual preferences since these preferences are not observed – only the choices of the household are observed. In the approach we present below we begin by developing estimates of the preferences of the individual members of the household (males and females) by using stated preference methods. The stated preference methods are designed to identify individual preferences for a good that is normally "purchased" by the household. Thus, we employ stated preference methods to untangle the individual preferences from the household preference. We then employ the revealed preference information for the same type of good to calibrate the stated preference information via a bargaining framework. The innovations in our work are the following: (1) we employ stated preference methods to provide estimates of normally unobservable individual preference information, (2) we combine revealed preference and stated

preference methods in a novel way (through the bargaining framework), (3) we use our stated preference – revealed preference calibration method to examine additional factors affecting the power dimensions between individuals (assuming exogeneity of these factors) and (4) we apply this technique to the demand for a single "good" (vacation site choice) thereby facilitating the use of intrahousehold analysis and welfare analysis for these types of goods.

Methods

The approach taken in this study to examine a bargained household decision employs two types of data, one that captures the preferences of each individual household decision maker for a particular shared household good (stated preference) and another that captures the actual household decision for the same good (revealed preference). Each individual enters the bargaining framework knowing his or her own preference structure. The "good" we deal with is vacation site choice, or where households choose to go for a relatively lengthy camping trip. As the good we deal with is a mutually exclusive choice (only one site can be chosen) we employ discrete choice / random utility theory to describe the choice process. If one individual in the household had complete control of the decision regarding site choice, he/she would employ the following process (based on Hanemann 1982):

$$\begin{aligned} & Max\ \ u^i(y_1 ... y_J, x_1 ... x_J; z)\ \ subject\ \ to \\ & \sum_{j=1}^{J} p_j y_j + z \leq M \\ & y_k \cdot y_j = 0\ \ \forall k \neq j \\ & y_j = y_j^*\ \ \forall j \end{aligned} \qquad (2)$$

In this case $y_1 \ldots y_j$ represent choices of alternative sites (discrete alternatives), $x_1 \ldots x_j$ represent attributes of these sites that are only experienced if the site is chosen and z is a numeraire good. The budget constraint is reflected in the second equation in (2) where p_j is the price of consuming y_j and M is income. The last two expressions in (2) reflect the fact that the choices

are mutually exclusive and that given a choice of alternative j, the optimal level of alternative j will be chosen. Maximization generates a set of conditional indirect utility functions that outline the utility realized by household member i, conditional on choosing any particular alternative j as:

$$V_j^i (M-p_j, x_j) \qquad (3)$$

In a random utility framework it is assumed that utility is made up of a systematic component and a random component, where the random component contains information available to the individual but not the researcher. Assuming that the random component is additive to the systematic component, and assuming a type I extreme value distribution for the random component, the probability of individual i choosing alternative j can be estimated using the standard logit model (Ben-Akiva and Lerman, 1987):

$$P_j = \frac{\exp[\mu \cdot V_j(M - p_j\,,\, x_j)]}{\sum_{k \in D_i} \exp[\mu \cdot V_k(M - p_k\,,\, x_k)]} \qquad (4)$$

where μ is a scale factor and D_i is the choice set for individual i. With data on choices made by individual i (or stated preferences where individual i is instructed to choose based on their preferences) this model will provide estimates of the parameters of the indirect utility function of individual i. We ask each partner in two partner households to make choices in a stated preference experiment that is based on the same attributes (x's) as the actual site choice decision. We then use these choices to develop estimates of male and female partner preference parameters.

Let the conditional indirect utility function be linear in x and let β^i represent the preferences of household member i= m, f, or $V_j^i = x_j \beta^i$. Given stated preference estimates of individual partner parameters, we then construct the bargaining model as the outcome of the

weighted average of household partner (male and female) preferences, where the weights are the individual power factors. We calibrate this with the household utility representation using the actual choices (revealed preference data). The calibration equation for alternative j estimated is as follows:

$$V_{jn} = \delta(s_n)(x_j^{\,n}\beta^m) \;\; + (1-\delta(s_n))(\mathrm{x}_j^{\,n}\beta^f) \qquad (5)$$

where V_{jn} represents the conditional indirect utility of household n for alternative j, x_j^n is the vector of attributes of alternative j available to household n, β^i is the vector of parameters derived from the individual stated preference data for each partner; and δ is the parameter for marital power and is a function of household and individual characteristics, s_n. The attributes of the alternatives are indexed by n to indicate that they are the "real" attributes from revealed preference data available on the alternative sites. Estimating a value for δ tests whether this is a bargained good ($0 < \delta < 1$) or a good that is essentially chosen based on one partner's preferences alone ($\delta = 0, 1$). In addition to examining values of δ we also examine factors affecting δ or parameters on household elements s_n.

Estimation Procedure

The first stage of estimation is to determine the preference structures of the male and female partners in the households by estimating separate stated preference models. We also estimate a model with all individuals pooled to test whether there are significant differences between males and females. If there were no preference differences then there would be no need to continue with the analysis as the model in equation 1 would reduce to a unitary household model. Conditional logit estimates of the parameters from the stated preference data were

examined using a likelihood ratio test described in Swait and Louviere (1993) to determine whether preferences between two groups differ.

In the second stage of the estimation, the δ, is determined. The household preferences are represented by the indirect utility function derived from the revealed preference data and the individual preference structures for each partner are derived from the stated preference data as presented in equation (5). The dependent variable, V_{jn}, is not observed; however, the actual household decision is observable. Thus, the parameter, δ, is estimated as the value that provides the best fit between the weighted utility and the actual choice. The weighted utilities are made up of the actual attributes of the alternatives (j) and the preferences of the household partners. A grid search method is used to determine estimates of δ for each household.[1] In this procedure estimates of δ are derived that best predict the actual choice vector. The estimation of δ uses a criterion function based on a maximum likelihood estimator that would be used if equation (5) was the conditional indirect utility function and the objective was to find the maximum likelihood estimates of δ. This procedure finds the δ that provides the highest probability of predicting the actual choice. The values of δ for each household are then used as the dependent variable in the next stage of estimation.

The third stage of the estimation procedure examines what household characteristics, s_n, explain estimates of power.

$$\delta = f(s_n) \tag{6}$$

[1] If there is enough variation between the preference structures and in the power variable, δ, δ as a function of household characteristics can be determined jointly with the estimation of the individual preference parameters by maximum likelihood. However, our data did not have sufficient variation to develop these estimates, thus we used this two-step procedure and estimated the δs by a grid search.

The household characteristics to be examined are drawn from the intrahousehold allocation literature and from the sociological literature on household power. Factors affecting δ (a value between 0 and 1) are examined by fitting a logistic distribution (with covariates) to the values of δ.

Case Study Description and Data

We examine a decision for a single shared household good under the (testable) assumption that both partners have input into the decision. The good focussed on in this research is family vacations. Studies on household decision making have generally found that decisions about vacations are one of the most democratic decisions making it a suitable good for this research (Sharp and Mott 1956; Filiatrault and Ritchie 1980; Nichols and Snepenger 1988; Engel, Blackwell, and Miniard 1993)[2]. The data used for the analysis include data on actual camping trips made by the household for the past season (revealed preference data), and choice experiment data from each partner (stated preference data). In addition, information on household income, ideology and other household characteristics were collected. These data were collected in two stages; first an in-person interview identified suitable candidates, households with two adults, for the study, followed up by a mail survey for those households identified in the first stage. The survey instrument is described below, followed by more detail on the sample and response rates.

[2] As a shared good, the vacation decision is preferable as a focus of analysis to either durable goods or smaller goods that are purchased more frequently. Though individuals could have strong preferences over durable goods, such as the purchase of a vehicle, these purchases occur too infrequently for this type of analysis. Smaller, more frequently purchased goods, such as groceries, are inappropriate because individuals may not hold strong enough preferences for particular brands of goods.

Revealed Preference Component of Survey

Respondents were asked to complete a camping trip log. Information requested included the approximate date of the trip, the duration, the location, who chose the location, and the size of the camping party.

Stated Preference Component of the Survey

Characteristics of the camping site that influence a family's decision to camp at one location over another were identified from previous research efforts, including those of McFarlane, Fisher, and Boxall (1999). The relevant levels of these characteristics were also identified. These attributes were compared with the tourism literature from Saskatchewan and Alberta (Alberta Hotel Association 1998; Tourism Saskatchewan 1999). The choice set presented to respondents included two different camping alternatives with the third alternative to stay at home. The stay at home alternative did not include any attributes and is a realistic alternative as it allowed the respondents to "choose not to choose" if the attributes available to them in the two other choice alternatives were not desirable. The attributes included in the final design were distance (a cost variable was calculated based on distance to the site), type of facilities, fees, whether or not firewood was free, the availability of activities, and road quality. The attributes and their respective levels are described in Table 1.

Pre-tests were conducted and discussions were held with Saskatchewan Resource Management personnel to ensure that the set of site characteristics were adequate to explain choice and not so complex that survey fatigue would set in.

A statistical design was employed to develop the stated preference tasks (Louviere, Hensher and Swait, 2000). Each of the two alternatives had nine attributes: three attributes with four levels and six attributes with two levels. The entire factorial sample consists of (3^4 x 6^2) x

(3^4 x 6^2) x 2. We employed the smallest main effects design consisting of 32 alternatives that were blocked into four versions with eight tasks in each. All the attributes are orthogonal. However, the blocking variable was not completely orthogonal but was optimized.

An equal number of each of the four versions of the survey was mailed out. Each household received two different versions of the choice experiment to help mitigate collusion in the answering process. The returned surveys included a fairly equal proportion of each of the four versions.

Sample

Data collection occurred in two stages. The first stage took place during the summer of 1999, at which time in-person interviews were conducted with families who were camping in the Meadow Lake Provincial Campgrounds in Northwest Saskatchewan.[3] The sample was purposive; that is, interviews were conducted on-site at the Meadow Lake Provincial Park campgrounds with the interviewers approaching all camping sites that were occupied by family groupings. Because the study focuses on household decision making, only potential family groups were approached for an initial short interview. The interview was used to screen respondents to determine whether the camping group was actually a household. This was done by asking them basic questions about their camping experience and a few demographic questions. If the group was a family, the household partners were asked if they would be willing to participate in the second stage of the study, a mail survey.

[3] This park is on the southern fringe of the boreal forest and offers 20 different campgrounds, with each campground offering a different set of services to the visitors ranging from “no trace” to full-service camping (Tourism Saskatchewan 1999). The fact that there is a range of camping services in this provincial park allowed the researcher access to campers who have different types of preferences for a range of camping facilities and activities.

For households to participate in the second part of the study, the partners had to agree that each would complete their survey independently.[4] The completion of the surveys by each partner is a critical component of the data collection, because these surveys enable the comparison of their individual preferences to the actual household decisions. The survey mail-out followed Dillman's (1978) recommended procedures.

In total 543 in-person interviews were conducted, with only 10 individuals refusing to take part in the interview process. Of the 543 interviews, 24 participants refused to take part in the mail survey, and 26 interviews did not meet the sampling criteria. Interviewees did not meet the sampling criteria for the mail-out survey if they resided outside of Canada or if the household was a single-headed household. In the end 493 households received the mail-out surveys. The response rate for the mail-out survey was 80.1%; 395 households returned their surveys. Some 777 of the possible 790 surveys (two surveys per household) were useable. There are several reasons for having less than a full sample. First, both surveys were not always returned or completed adequately. Second, in a few instances it appeared that the same individual had completed both surveys. These surveys were identified as having the same handwriting on both surveys and were excluded from the gender and bargaining analysis. All the completed surveys were useable for the stated preference analysis. However, for the bargaining analysis, the sample was smaller at 356 households.

Data Preparation

According to the trip logs (revealed preference data), these families visited over 350 camping sites in Saskatchewan, Alberta, and British Columbia. Using tourist information

[4] An additional reason to collect responses from both partners is that there is growing literature on household decision making that demonstrates that there are often large discrepancies in their responses, so that relying on one partner could result in biased results (Blumberg and Coleman 1989).

(Alberta Hotel Association 1998; Tourism Saskatchewan 1999) the attributes for each camping site were identified. In the final choice set, 25 alternative locations were specified based on the geographical and attribute information. The descriptions of the attributes for the 25 alternatives were constructed to match the attributes used in the stated preference task, described above.

All of the site attribute data for stated and revealed preference models were effects coded[5] except fees and cost, which were combined, creating a continuous monetary variable. The travel cost variable was constructed from the distance and household income information. The travel cost variable consists of a cost for the distance travelled (a mileage cost times the distance from home to the site) and a time cost (1/3 the wage per hour times the number of hours travelled). Fees for the campground were then added to the travel cost to create a total cost variable for the analysis.

Results

The results of the first stage of the estimation procedure, the stated preference models, are reported in Table 2. All the attributes are significant in the male and the combined data estimations, while two site attributes, access for ATV and paved roads, are not significant in the female estimation.

Using the likelihood ratio test described in Swait and Louviere (1993), the hypothesis that the parameter estimates for the men and women are equal is rejected (χ^2 (10 df) = 32.86). This result suggests that the parameters for the male and female samples of this choice task have underlying models with different parameters, implying that the preferences of the two groups differ systematically. This result indicates that a bargaining model may be a more appropriate framework than the common preference model to examine this type of household decision.

[5] For a description and discussion of effects coding, refer to Louviere (1988) and Adamowicz et al. (1994).

The differences in the preference structures between the genders are further exemplified in models with interaction terms. Results for these estimations are presented in Table 3. The results indicate that all the attribute variables had the expected signs in both models. However, there are some differences between the two data sets that are noteworthy. Two site attribute variables in the female model are not significant: the availability of trails for All Terrain Vehicles (ATVs) and the road quality. In contrast, in the male results both of these variables are significant at the 1% level. In addition, the magnitude of the parameters is fairly similar between the two models with the exception of the level of facilities and access to a beach. In the female model the marginal rate of substitution[6] for the level of facilities is double that of the male model. For women, having access to better facilities is more important than it is for men. The same is true for having access to the beach; women have a marginal rate of substitution that is one and a quarter times larger than that of men.

Interestingly, there are some similarities in the roles of the sociodemographic variables that drive these preference structures. The presence of more than one child increases the desirability of having access to a beach for both partners; however, the magnitude of the marginal rate of substitutions is larger for males compared to females. The level of household income interacted with the cost of the trip is also a determining factor for both men and women. The effect is positive, indicating that as the level of household income increases, the cost of the trip becomes a less important factor. A third sociodemographic factor common between both models is that full-time employment affects the preference structures. However, the attributes that interact significantly with full-time employment are not the same in the two models. Women

[6] The parameter estimates are actually $\mu\beta$, where μ is the scale and β is the true parameter (Swait and Louviere, 1993). To be able to discuss the parameters without the confounding effect of the scale, marginal rates ($\beta i/\beta\$$) are used.

employed full time find fishing to be a less attractive holiday site attribute. Road quality is a less important attribute when the men are employed full time. The relative financial contribution to household income is an important factor in the female model only. If the wife's level of financial contribution to the household income is 75% or more, the cost of the trip has less of a negative impact on her utility. The parameters from the models with interactions between attributes and demographic variables are used in the next stage of estimation, as they provide a better fit to the individuals' preference structures.

The second stage of the estimation procedure, a grid search, produces a distribution of the estimates for δ and is shown in Table 4. As the value of δ nears 1, the male partner's preferences better reflect the household decisions; and as the value of δ nears 0, the female's preferences better reflect the household decisions. It appears that this recreational decision is not necessarily a compromised decision for most households since 95% of the households' revealed preference structure are similar to only one partner's preference structure. In fact, the majority of the households' preference structures more closely reflect the women's preferences than the men's. For approximately 5% of the households this decision seems to be a compromise between both partners because their holiday choices do not clearly reflect either the husband's or the wife's preferences.

This distribution indicates that decisions regarding family camping trips may not be negotiated and that one individual has more influence in the final outcome than his or her respective partner. This result contradicts the couples' responses when asked directly who is responsible for deciding the location and timing of their camping trips. They indicated that these decisions are, for the most part, shared.

The third stage of the estimation procedure investigates what household characteristics may provide insight into understanding the determinants of these decision structures. These determinants of the power structure are drawn from sociological and intrahousehold allocation theories. In the economics literature the proportion of income is the most commonly employed household characteristics (Browning and Chiappori, 1998). In the sociological literature a broader range of variables are suggested to have influence on household decisions. Based on the resource theory posited by Blood and Wolfe (1960) and gender balance of power theory presented by Blumberg and Coleman (1989), variables that measure the relative and absolute levels of employment, education, and income are examined. According to Pahl (1995, 1989) and Dobblesteen (1996), how households organize their finances can also inform us about the power dynamics existent in household decision making. Variables identifying which households have wife- or husband-dominated financial management strategies are created and examined. Blumstein and Schwartz (1991) suggest that resource theory is an insufficient explanator of how power is distributed in a household and that an understanding of the household's ideology, that is, who they believe the primary breadwinner should be in their household, also needs to be taken into account. The effect of income on decision-making power varies depending on whether the household is ideologically traditional, with the husband having authority, or whether the household rejects the husband's authority.

The variables presented in two specifications of the determinants of the power function in Table 5 include (1) the proportion of income earned by the male, (2) the male's income, (3) relative education levels (1 if the male's education level is higher), (4) a reported ideological variable indicating if the spouses believe that the male should be the "breadwinner", (5) a reported variable indicating who dominates the decision about the location of family holiday

locations, (6) an indicator variable for a female spouse who stays at home full time. Several other variables that were examined but were never significant are worth noting[7]. Sociodemographic variables such as the number of children in the household and the relative age of the two partners have been identified to be potentially influential variables. In fact, in most travel and leisure research, the number and age of the children were noted as increasing the females' relative input into the decision (Fodness 1992). Division of labour and areas of decision making have been cited as potential indicators of the household power structure (Blumstein and Schwartz 1991; Pahl 1995; Dobblesteen 1996). For this shared household good neither the division of household tasks nor the structure of household financial management were significant indicators of the weighting function**.** The fact that these variables are not significant in this decision structure suggests that having influence, or the perception of influence, in decisions in other areas of the household, such as managing the finances, does not always translate into influence in other dimensions of household management.

Two models were estimated with income defined differently in each. The first model includes the husband's absolute level of income and the second includes the relative contributions of income to the household by each partner. Both variables are strongly significant in their respective models and have negative coefficients, indicating that as the income of the husband increases, it is more likely that the location of the holiday will reflect the wife's preferences. In turn, this suggests that the wives of men with higher incomes have more influence over the planning of the holiday camping trips.

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[7] See Dosman (2000) for a full description of the variables considered in these estimations.

The significant variables included in both models are the household's ideology of who the "breadwinner" in the household should be and who is responsible for deciding where the family would go on vacation. The "breadwinner" variable is negative and of the same magnitude in both models. This result indicates that the more traditional the household is, the more likely the holiday location reflects the preference structure of the wife. The "vacation decision maker" variable is positive and of the same magnitude in both models. In households who report that men make the decision the weighting nears 1, indicating that the camping site choices more closely reflect the husband's preference structure. This result provides support for the modeling framework as the model confirms the responses from the individuals.

There were also variables that were significant in only one model. In model 1 the relative education level was positive, indicating that in households in which the husbands have a higher level of education than their wives, the attributes of the camping choice are more likely to reflect the husbands' preferences. In model 2 the variable indicating that the wife is at home full time is positive. This suggests that in these households the holiday location chosen more closely reflects the husband's preferences (everything else held constant). However, these latter two variables are only significant at a 5% level while the other factors are significant at a 1% level.

Conclusion

A new empirical approach was developed to examine individual household member's preferences within the framework of actual household decisions. Preferences of individual members of the household were elicited using stated preference methods and were calibrated against actual household choices to yield a model of intrahousehold choice. The empirical application was household vacation choices, a good chosen because of its relative importance in terms of time use, expenditure and potential for intrahousehold bargaining. Within this new

approach dimensions of household bargaining power were examined. In addition to "traditional" measures of bargaining power (proportion of total income earned by each family member, etc.) measures of power from the sociology literature were integrated into the model. This provided a linkage between economics and sociology literatures and allowed for the examination of more complex hypotheses regarding intrahousehold choice.

Qualitatively the findings in our model are similar to those discovered by other researchers. That is, changes to relative income, for example, will generate changes in demands. In our model, an increase in a man's income will result in a lower probability of his household choosing sites with characteristics that he finds appealing (fishing, more rustic facilities). This is because the power associated with the female partner for this decision increases as the male's income increases. We interpret this as a value of time response by the household. The higher income earner has a higher value of time and thus has less time to spend on vacation planning details. Note that this is contrary to much of the literature on power and household decision making in which it is hypothesized that increasing income of a partner increases their power in all decisions.

Our approach also allows us to develop estimates of economic welfare based on the household indirect utility function (5). If the household's preferences are reflected in the preference of one individual, then welfare can be based on this individual. However, if the household preferences are bargained, then the welfare measure arises from a weighted average of the individuals in the household. Furthermore, by measuring each individual's preference, we can assess the impact of policy changes on each individual as well as on the household and derive a measure of the incidence of the policy change on members within the household

Several challenges must be overcome in order to fully develop this approach to intrahousehold analysis. It is possible to identify and estimate a full information maximum likelihood version of equation (5) with sufficient variation in the preferences of the individuals and in the outcome of the bargaining process. However, in our case we discovered that the preference differences between the males and females were not that large and in many cases the decision was not bargained (resulting in a 0 or 1 for the δ parameter). In other household decisions, however, we suspect this will not be the case. In decisions involving health risks, for example, it is widely recognized that male and female preferences differ (Flynn, Slovic and Mertz 1994; Dosman, Adamowicz and Hrudey 2001). Furthermore, it is expected that in decisions involving children and risks (child health, fertility, etc.) preferences and power associated with intrahousehold processes may be very important in explaining household behavior (Smith and van Houtven, 1998). Further research in these areas using the techniques we explore could provide significant new insights into household behavior. In addition, this type of model may be effective in explaining behavior in other groups, not just households. Many decisions are actually bargained decisions made by groups (where to have dinner with friends, which type of office photo-copier to purchase, recreation location choices made by a group of friends, etc.). Insights into these collective decisions may be possible with models such as the ones we develop here.

Econometric improvements to the model include a movement to individual level estimates (Revelt and Train, 1999) to provide better estimates of the individual partner preferences used in the bargaining model. Alternatively, hierarchical bayes methods may be employed to develop individual level estimates (Huber and Train, 2001). Either method is well developed for stated preference approaches.

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Table 1: Attributes and Levels Used in Choice Experiment

Attributes	Levels	Description of discrete levels[a]
Distance	Level 1	100 km
	Level 2	300 km
	Level 3	500 km
	Level 4	700 km
Facilities	Level 1	Minimal facilities
	Level 2	Moderate facilities
	Level 3	Well serviced facilities
	Level 4	Fully serviced facilities
Fees	Level 1	$7
	Level 2	$14
	Level 3	$21
	Level 4	$28
Firewood	Level 1	$5 per bundle
	Level 2	Free
Trails	Level 1	Yes
	Level 2	No
ATV	Level 1	Yes
	Level 2	No
Beach	Level 1	Yes
	Level 2	No
Fishing	Level 1	Yes
	Level 2	No
Road quality	Level 1	Fully paved to campsite
	Level 2	Last 25 km gravel

Table 2: Results of the Stated Preference Models for the Male, Female, and Combined Data Sets

Variables	Combined data (n=5015)	Male data (n=2519)*	Female data (n=2496)
Cost	-0.2674**	-0.2732**	-0.2907**
	(-18.239)	(-14.892)	(-15.174)
Facility	0.2306**	0.1530**	0.3282**
	(9.90)	(4.672)	(9.358)
Wood	0.2120**	0.1977**	0.2478**
	(9.085)	(5.920)	(6.943)
Trails	0.2336**	0.2481**	0.2445**
	(10.028)	(7.608)	(7.559)
Beach	0.5766**	0.5446**	0.6581**
	(20.423)	(15.917)	(18.565)
ATV	0.0512*	0.1027**	0.005
	(2.315)	(3.108)	(0.156)
Fish	0.4036**	0.4693**	0.3787**
	(15.461)	(13.944)	(10.928)
Road	0.0641**	0.1070**	0.0357
	(3.076)	(3.383)	(0.662)
No camping	-0.9821**	-1.0305**	-1.0321**
	(-16.452)	(-13.449)	(13.039)
Scale	0.0822		
	(1.549)		
Log likelihood	-4643.26	-2349.62	-2277.21

t-statistics are in parentheses, ** is .01 significance level, * is .05 significance level.

The total number of choice tasks completed differs between the two samples because not all choice tasks were completed in some of the surveys.

Table 3: Results of the Stated Preference Models for the Male and Female Data Sets with Socio-demographic Interaction Terms

Variables	Female model (n=2496)	Male model (n=2519)
Travel cost + fees	-0.331**	-0.297**
	(-14.916)	(-14.162)
Facility	0.341**	0.152**
	(9.626)	(4.590)
Wood	0.254**	0.198**
	(7.332)	(5.953)
Trails	0.249**	0.248**
	(7.682)	(7.592)
Beach	0.537**	0.376**
	(9.223)	(6.840)
ATV	0.003	0.098**
	(0.078)	(2.918)
Fish	0.448**	0.461**
	(9.966)	(13.683)
Road	0.036	0.298**
	(1.088)	(3.204)
Constant	-1.07**	-1.06**
	(-13.211)	(-13.705)
Number of Children * beach	0.201**	0.261**
	(2.768)	(3.775)
	0.074**	0.047*
High income * (cost+fees)	(3.171)	(2.087)
Relative income * (cost +	0.099*	
fees)	(1.963)	
Employed * fish	-0.156*	
	(-2.212)	
Employed *road		-0.209*
		(-2.105)
Log Likelihood	-2251.94	-2350.75
Adjusted R^2	.177	.149

t-statistics are in parentheses. ** is .01 significance level. * is .05 significance level.

Table 4: Distribution of Weighting Parameter δ

	δ	Number	% of households
Female preferences dominant	0=δ	200	78.4
Bargained preference structure	0>δ>1	13	5.1
Male preferences dominant	1=δ	42	16.5
Total		255	100

Table 5: Household and Power Structure Determinants of the Weight δ (n=255) *

Variables	Model 1	Model 2
Constant	-2.302	-1.0667
	(-1.494)	(-0.662)
Husband's absolute level of income	-0.0173**	
	(-2.821)	
Male is breadwinner	-0.3377**	-0.3393**
	(-2.382)	(-2.362)
Relative education levels	0.70267*	
	(1.888)	
Responsible of holiday location	0.6476**	0.6022**
	(2.902)	(2.737)
Relative income level		-0.0139**
		(-2.602)
Wife stays at home		0.795*
		(1.873)
Log likelihood function	-110.33	-111.21
Adj. R^2	.363	.358

t-statistics are in parenthesis. ** is .01 significance level. * is .05 significance level.

* The sample size is 255 households. The division of labor and ideology sections as well as level of household income were not always completed fully. This results in a smaller sample size for these estimations.