ORIGINAL ARTICLES

Consumers’ willingness to pay for Dates in Ihsaa governorate -Saudi Arabia: a stated choice experiment approach

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ABSTRACT

Dates are one of the major crops produced in Saudi Arabia for its considerable religious and nutritive values for the consumers. The aim of this paper is to assess consumers’ preferences and tradeoffs between different regions for a major Date Palm variety using a choice experiment. Specifically, the paper investigates consumers’ willingness to pay for Ihsaa region using Khalas variety. Empirical results indicate that consumers are willing to pay a premium of 8.6SR/kg for Khalas variety from Ihsaa region.

Key words: choice experiment, date Palm, Random Parameter Logit Model

Introduction

Date Palm is one of the major perennial crops produced in Saudi Arabia, the second world producer with a contribution of 17% of world production. Saudi Arabia and Algeria are the biggest countries in planting Date Palm representing 15.8% and 15.6% of the world cultivated area respectively (FAOSTAT, 2013). In general, the consumption of Date Palm is wide spread in the Mediterranean starting from Morocco to Egypt and the Middle East countries; moreover, its consumption is affected by the Islamic religion and its nutritional values. Date Palm production in Saudi Arabia is of considerable importance for its nutritive and religious values to Muslim consumers. Many studies have shown that religion can affect consumer behavior, in general, and the buying decision (Mullen et al. 2000; Blackwell et al. 2001; Pettinger et al. 2004).

The eastern area of Saudi Arabia is considered the largest industrialized cluster for processing dried dates. The number of palm trees in the Saudi Arabia is estimated at 23.7 million trees and the different date varieties are about 400 that spread all over the different agricultural areas (Ministry of Agriculture, 2013). Fresh or dried dates are eaten directly or processed in different methods like stuffed, chopped. In addition, dates are added as ingredients to cereals, in pudding, bread, cakes, cookies, ice cream and candy bars. Date Palm is processed in different forms such as cubes, paste, spread, powder, jam, jelly, juice, syrup, vinegar or alcohol. Al-Abbad et al. (2011) conducted a survey of 30 farmers and traders in Ihsaa town using a feasibility study and SWOT analysis. The results indicate that 23% of the respondents sell their produce at the farm gate due to the low prices offered from Dates Palm manufacturers, 40% sell their output in the markets and 37% sell to factories. Problems of supply chain logistics can be solved through marketing cooperatives and exploitation of government subsidies. El-Sabea (2010) proposed a way to increase exports of dates through creating marketing cooperatives that develop export strategies that gives better opportunities for higher prices.

The Saudi Arabia government advocates for an increase of production by providing high quality varieties and extension services as an instrument for increasing food security and its role in protecting the environment. The total cultivated area of Date Palm in Saudi Arabia is 156 thousand hectares producing 992 thousand tons in 2011. Up to date, marketed Date Palm has two channels one is directly to consumers and the other is going to processing plants which represents 29% of the total produced Date Palm in 2011. The number of processing plants reached 145 in 2011 (Ministry of Agriculture, 2013). Hence policies promoting processing have a relevant effect on the agricultural sector of adding value, jobs creation and solving many marketing problems that occur from the traditional marketing approach (Ministry of Agriculture, 2013). Al-Shareed et al (2012) investigated the Saudi Arabia’s Date Palm in the international market based on demand analysis of the importing countries. The results indicate that the European Union (EU) is the largest importer of Date Palm which represents 10% of the world’s imports volume which account for 30% of value which indicates that the import prices of the EU is higher than the world average.

The objective of this paper is to evaluate consumers’ preferences and tradeoffs between two different regions for a major Date Palm variety which is Khalas in Ihsaa town in Saudi Arabia using a stated choice experiment with cheap talk script. The contribution of this work to the literature is the application of a stated choice experiment in Saudi Arabia, No study has adopted this methodology using random parameter logit model

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for its flexibility compared with the fixed coefficients of the Multinomial Logit (MNL). The random parameter logit has three main features that makes it more desirable as it allows for random taste variations, relaxes the assumption of Independence from Irrelevant Alternatives (IIA) and finally handles cases where unobserved factors are correlated over time (Train, 2009).

The remainder of this paper is organized as follows. Section 2 presents a review of the literature assessing the willingness to pay. Section 3 presents the methodological approach. Section 4 presents the choice experiment design. Section 5 reports and analyzes the empirical results. Section 6 presents the concluding remarks and a summary of the research results.

Previous literature:

Discrete choice experiment is based on the premise that a good can always be regarded as its features or attributes rather than the product itself. Therefore, the probability of choosing an alternative will be higher if its associated utility is higher than the other alternatives in a specified scenario (Loureiro and Umberger 2007). Furthermore, Hensher and Greene (2003) showed that the resulted utility associated to the chosen alternative was related to the utility of any non-chosen alternative in the choice set, making both alternatives as dependents. In spite of the common use of the Willingness to Pay (WTP) for specific attributes, recent literature shows some explicit concern about the hypothetic nature of the experiment, which can generate biased results. More precisely, individuals tend to overstate their willingness to pay in the hypothetical choice experiments (Lusk and Schroeder 2004; Alfnes and Steine 2005). Nonetheless, when one thinks through the marginal WTP, the evidence is mixed in relation to the presence of hypothetical bias. On one hand, previous studies failed to reject the hypothesis that marginal WTP is real and hypothetical settings were the same (Carlsson and Martinsson 2001; Cameron et al. 2002; Lusk and Schroeder 2004). On the other hand, the hypothesis of equivalency between hypothetical and real WTP was rejected in (Carlsson, et al., 2005; Olof and Henrik, 2008).

Furthermore, the best practice recommendation found in the literature to moderate the effect of the hypothetic bias was the inclusion of ¨opt-out alternative¨, rather than forcing the choice (Hensher, 2010; Menapace, et al. 2011). There is also a possibility to mitigate the hypothetical bias by incorporating financial incentives by randomly drawing a bidding choice scenario (Alfnes, et al. 2006; Chang, et al. 2009) or using a cheap talk script that explicitly describes the hypothetical bias problem to participants (Carlsson, et al. 2005).

For the general link between food and health and the degree of consistency in the conclusions of the recent previous literature about consumers’ interests in the nutrition properties of the food products they eat and its relation to health (Armstrong, et al. 2001; Mannell, Brevard, et al. 2006), the quantitative results are largely in line with this. Respondents express agreement that one should eat less food with sugar and fat and more fruits and vegetables (Food Standards Agency, 2002). In our case is additionally supported by the religious motive to the consumption of Dates Palm for its health benefits. There is also an age effect with the older respondents more concerned about their health (Loureiro et al. 2006). A recurrent structure is that particular demographic groups have a greater concern in nutrition information (Food Standards Agency, 2002). Though, young women may be concerned with nutrition for motives of weight control (Food Standards Agency, 2002). A survey conducted by Aleid (2004) in the eastern region of Saudi Arabia using a survey of 700 respondents studying consumption pattern of fresh and processed Dates Palm showed that consumers prefer Date Palm in season compared with other fresh fruits while in the off season they start processing it to increase its shelf life for future consumption which gives opportunities for investments in storage facilities, additionally, respondents found to prefer Khulas Date Palm variety fresh or processed compared with other varieties, 60% of the respondents preferred the processed while 80% of the sample preferred it when it is fresh in season. The average yearly consumption of Date Palm of the respondents is 236 kg.

Methodology:

Choice is a founded approach for understanding and anticipating consumer trade-offs and alternatives in market research established on a household survey (Gracia et al. 2009). Commodities and services are an aggregation of attributes and the sum up utility experienced from a product or service is the summation of these item-by-item utilities experienced by the attributes of such commodities and services. As consumers decide between alternatives, they make trade-offs between dissimilar attributes and attribute levels (James and Burton, 2003). Hypothetical willingness to pay WTP analysis is based on stated preferences. Therefore, an expected emergence with hypothetical experiments is hypothetical prejudice in the WTP estimates because hypothetical and actual values can importantly differ. Biased WTP values arise since people coping with hypothetical buying decisions tend to conduct differently from people in an actual buying situation. The evidence of the existence of hypothetical bias is widespread (Cummings et al. 1995; List and Gallet 2001; Murphy et al. 2005; Silva et al. 2007). Choice experiment is based on the fundamental principle of the theory of value (Lancaster, 1966) that reasons the utility of goods can be fractioned into utilities of various attributes of products and indicates that
consumers make choices established on preferences for attributes of these goods and Random Utility Theory (RUT). The RUT assumes the individual’s utility is given by:

\[ U_{ij} = V_{ij} + \epsilon_{ij} \]  

(1)

where \( U_{ij} \) is the utility obtained by individual \( i \) for choosing product \( j \) and it comprises two components: a deterministic (observable) component \( V_{ij} \), which comprises the factors alternatives’ characteristics, and random (unobservable) \( \epsilon_{ij} \), which includes altogether the aspects regarded by the individuals at the time of the selection, which are not under the control. In terms of probability the specification of the random utility model is

\[ \text{Prob}_{ij} = \text{Prob}[U_{ij} > U_{ik}] = \text{Prob}[(V_{ij} + \epsilon_{ij}) \geq (V_{ik} + \epsilon_{ik}); \forall j \neq k \in C_n] \]  

(2)

That is the probability of individual \( i \) choosing alternative \( j \) is equal to the probability that the utility gained from alternative \( j \) is greater than the utility associated with alternative \( k \) after evaluating all alternatives in the choice set \( C_n \). The observable component \( V_{ij} \) is as follows:

\[ V_{ij} = \sum_k \beta_{ik} \cdot X_{kj} + \beta_{\text{price}} \cdot P_j \]  

(3)

where \( \beta_{ik} \) the marginal utility of the attribute \( X_{kj} \), \( \beta_{\text{price}} \) the marginal utility of the price \( P_j \) of alternative \( j \).

Diverse discrete choice models are obtained from different representations of the density function of the error term, which correspond to different assumptions about the distribution of the unobserved portion of utility (McFadden, 1974). The probability that an individual \( i \) choose alternative \( j \) of a choice

\[ \text{Prob}_{ij} = \frac{e^{V_{ij}}}{\sum_{k=1}^{n} e^{V_{ik}}}, \text{ with } k \in C_n \]

The estimation of this model can be handled by the maximum likelihood method. Nevertheless, this model has a some shortcomings (Phanikumar and Maitra, 2007) such as (IIA) property involving proportionate substitution across alternatives, second, the assumption of preference homogeneity in the sample, entailing that all coefficients of all attributes in the utility function are assumed to be the equivalent across all respondents and third the hypothesis of independent errors over time. Adjustments to the MNL models to get over the restrictions guide to the random parameter logit model specification. In a lot of instances, heterogeneity in preferences within the population is anticipated.

Opposed to the MNL model, the Random Parameter Logit or mixed model (RPL) permits more flexibility and continuous form of preference heterogeneity; the utility coefficients change across persons following the continuous probability distributions functions (Chang et al. 2009). Therefore, it provides a greater variability of preferences for alternative specific attributes across individuals (Train, 2000) and allows for placing how preferences change in a population. A RPL model can consequently be accustomed to the examination of the heterogeneity of preferences (Revelt and Train, 1998). Other advantages of the RPL model are that it’s not subject to the assumption of (IIA) and accounts for repeated observations taken from each respondent (Revelt and Train, 1998). In the RPL model, the probability that individual \( i \) choose alternative \( j \) in a particular choice set, \( C \), with the following specification

\[ \text{Prob}_{ij} = \int \frac{e^{V_{ij}}}{\sum_{k=1}^{n} e^{V_{ik}}} f\left(\frac{\beta}{\theta}\right) d\beta, \text{ with } j \in C_n \]  

(4)

where \( f\left(\frac{\beta}{\theta}\right) \) is the density of the coefficients \( \beta \) with \( \theta \) referring to moments of the parameters distributions. There is no closed form solution; therefore the probabilities are approximated through simulation techniques following Train (2009). According to Train (2009), the simulation done up in three steps for any given value of \( \theta \). Firstly, to draw a value of \( \beta_r \) from \( f(\beta_r/\theta) \) and label it \( \beta'_r \) with \( r = 1 \ldots R \). Then, calculate the logit formula \( L_{ij}(\beta'_r) \) with this draw. Finally, repeat steps 1 and 2 many times and average the results. This average is the simulated probability:

\[ \overline{P}_{ij} = \frac{1}{R} \sum_{r=1}^{R} L_{ij}(\beta'_r) \]  

(5)

where \( R \) is the number of draws. The simulated probabilities are inserted into the log-likelihood function to give a simulated log-likelihood (SLL):
\[ SLL = \sum_{i=1}^{I} \sum_{j=1}^{J} d_{ij} \ln \hat{P}_{ij} \]  

(6)

where \( d_{ij} = 1 \) if \( i \) choose \( j \); and zero otherwise. The maximum simulated likelihood estimator (MSLE), is the value of the \( \theta \) that maximizes SLL.

The paper follow the previous literature to calculate the WTP estimates for the attributes which is the ratio of the partial derivative of the utility with respect to the attribute to the partial derivative of the utility function with respect to the variable Price following Morrison et al (2002). As suggested by Revelt and Train (2000) fixing the price is better because is not easy to find the correct distribution of the price, the WTP is given by

\[ WTP = \frac{\frac{\partial u_{ij}}{\partial \text{attribute}}}{\frac{\partial u_{ij}}{\partial \text{Price}}} \]  

(7)

The estimated ratios are interpreted as the price change associated with a unit increase in a given attribute. The distribution of the WTP will follow the distribution of the estimated parameters of the attribute.

Choice experiment design:

Survey:

This study uses data collected from a survey of 350 food shoppers from which 336 completed the survey in IHSAA region in Saudi Arabia. Data were collected during February-April 2013 at different shopping hours and different types of food retail stores in Ihsaa town in the eastern region of Saudi Arabia; this time period doesn’t include seasonal effects of Islamic festivals. The paper used a stratified random sample based on gender. The questionnaire consists of four major blocks. The first block derives information on respondents’ purchasing and consumption habits about Date Palm. The second block is the major block that includes the stated choice experiment. The last block gets information about socio demographic characteristics, consumers’ personality traits and consumer’s lifestyles. Most of the scales used have been taken from previous studies (Chen, 2007; Gil et al, 2000; Mtimet and Albisu, 2006). All indicators have been measured through five-point Likert scales (from 0 to 5, where 0 indicates total disagreement, 5 total agreement and 3 indicates indifferent).

Choice experiment design:

In the choice experiment, three attribute were found relevant based on a pilot study of 35 face to face interviews and previous literature to identify consumption patterns and attitudes towards Date Palm. The first attribute is the production location which is considered an important factor in purchasing, the second attribute is the processing of Date Palm, and the last is the price which is considered main attribute identified in the previous literature in determining consumer’s choices. It is also found in pilot survey, these attributes are used in the choice set with two levels. The weight is fixed to one kilogram (kg) and variety of Date Palm (Khalas) in the experiment. The paper follow the strategy proposed by Street et al (2005) to get a 100% efficient main effects design, Table 1 shows attributes and attribute levels in the Choice Experiment. Table 2 shows one of the choice sets offered to respondents.

| Table 1: Attributes and attribute levels in the Choice Experiment |
|-----------------|-----------------|
| Attributes      | Levels          |
| Origin          | Ihsaa Kharg     |
| Processing      | Processed Unprocessed |
| Price           | 15 SR/kg 20 SR/kg |

<table>
<thead>
<tr>
<th>Table 2: Example of a choice set of the experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative “A”</td>
</tr>
<tr>
<td>Process : unprocessed</td>
</tr>
<tr>
<td>Location : Ihsaa</td>
</tr>
<tr>
<td>Price : 15 SR</td>
</tr>
<tr>
<td>Alternative “B”</td>
</tr>
<tr>
<td>Process : processed</td>
</tr>
<tr>
<td>Location : Ihsaa</td>
</tr>
<tr>
<td>Price : 20 SR</td>
</tr>
<tr>
<td>Alternative “C”</td>
</tr>
<tr>
<td>Process : processed</td>
</tr>
<tr>
<td>Location : Kharg</td>
</tr>
<tr>
<td>Price : 15 SR</td>
</tr>
</tbody>
</table>

Results:

The summary statistics for the sample socio-demographic characteristics is provided in (table 3). The sample is represent males (52%) and females (48%) in IHSAA region, the educational level is (50%) for
university degree and (32%) for intermediate education. The average income of a household is between SR5000 and SR7000 per month.

Table 3: Socio-demographic characteristics of the sample

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>52.1%</td>
</tr>
<tr>
<td>Female</td>
<td>47.9%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>18-35</td>
<td>68%</td>
</tr>
<tr>
<td>36-more than 45</td>
<td>32%</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
</tr>
<tr>
<td>Primary education</td>
<td>15.2%</td>
</tr>
<tr>
<td>Secondary education</td>
<td>32.1%</td>
</tr>
<tr>
<td>University education</td>
<td>52.7%</td>
</tr>
<tr>
<td>Household income</td>
<td></td>
</tr>
<tr>
<td>Below 3000 SR</td>
<td>17.4%</td>
</tr>
<tr>
<td>Between 3000 and 5000 SR</td>
<td>14.3%</td>
</tr>
<tr>
<td>Between 5000 and 7000 SR</td>
<td>23.4%</td>
</tr>
<tr>
<td>More than 7000 SR</td>
<td>44.9%</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
</tr>
<tr>
<td>Part time worker</td>
<td>21.6%</td>
</tr>
<tr>
<td>Full time worker</td>
<td>57.1%</td>
</tr>
<tr>
<td>Retired</td>
<td>9%</td>
</tr>
<tr>
<td>House wives</td>
<td>12.3%</td>
</tr>
</tbody>
</table>

In terms of occupation level 57.1% of the sample is full time worker while 21.6% is part time worker and 12.3 are house wives. Finally, 60% of the sample is married and the average household size is between 3 and 5 members. The sample is consistent with the (CDSI, 2013) in terms of gender and education. From the 336 respondents considered in the sample 334 completed the choice experiment block of questions. The variables are defined in (table 4) and the analysis was conducted using Stata 11.

Table 4: Definition of explanatory variables

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origin</td>
<td>$1 = $\text{Ihsaa}; -1 = \text{Kharg}</td>
</tr>
<tr>
<td>Processing</td>
<td>$1 = \text{processed}; -1 = \text{unprocessed}</td>
</tr>
<tr>
<td>Price</td>
<td>15 SR/kg and 20 SR/kg</td>
</tr>
<tr>
<td>Gender</td>
<td>$1 = \text{female}; 0 = \text{male}</td>
</tr>
<tr>
<td>Age</td>
<td>$1 = \text{36-more than 50}; 0 = \text{18-35 years old}$</td>
</tr>
</tbody>
</table>

Now the paper turn to the interpretation of the RPL results. The estimated utility function includes attributes levels and the interaction terms with socio-demographic characteristics, the price attribute is introduced as a continuous variable. Socio-demographic variables like gender and age are defined as dummy variables. Results of the RPL are presented in (table 5).

The price attribute has a significant negative effect which is consistent with demand theory, indicating a price increase lead to a decrease in consumers utility (Gracia, 2009; Menapace et al., 2011). The paper adopt Revelt and Train (1998) approach to calculate WTP by fixing the price and allowing other coefficients to vary. The WTP for each attribute will follow the distribution of the attribute’s coefficient. The origin attribute is positive and have a significant effect over consumer’s utility indicating that consumers gain more utility from locally produced Date Palm in IHSAA rather than produced in Kharg.

In addition it is most relevant attribute for its high impact on consumer utility. The process attribute has a positive sign indicating that unprocessed Dates reduces consumer’s utility compared to processed Dates which have a longer shelf life; it has a statistically significant standard deviation indicating the presence of unobserved preference heterogeneity regarding this attribute.

The interaction term age and location shows a significant and positive effect indicating that adult consumers have more utility when purchasing locally produced Date Palm from Ihsaa, with the presence of preference heterogeneity in the interaction term. Finally the effect of interaction between gender and location is also found to be relevant with positive effect on the utility function showing that female consumers choose gain more utility from Ihsaa Date Palm rather than from Kharg. The WTP for the attributes are calculated from the RPL estimation results in (table 5) following equation (7). Results show that all attributes have positive premiums. Consumers are willing to pay 8.6SR for the origin attribute which is the highest, which implies 8.6 SR per kg is the premium that makes consumers indifferent between the two levels of utility, associated with Ihsaa and Kharg origins of Date Palm. The WTP for the processed Date Palm is 1.5SR per kg. The age interacted with origin attribute has a statistically significant effect and shows that adult consumers have more utility when they choose Date Palm from Ihsaa region. The standard deviation for the attributes and interactions with socio-
demographic characteristics is statistically significant indicating the presence unobserved preference heterogeneity regarding these attributes which justifies the use of the random parameter logit model to take into account this heterogeneity. Regarding the model fit, a chi-square statistics statistically significant which suggests that the attributes and the interaction terms in the model are jointly significant and affecting consumers’ utility.

Table 5: Random Parameter Logit model estimates

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Parameters estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>-0.042*** (0.009)</td>
</tr>
<tr>
<td>Process : mean</td>
<td>0.062* (0.036)</td>
</tr>
<tr>
<td>Location : mean</td>
<td>0.360*** (0.053)</td>
</tr>
<tr>
<td>Interaction terms</td>
<td></td>
</tr>
<tr>
<td>Age-location : mean</td>
<td>0.146* (0.086)</td>
</tr>
<tr>
<td>Gender-location : mean</td>
<td>0.093 (0.077)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters’ distributions standard deviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
</tr>
<tr>
<td>location</td>
</tr>
<tr>
<td>Age - location</td>
</tr>
<tr>
<td>Gender - location</td>
</tr>
<tr>
<td>Model diagnostics</td>
</tr>
<tr>
<td>Log likelihood</td>
</tr>
<tr>
<td>$\chi^2(4)$</td>
</tr>
<tr>
<td>BIC</td>
</tr>
</tbody>
</table>

*** (**) [*] denotes statistical significance at the 1 (5) [10] % level . Standard errors in parenthesis

Conclusions:

The objective of this paper is to assess consumers’ willingness to pay using two major varieties of Date Palm in Ihsaa town in Saudi Arabia through a stated choice experiment with cheap talk script, considering specific attributes identified by a pilot study of 35 respondents that are production location, processing and the price. This work is considered the first to apply a choice experiment to understand consumers’ preferences towards two major varieties of Date Palm in Saudi Arabia. Results indicate that consumers are receiving more utility and willing to pay more for locally produced Date Palm from Ihsaa compared with Kharg regions. The processing and the interaction between age and location are also found to be relevant in increasing consumers’ utility. Consumers are willing to pay more for processed Date Palm for its property of long shelf life. The price is negative which is consistent with the demand theory. The standard deviation for the attributes and interactions with socio-demographic characteristics is significant indicating the presence of heterogeneity in consumers’ preferences.

A governmental effort to increase Dates Palm production by providing high quality varieties and extension services as an instrument for increasing food security and its role in protecting the environment. Hence strategies towards encouraging farmers to direct Dates Palm for manufacturing have a relevant effect for adding value to this sector. Consequently, jobs creation and solving many marketing problems that occur from the traditional marketing approach. Additionally creating extension programs to increase farmers’ awareness of the governmental subsidises and how they can exploit it.

A possible extension of our analysis is to take into consideration the effect of attitudes, personality traits and lifestyle orientation in food choice to reveal the ambiguity associated with consumer’s behavior process. The first attempt to integrate choice models with latent variable models was done by Ben Akiva et al. (2002) who developed the hybrid choice model. Studies adopted this methodology (Temme et al., 2008; Bolduc and Alvarez-Daziano, 2008; Rungie et al, 2011) suggest that inclusion of latent variables improves the model fit through better explaining choices by adding latent characteristics of the decision makers. Investigation of this latter aspect constitutes an opportunity to extend this analysis.

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