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Comparison of rating-based and choice-based conjoint analysis models. A case study based on preferences for iced coffee in Norway

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ABSTRACT

The authors compare two conjoint analysis approaches eliciting consumer preferences among different product profiles of iced coffees in Norway: rating-based and choice-based conjoint experiments. In the conjoint experiments, stimuli were presented in the form of mock-up pictures of iced coffees varying in coffee type, production origin, calorie content and price, following an orthogonal design. One group of participants ($n = 101$) performed a rating task of 12 iced coffees whereas another group ($n = 102$) performed a choice task on 20 iced coffees presented in eight triads. Then, all participants performed self-explicated rating and ranking evaluations of the iced coffee attributes. The rating data were analyzed by a Mixed Model ANOVA while the choice data were analyzed by a Mixed Logit Model. Both models include conjoint factors, demographic variables and their interactions. Results show that the two approaches share similar main results, where consumers prefer low calorie and low price iced coffee products. However, additional effects are detected within each of the two approaches. Further, self-explicated measures indicate that coffee type is the primary attribute for consumers' selection of iced coffee. The two conjoint approaches are compared and discussed in terms of experimental designs, data analysis methodologies, outcomes, user-friendliness of the results interpretation, estimation power and practical issues.

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1. Introduction

1.1. Experimental consumer studies: Multi-Attribute Valuation (MAV)

Measuring consumers' preferences for goods and services has in recent decades been a significant challenge both in science and for practitioners, for example for product development and marketing purposes (Louviere, Hensher, Swait, & Adamowicz, 2000; Lusk & Shogren, 2007). Among the different preference study techniques, Stated Preference (SP) methods are the most frequently applied (Bateman et al., 2002). SP methods are very useful and versatile and are used for a number of different purposes, including quantifying the individuals' economic valuation or Willingness To Pay (WTP) for a certain good or service (Alfnes, 2004; Alfnes, Guttormsen, Steine, & Kolstad, 2006; Bateman et al., 2002; Caputo, Nayga, & Scarpa, 2013; Van Wezemael, Caputo, Nayga, Chryssochoidis, & Verbeke, 2014). SP methods have the advantage that they can also provide information about hypothetical and simulated products in addition to existing products in the market. Since the mid-1990's, SP methods have dramatically increased in popularity with applications in agricultural and food economics, environmental and resources economics and health economics (Balcombe, Fraser, & Falco, 2010; Louviere, Flynn, & Carson, 2010; Meenakshi et al., 2012; Olesen, Alfnes, Røra, & Kolstad, 2010; Van Loo, Caputo, Nayga, Meullenet, & Ricke, 2011).

Among SP methods the most widespread are the Multi-Attribute Valuation (MAV) techniques, dealing with products featuring multiple attributes alternatives (Louviere et al., 2000). In MAV techniques each good or service is described in terms of their attributes and the levels that these can take (Louviere et al., 2000). Then, consumers are presented with various alternative descriptions of a product or service, differentiated by varying attribute levels, and are asked to either rank, rate or choose among the various alternatives (Louviere et al., 2000; Molteni & Troilo, 2007).

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1.2. Conjoint analysis

One of the most frequently used methodologies for MAV studies is conjoint analysis (CA), which has its origin in marketing (Green & Srinivasan, 1990) and is widely applied in both academic and industry research (Annunziata & Vecchio, 2013; De Pelsmaeker, Dewettinck, & Gellynck, 2013; Saito & Saito, 2013). CA is a method able to estimate the structure of consumer evaluations on a set of product profiles consisting of predetermined combinations of levels of product attributes (Green & Srinivasan, 1990). Thus the method is able to measure buyers' trade-offs among multi-attribute goods or services (Claret et al., 2012; Cox, Evans, & Lease, 2007; Næs, Brockhoff, & Tomic, 2010).

Broadly speaking there are two main CA categories: (i) acceptance-based approaches, which require the individual to rate each alternative product according to their degree of hypothetical purchase intention (here called RBCA) and (ii) preference-based approaches, where consumers are required to express their preferences either in terms of ranks or of choices among several alternative products with varying levels of attributes (here called CBCA).

Several variants of rating scales for acceptance methods have been developed and are commonly used in consumer testing (Hein, Jaeger, Tom Carr, & Delahunty, 2008). We will here focus on willingness to buy (WTB) evaluated on a 9-point category scale ranging from 1 (extremely unlikely) to 9 (extremely likely). Choice experiments (CEs) originate in economics and are increasingly expanding to different fields such as transportation, environment, health, food and marketing (Gracia & de Magistris, 2013; Haaijer, Kamakura, & Wedel, 2001; Lusk & Schroeder, 2004; Van Loo et al., 2011; Yangui, Akaichi, Costa-Font, & Gil, 2014). The underlying hypothesis of CEs is that obtaining preferences by having respondents choose a single preferred stimulus among a set of stimuli is a more realistic and therefore a better method for approaching actual decisions (Louviere et al., 2000).

The literature states that there is no clear empirical evidence for choosing RBCA models over CBCA models, and vice versa (Moore, 2004) in terms of experimental designs techniques, data analysis methodologies, outcomes, user-friendliness, estimation power and practical issues. It is therefore important to conduct more research comparing the two models in different settings, possibly by systematically varying design parameters (Karniouchina, Moore, van der Rhee, & Verma, 2009; Moore, 2004).

1.3. Rating versus choice experiments modeling

Rating and choice-based CA experiments employ different experimental designs and modeling approaches to estimate models that predict consumer preferences (Louviere & Woodworth, 1983). The literature shows that preferences vary across contexts and elicitation processes (Payne, Bettman, & Johnson, 1992), suggesting that there may be systematic differences between RBCA and CBCA elicitation models (Moore, 2004). First of all, an hypothesis put forward is that CBCA tasks are more similar to real market place behavior than profile ratings, which may lead to a greater external validity of CBCA (Elrod, Louviere, & Davey, 1992). Secondly, in terms of information produced, CBCA may produce less information than individual rating tasks (Lusk, Fields, & Prevatt, 2008; Moore, 2004). Thirdly, choice tasks are expected to be easier to perform than rating tasks since respondents can make choices independently without worrying about rating scale consistency over profiles (Moore, Gray-Lee, & Louviere, 1998) and with less mental processing (Næs et al., 2010). Fourthly, since only one choice is made in CBCA a larger number of profiles can sometimes be presented to consumers. An important exception to this is when real food products have to be tasted by the consumer. In this case, a RBCA approach may be preferred in order to limit sensory fatigue with the number of products. Fifth, CBCA experimental designs as well as data analysis are more complex (Street & Burgess, 2007; Train, 2009) than RBCA (Næs et al., 2010) which is based on standard well established ANOVA (ANalysis Of VAriance). Finally, RBCA models present results directly in the same units as the rating scores while for the CBCA the size of the coefficients can only be considered relative to each other. A common approach is then to convert CBCA coefficients into willingness-to-pay values expressed in monetary units, allowing an easy interpretation of results. However this is only possible if one of the conjoint factors in the experimental design is price (Hole, 2007).

1.4. Self-explicated tests

Another important way of collecting MAV data is to use self-explicated tests. Contrary to conjoint analysis, these tests consist in simply asking the consumer what product attributes are the most important for product selection (Sattler & Hensel-Börner, 2003). The approach is straightforward and does not require any complex design or data analysis. In the present case study, the self-explicated tests will be limited to investigating the importance of four iced coffee attributes, without investigating consumer preferences for actual sublevels of the attributes.

1.5. Application based on iced coffee

Iced coffee was introduced on the Norwegian food market in 1999 by one of the main Norwegian dairy companies. Since then, other brands have followed up with a subsequent growth of consumption in the recent years (Asioli, Næs, Granli, & Lengard Almli, 2014). As the product range of iced coffee on the Norwegian market is expanding, more information is needed for food companies for a better understanding of consumer preferences and choice attributes for this product category. Therefore, it is relevant to consider the impact of various extrinsic factors that influence consumer food choice. Getting more information from consumers is particularly useful for iced coffee producers in Scandinavia, considering that Scandinavian countries have some of the world's highest levels of coffee consumption, with 7.2 kg per capita in Norway (CaffeineInformer, 2015).

To the best knowledge of the authors, there are only two studies which investigated factors that influence consumer preferences of iced coffee. Petit and Sieffermann (2007) investigated the effect of the physical testing environment on liking and consumption of iced coffee by French consumers while Asioli et al. (2014) investigated extrinsic product factors and individual characteristics affecting consumers' willingness to buy (WTB) iced coffee from rating evaluations in Norway. The present paper is partially based on the same consumer study as the latter reference, but focuses on method comparisons and utilizes an additional part of the original data material, namely choice-based willingness to buy.

1.6. Objective

The primary objective of this study is to compare RBCA and CBCA models of iced coffees varying in extrinsic parameters. The models will study conjoint effects and their interaction with consumer demographic characteristics. Practical issues, user-friendliness, interpretation and concrete results of the two approaches will be discussed. In addition, a self-explicated test of attributes' importance will be reported for the purpose of investigating its potential role in this type of studies as complementary to conjoint analysis.

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