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How where I shop influences what I buy: the importance of the retail format in sustainable tomato consumption

Chad M. Baum[1] *and Robert Weigelt*[2]

Abstract

Although interest in sustainable food has increased substantially in recent years, the actual demand for such products has typically proceeded quite unevenly across consumers. Making sense of the variable pace of behavioral change requires that we explore the foundations of sustainable consumer behavior, especially the importance attached to particular attributes and the types of tradeoffs that exist. For this reason, this study utilizes a discrete choice experiment (DCE) that integrates the type of retail format to establish the potential for interaction effects with attributes. Stated-preference methods like DCEs have proven useful to explain how and why individuals' willingness to pay (WTP) for qualities such as organic, fair trade, and locality can differ. However, by mostly focusing on product qualities alone, the importance of the retail formats where products are actually purchased – and their potential impact on the valuation of attributes – is left unexplored. Framing this DCE in relation to sustainable tomato consumption, we can conclude that the type of retail format is a significant determinant of purchasing behavior, both on its own and in its interaction with the other qualities.

Keywords: sustainable consumption; retail format; discrete choice experiment; willingness to pay

JEL classification: D12; Q13; Q18

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1 Introduction

Interest in sustainable food has grown markedly in recent years and, along with it, the increasing familiarity of such products in the shopping baskets of consumers and on the shelves of retailers. On the one side, prompted by concerns over heightened pesticide usage, global sales of organic food have grown fourfold in the last decade, recently surpassing $64 billion worldwide (Sahota, 2014). Meanwhile, linked with the promise of higher farm incomes in developing countries, the market for fair-trade goods has similarly expanded to $8 billion globally, having grown annually in excess of 20% (Fair Trade, 2014). In each case, growing demand for sustainable production is driven by the perceived shortcomings of conventional food systems, and what is more the greater belief that purchasing decisions are a suitable means to express this dissatisfaction. On the other, there are the resulting changes to supply chains and the retail sector. For instance, given that most families (81%) in the United States identify themselves as (at least) occasional consumers of organic food (OTA, 2013), it is crucial for most retail formats (82%) to make sure to have such products on offer (FMI, 2008). Generally speaking, this connection between the 'mainstreaming' of sustainable consumption and the greater involvement of various retail formats speaks to an important truth. For sustainable consumption to be a vehicle for meaningful change, it is vital for it to not be just a niche concern, but undertaken by an increasing proportion of the population.

Even while interest in sustainable food has grown markedly, actual consumption of products has however tended to grow unevenly. As such, it is a small subset of passionate consumers shopping at alternative venues like farmers' markets who are ultimately responsible for the aforementioned growth (Padel & Foster, 2005; Pearson et al., 2011). Instead of the stated willingness to pay more for sustainable food, there is thus a substantial gap between what people say and how they behave (e.g. Bamberg & Möser, 2007; Gifford, 2011). If, owing to the range of factors that countervail against the adoption of new behaviors, the predicted behavioral changes are unlikely to materialize, we are likely to confront a

substantive limit on the potential for growth in sustainable food markets. For this reason, one key task for researchers is to understand the structural and psychological factors that underlie the uneven pace of behavioral change. On the one hand, given how this varies across individuals, one can pursue an 'individual-oriented' explanation that, for instance, attempts to construct a 'profile' of sustainable consumers, i.e. on the basis of socio-demographic characteristics such as age, gender, and income (Govindasamy & Italia, 1999) and motivational interests like environmental concern and perceived self-efficacy (Hughner et al., 2007; Nurse Rainbolt et al., 2012). In other words, some individuals act more sustainably exactly because they more closely resemble the prototypical sustainable consumer, i.e. someone with the values, motivation, and resources needed to consume sustainably.

Notably absent from this account, however, is the greater diversity among types of retail formats that has been developing alongside the emergence of sustainable consumption. Nonetheless, whether by providing for the availability of sustainable food or ensuring the credibility of quality claims, the retail format is a central element of purchasing decisions. After all, type of shopping venue has been acknowledged as one of the most important determinants of organic consumption (Schifferstein & Oude Ophuis, 1998; Thompson & Kidwell, 1998; Zepeda & Li, 2007). Shopping at an alternative retail format, such as a farmers' market, has therefore been linked with a greater likelihood of purchasing local and organic food (Bond et al., 2008a; Yue & Tong, 2009), as well as heightened levels of both quality perception and price sensitivity (Umberger et al., 2009; Hsieh & Stiegert, 2012). However, owing to the focus on products and product attributes, it is difficult to offer greater clarity on any relationship between formats and sustainable consumption, plus whether this may vary due to the type of retail format in which products are actually purchased.

Accordingly, this study uses a hypothetical discrete choice experiment (DCE) with opt-out option to explore the importance of the type of retail format for sustainable consumption. In specific, we ask if the fact that a product is sold at a

certain format affects the perceived value of organic and local production, i.e. in addition to the impact of any product labels. Stated-preference methods like DCEs have proven useful to understand how and why consumers differ in their demand for sustainable production. By integrating type of retail format – i.e. discounters, supermarkets, and independent organic retailers – directly into choice tasks, we can therefore explore two possible mechanisms by which formats might impact sustainable (tomato) consumption. First, alongside sustainable attributes such as organic, fair trade, and local production, the type of retail format could have a direct impact on the likelihood of sustainable purchasing. Second, by facilitating interactions with the quality attributes, we can explore the potential for a more indirect influence, namely via the impact on the demand for certain attributes. For instance, it could be that a format influences choices involving organic food but not fair trade. Finally, to quantify how much retail formats matter, we use the empirical results to deliver willingness to pay (WTP) estimates, including for the interactions between retail formats and product attributes.

2 Retail Formats and Sustainable Consumption

The overall intent of this section is to piece together evidence and arguments from the literature on sustainable consumption regarding the importance of the retail format. In specific, we consider how and why the type of retail format can have an influence on sustainable purchasing decisions, directly and indirectly. To motivate our discrete choice experiment (DCE), it is useful to begin by clarifying how demand is usually conceived in the literature. Following Lancaster (1966), DCEs tend to disassemble products into their component attributes. Regarding sustainable consumption, this involves separating the distinct aspects of interest (e.g. organic, fair trade, and locality) from one another. In this manner, we can isolate the sources of consumer demand before estimating the value assigned to each. For instance, Onozaka & Thilmany McFadden (2011) find a premium for local vis-à-vis national production of $0.22 for apples and $0.38 for tomatoes. Such estimates of

willingness to pay (WTP) offer a broad measure to discuss the perceived value of an attribute – not to mention the basis to consider how this varies by country and product category (Rödiger & Hamm, 2015). In contrast, it is notable that the aforementioned study fails to find any 'organic' premium, implying that consumers either fail to see the merits of organic production or, more revealingly, that the presence of locality is sufficient to ensure the overall quality of the product.

Potential interactions among the diverse aspects of sustainable production thus introduce a further point of contention. In the first place, it is possible that the overall effect of the many attributes differs from what their respective sums would indicate (Onozaka & Thilmany McFadden, 2011; Meas et al., 2015). For example, Bond et al. (2008b) reveal that WTP for a product with organic, local, and nutritional claims is only slightly higher than for a single claim in isolation. Besides demonstrating that the total effect is not necessarily additive, this kind of interaction points to the potential for 'indirect' effects of one attribute on another. Through the learning theory of attitude formation (Fishbein, 1967), Dentoni et al. (2009) therefore develop a conceptual framework that explicitly distinguishes 'direct' and 'indirect' benefits of attributes. Highlighting the importance of credibility for sustainable production, the authors specifically define an indirect effect as one "mediated by [the] belief that other desirable product attributes… are present in the product" (Dentoni et al., 2009, p. 384-5). In other words, as the credence qualities related to the production process (e.g. fair trade and organic production) cannot be verified before or after consumption (Darby & Karni, 1973), any attribute that can serve more broadly as a cue of product quality is able to assume additional importance. In the case of locality, the greater visibility and perceived trustworthiness of the shorter supply chains (Meyer & Sauter, 2004; Henseleit et al., 2007) could, for instance, impact quality evaluation of claims involving organic production and animal welfare (Darby et al., 2008; Thilmany et al., 2008; Verbeke & Ward, 2008). The broad upshot is that there are a number of reasons why people might value an attribute like local production, namely the benefits directly attained and its relevance as a cue to infer the existence of other

qualities. This can be expressed more clearly via the equation below, adapted from Dentoni et al. (2009):

$$Quality\ Evaluation\ (Product) = \sum_{i=1}^{n} e_i b_i \qquad (1.1).$$

In Equation 1.1, overall evaluation of product quality is expressed vis-à-vis the summation of the expected value of all attributes comprising the product. In specific, *i* is an attribute of the product, e_i reflects the evaluative judgment for a particular attribute *i*, and b_i concerns the belief strength that attribute *i* exists. Holding the relevant evaluative judgments constant, we note that any factor that increases belief strength that an attribute is present will have an impact on quality evaluation. As a result, the existence of preference heterogeneity could reflect the outcome of an underlying difference in preferences or, conversely, a difference in their respective levels of belief strength.

Aside from local production, a number of other attributes could serve as cues of product quality, notably the retail formats in which purchasing decisions are actually taken. Generally speaking, it has not been necessary to assign any further role to retailers or retail formats, other than ensuring sufficient access to sustainable products. In part, this is the result of the widespread application of models based on Attitude–Behavior-Context (ABC) Theory, such that context is solely defined as a set of constraints or incentives (see Feldmann & Hamm, 2015). In fact, it is not uncommon to characterize the role of retail formats only in terms of making sustainable products cheaper and widely available (Vermeir & Verbeke, 2008; Zepeda & Li, 2007). However, by focusing on sustainable consumption being as easy and convenient as possible, it becomes difficult to explain the impact of 'alternative' formats on sustainable purchasing decisions. For instance, Russell and Zepeda (2008) illustrate how participation in community-supported agriculture regimes can cause individuals to 'adapt' their preferences to the arrangement, i.e. by assigning greater importance to seasonality and developing an appreciation for the task of farming. This dynamism is expressly linked with the deeper level of

interaction with the people and places involved in the production of one's food, a finding that has been anecdotally replicated by other studies (e.g. Brown, 2002; Hinrichs, 2000; Padel & Foster, 2005; Zanoli & Naspetti, 2004).

Furthermore, any differences between retail formats prove especially significant if ever there are issues with certification systems. Notably, if the information from such systems is insufficiently credible, utilizing labels as the exclusive basis for quality evaluation is likely to prove ineffective (Jahn et al. 2005; Janssen & Hamm, 2012). In fact, Rousseau (2015) determines that a plurality of consumers tend to see labels as 'marketing tools' that do not always guarantee what is promised. As a result, it is necessary to use other cues to 'indirectly' evaluate quality claims, including the perceived credibility of sellers (Cuthbertson & Marks 2008; Moser et al. 2011) and certification agency involved (Janssen & Hamm 2012; Olynk et al. 2010; Van Loo et al., 2011). As such, we can hypothesize a potential role for the type of retail format: namely, whenever quality claims of one format, e.g. independent organic retailers, are perceived to be more credible than those of its counterparts. If so, the type of format can positively impact likelihood of sustainable purchasing, irrespective of any change in level of quality. We can thus discern two distinct ways a consumer derives greater value from an attribute: (1) because the consequences engendered by the attribute matter to them; or (2) given its efficacy as a signal, there is a stronger belief that other valuable attributes are present. Taking the case of organic production, two consumers who purchase from different retail formats could end up expressing the same 'value' for an attribute even if, e.g., the first consumer places greater importance on organic production, but is less sure that it is present, while the second, although caring less, has better access to credible information. In sum, retail formats and labeling schemes represent distinct means to gather information.

Although no other DCE directly considers the relevance of information credibility for purchasing decisions, several studies (e.g. Bond et al., 2008b; Onozaka et al., 2011; Yue & Tong, 2009) have utilized retail formats to distinguish consumers in terms of where they shop most frequently. As a result, differences

between retail formats are something akin to a socio-demographic factor, since any change in one's preferences is also likely to correspond with a change in the shopping venue. In other words, type of venue can be used for "'sorting' consumers with similar motivations and values" into relevant groups for further analysis (Onozaka et al., 2011, p. 583). Nonetheless, even as an initial step towards clarifying why retail formats matter, any sort of *in situ* explanation of how the type of retail format is relevant for consumer decision-making remains absent. In fact, by characterizing format choice so statically, there is little scope for preference or attitude learning to occur, or indeed for situational factors to have much of an impact at all. Given how few studies have highlighted the interactions between the how and where of food production (Table 1), it is thus reasonable for this analysis to be extended to also include the type of retail format. To explore the mechanisms involved, we integrate type of retail format as an attribute within our DCE to consider its impact on purchasing decisions in a more comprehensive fashion.

3 Designing the Discrete Choice Experiment

Driven by the growing interest in sustainability considerations, consumer research is increasingly turning to stated-preference methods to understand potential demand. Instead of what individuals purchase or have purchased, such approaches use survey responses to determine the (non-market) value of specific quality improvements (Arrow et al., 1993; Kahneman & Knetsch, 1992; Turner et al., 2002). Even where markets are not well-established, it is stressed how such surveys "can create an idealized market … whereby respondents face a choice between two different quantities of the good" (Carson, 2000, p. 1414). Participants are notably invited to express their preferences between the status quo to which they are accustomed and one or more alternative outcomes that typically require a cost increase. Regarding discrete choice experiments (DCEs), preferences of individuals are ascertained from (repeated) choice tasks in which they are asked to choose

from among a set of products.[3] By analyzing the decisions taken, it is possible to assess the viability of potential markets for these qualities, i.e. by comparing the degree of WTP to the price premium that would be required to support higher-quality production. If individuals are not willing to pay enough, then this offers one explanation for why a market has failed to materialize.

In spite of their possible advantages, DCEs have not been extensively used to explore sustainable food consumption. In fact, to the best of our knowledge, only ten studies use a DCE to explore sustainable purchasing determinants (see Table 1), and some of these fail to accurately recognize their method as a DCE. On this point, Louviere et al. (2010) note the critical differences between DCEs and the other approaches, most notably conjoint analysis, with which they are commonly confused. Notably, though both represent cases of multi-attribute valuation, DCEs are discerned by the underlying behavioral theoretical foundation, random utility theory, and resultant advances in versatility and (external) validity for decision-making processes (ibid.).

[3] The choice-driven nature of DCEs is one of their principal advantages, i.e. for their greater correspondence with the types of decisions made in the real world. A contrast with experimental auctions is helpful in this regard, especially given the evidence that preference reversals are likely to occur when individuals engage in bidding instead of choice (Lichtenstein & Slovic, 1971; Slovic & Lichtenstein, 1983). That is, as bidding is more specifically motivated by winning, it is a mechanism that is not analogous to choice, and which can therefore lead to distinct outcomes.

Table 1: Summary of DCE Studies

	Products	Key attributes	Attribute interactions
Lusk et al., 2003	Beef ribeye steaks	Fed genetically modified corn Administered growth hormones	No
Bond et al., 2008b	Red leaf lettuce	Organic certification Nutritional claim	No
Yue and Tong, 2009	Tomatoes	Organic certification Local production	Yes, between organic and local
Onozaka & Thilmany McFadden, 2011	Apples Tomatoes	Organic certification Fair Trade certification Origin (local, national, imported) Size of Carbon Footprint	Yes, between all relevant attributes
Van Loo et al., 2011	Chicken breast	Organic certification (different types of logos)	No
Janssen & Hamm, 2012	Apples Eggs	Organic certification (different types of logos)	No
Rousseau & Vranken, 2013	Apples	Organic certification Origin (local, Spain, Australia)	No
Garcia-Yi, 2015	Yellow chili peppers	Organic certification Fair Trade certification	No
Meas et al., 2015	Processed blackberry jam	Organic certification Origin (local, state-level, other) Nutritional claim Size of Farm (large, small) Type of brand (national, regional, or store-specific)	Yes, for farm size, organic, and origin.
Rousseau, 2015	Chocolate	Organic certification Fair Trade certification Origin (Belgium, Switzerland, Netherlands)	No

3.1 *Survey and Data Collection*

This survey was administered via computer at an open-to-the-public event in November 2013 in Germany. Participants are typically motivated to attend 'Long Night of Science' events due to an interest in the work of local research institutes. As such, these events represent an opportunity for data collection that avoids some notable shortcomings of student-based samples. Furthermore, as the second-largest market for organic and fair-trade products (Schaack et al., 2014), Germany is a suitable context for exploring sustainable consumption. Not to mention, the retail sector is quite diverse as well. On the one hand, there is the prevalence of both discounters and supermarkets, which account for almost three-fourths of the total market share (Minhoff & Lehmann, 2015). Nevertheless, alternative retail formats also play a prominent role, especially whenever issues of trustworthiness are involved (e.g. GS1, 2006).

The survey begins with information about the experiment. Initial instructions about the DCE are presented to instill a proper decision-making frame: with individuals explicitly asked to envision themselves going shopping for, among other things, tomatoes. Participants are requested to complete all choice tasks alone and to answer as accurately and spontaneously as possible. Since learning effects and fatigue are often prevalent for computer-administered surveys (Savage & Waldman, 2008), the sequence of tasks within the blocks is randomly determined. In this manner, we ensure that the variation in the sample reflects, as much as possible, the underlying preference heterogeneity.

The total number of participants who completed the DCE was 125, resulting in an eligible sample of 124: one failed to fill in the socio-demographic questionnaire. Through the software package MODDE 9.0, a D-optimal fractional factorial design is utilized to generate product profiles. We opt not to exclude any possible product profiles, with the single exception of the pair of 'organic retailer' and 'conventional' which was found to introduce unnecessary confusion. Two uneven blocks of tasks were then created, with the first block having 15 choices

and the second 14. Once participants were randomly assigned to blocks, we end up with a total of 1808 observations.

Table 2: Demographic Characteristics of the Sample and Local Population

Characteristic		Sample	Local Population
Gender	Male	37.9%	49.1%[1a]
	Female	62.1%	50.9%[1a]
Average age (years)		32.7 *(12.84)*	42.4[1a]
Nationality	German	94.3%	94.8%[1a]
Education	High-school degree (equivalent)	96.8%	70.9%[1b]
	University degree or higher	50.0%	22.3%[1b]
Employment	Full-time	48.4%	42.2%[1a]
	Part-time and mini-job	21.8%	24.8%[1a]
	Unemployed (incl. students and homemakers)	23.4%	26.5%[1a]
Average number of children		0.69 *(1.04)*	
Average household size		2.84 *(1.56)*	
Household income per month	< 1,000€	27.4%	13.1%[2b]
	1,000€ – 1,500€	12.1%	26.6%[2b]
	1,500€ – 2,000€	14.5%	18.4%[2b]
	2,000€ – 2,500€	11.3%	14.8%[2b]
	2,500€ – 3,000€	12.9%	10.3%[2b]
	> 3,000€	21.8%	16.1%[2b]
Responsible for shopping		84.7%	

Notes: Sample size N = 124. Standard deviations are in parentheses. [1] city-level data (Jena); [2] state-level data (Thuringia); Sources for population values: [a] Stadt Jena, Jenaer Statistik; [b] Thüringer Landesamt für Statistik

3.2 *Sample Characteristics*

A comparison of the socio-demographic characteristics for the sample and local population are provided in Table 2. Since the experiment concentrates on purchasing decisions, a minimum age of 18 is introduced. Women are more prevalent than men in the sample, which is not unexpected given the focus on food purchases. Moreover, the fact that 85% of the sample identifies itself as responsible for household shopping is more important for the validity of the experiment. Given

the nature of open-to-the-public events, there is however clear potential for self-selection bias. In specific, the sample has a higher level of educational attainment than is typical, as half have at least the equivalent of a Bachelors' degree. It should be noted, however, this is partly explained by the high proportion of university employees to the general population in the local context.

3.3 *Experimental Design*

There are three core features of any DCE: (1) the attributes and levels used to describe products; (2) the specification of the status quo; and (3) the structure of choice tasks. Each sub-section will therefore take up one specific topic in outlining the experimental design.

Attributes and Attribute Levels

Selection of the attributes was determined from an extensive review of the literature. The full list of attributes and attribute levels is seen in Table 3.[4] Four of the five attributes are reminiscent of other studies: i.e. price; production location; organic production; and ethical standards. Prices are for 500g of red round tomatoes, and reflect those in the broader experimental context. Similarly, levels for production location were selected based on likely availability, with Spain and Mexico both leading exporters of tomatoes to Germany. Furthermore, as one of the largest German states for tomato production, the region where the survey is conducted (Thuringia) is used to represent tomatoes of local origin. Meanwhile, information about organic production and ethical standards is provided to offer background to participants.[5]

[4] Two distinct rows for the price attribute are needed to ensure that no two products in a choice task are completely identical. This modification is required by use of an individual-specified status quo.

[5] Use of labels is eschewed in favor of the phrases 'organic' and 'fair' in the experiment. Labels are avoided in view of the tendency for value to be placed on labels themselves, irrespective of what they convey (Lotz et al., 2013). For instance, Janssen and Hamm (2012) show that a 'fake' logo explored in Switzerland was assigned higher WTP than generic organic labeling. Given our interest in underlying decision-making processes, this approach is thus justified.

Table 3: Attributes and Attribute Levels

Attribute	Attribute levels
Price per 500g	1.50 €; 2.50 € (Status quo) 1.00 €; 2.00 €; 3.00 € (Alternatives)
Country of origin	Local (Thuringia) Mexico Spain
Retail format	Organic retailer Discounter Supermarket
Organic production	Organic Conventional
Ethical standards	Fair Not fair

Three types of retail formats, i.e. discounters, supermarkets, and independent organic retailers, are included to highlight salient differences.[6] So that participants do not just rely on existing perceptions of specific retailers, we depict formats using features like store size, product variety, prices, and ownership structure (cf. Wortmann, 2004; Herrmann et al., 2009). Supermarkets are thus defined as the largest format, having the most diverse product assortment, and with access to national or international distribution networks. Discounters are identified by an emphasis on low prices, more limited product selection, and less use of advertising and service personnel. Finally, organic retailers are distinguished by the fact that the entire product range is oriented toward a single quality (i.e. organic) and that they are often independently owned and operated. It is noted that this latter feature can foster closer partnerships with small-scale producers in the region and, as a result, a higher percentage of local and regional products.

[6] The corresponding translation of 'independent organic retailer' in German is the much more familiar 'Biomarkt'. Hereafter, the shorter form, namely 'organic retailer', is therefore used with no intended change in meaning.

Specification of the Status Quo

As the baseline against which the product alternatives are compared, the status quo is an integral aspect of the DCE. To offer a realistic choice situation, it is vital for the status quo to take into account relevant differences in consumption histories; otherwise there is a risk for the decision-making calculus underlying the tradeoffs to be misrepresented. For the sake of convenience, it is however common to assign an identical status quo to all participants, e.g. one denoting the most purchased product in a given region. Regardless of whether one has ever tasted Fair-Trade coffee or purchases all her food from a farmers' market, the status quo is thus considered to be the same. Unfortunately, there are a number of issues with this simplification. First, imposing an unfamiliar status quo could confound an individual's ability to respond accurately, thus limiting the validity of the experiment. If I am accustomed to eating local and organic produce, then a status quo that does not reflect my expectations is likely to have limited meaning. Moreover, by neglecting the diversity in consumption histories, we are ignoring one potential factor likely to be influential for preference heterogeneity, which is after all what we wish to understand.

Consequently, we enlist the help of participants to specify the status quo for their respective set of choice tasks. After being provided with some initial information about the attributes and attribute levels, individuals are asked to pick the level that best reflects their typical consumption pattern. For instance, individuals are asked whether they tend to pay 1.50€ or 2.50€ for 500g of tomatoes. By replicating this procedure for each attribute, a description of the typical tomato is realized for each participant.[7] To our knowledge, this is the first experiment in the sustainable consumption literature to use such an individual-specified status quo. We see this as beneficial for a number of reasons, e.g. the potential to reduce experimental complexity by offering a more familiar baseline against which alternatives can be compared. More importantly, the additional step

[7] Complete results for the individual-specified status quo are available from the authors upon request.

of identifying one's typical tomato could foster a greater sense of ownership that renders "trading off" from the status quo slightly more difficult. In this regard, individual-specified status quos make overall interpretation easier. Namely, one advantage of DCEs is the potential opportunity to highlight the combination(s) of attributes that encourage individuals to forsake the familiarity of the status quo. By using details about consumption histories, we can therefore make choice tasks more reflective of actual decisions and improve the accuracy of the WTP estimates.

Description of Choice Task

In each choice task, participants are shown pictures of two tomatoes that vary in terms of only the aforementioned attributes (see Table 3). Participants are informed that the tomatoes are otherwise identical. An example of the choice task is shown in Figure 1. Note that 'Tomato A' represents the individual-specified status quo, thus remaining the same for all choice tasks of a participant, whereas 'Tomato B', as the alternative, varies throughout. Participants are also given an 'opt out' option to purchase neither product. As such, each choice task includes three possible options. The inclusion of an opt-out option in DCEs is recommended both to increase the realism of the choice setting and to obtain as much preference information as possible (Carson et al., 1994; Louviere et al., 2000). Moreover, if people are forced to choose even if a clear preference does not exist, the likelihood is higher that stated preferences deviate from actual purchasing behavior (Kontoleon & Yabe, 2003). Lack of an opt-out option can thus be cause to doubt the validity of the results and the resulting willingness-to-pay estimates.

Figure 1: Example of Choice Task

There are three choices available: Buying one of the two tomatoes described below or choosing neither of them. Please mark only one box.	
Tomato A	Tomato B
	
2.50€ / 500g	2.00€ / 500g
Local	Spain
Organic retailer	Supermarket
Organic	Organic
Fair	Fair

Please choose one:	I would buy tomato A.	I would buy tomato B.	I wouldn't buy either of them.
	☐	☐	☐

Model Specification

Discrete choice experiments (DCEs) signify one specific application of the random utility theory (RUT) first proposed by Thurstone (1927) and later extended by McFadden (1974). Applying the characteristics approach of Lancaster (1966), DCEs make use of the assumption that individuals gain utility through consuming the attributes comprising the product under evaluation. Using this framework, it is proposed that the utility that a decision maker *n* obtains by choosing alternative *j* in choice situation *t* can be represented by a discrete-choice specification of the following form:

$$U_{njt} = v(A_{njt}, \beta) + \varepsilon_{njt}. \qquad (1.2).$$

As expressed by Equation 1.2, the level of utility (U_{njt}) is decomposable into two additively separable components: a systematic (explainable) part $v(A_{njt}, \beta)$ that is a function of observable attributes of the alternatives, the socio-economic factors of

the respondent, and the features of the decision context and choice task; and a random error term ε_{nj} reflecting unmeasured preference heterogeneity (Louviere et al., 2000). Generally speaking, it is assumed that an individual *n* will select alternative *j* if and only if that alternative maximizes utility for all *J* alternatives presented in the choice situation *t*. Hence, the probability (P_{nit}) of choosing the alternative *i* over alternative *j* can be expressed in the following manner:

$$\begin{aligned} P_{nit} &= \text{Prob}(U_{ni} > U_{nj}) \,\forall j \neq i \in t \\ &\Pr ob(v_{ni} + \varepsilon_{ni} > v_{nj} + \varepsilon_{nj}) \,\forall j \neq i \in t \\ &\Pr ob(\varepsilon_{nj} - \varepsilon_{ni} < v_{ni} - v_{nj}) \,\forall j \neq i \in t. \end{aligned} \tag{1.3}$$

By varying the assumptions related to how the random components are distributed, it is possible to obtain different types of discrete-choice models. In this paper, it is resolved that all coefficients in the model, with the exception of price, vary across individuals. In other words, all coefficients are random parameters. A mixed-logit model specification is thus estimated to analyze the results (Greene and Hensher, 2003). If the subscript *t* is (briefly) ignored, the main equation for the probability of taking alternative *i* over *j* in a mixed-logit setting can be expressed as follows:

$$\mathrm{P_{ni}} = \int \frac{\exp(\mathrm{x'_{ni}}\beta)}{\sum_{j=1}^{J} \exp(\mathrm{x'_{nj}}\beta)} f(\beta \mid \theta)\, d\beta \tag{1.4},$$

where $f(\beta \mid \theta)$ is the density function of β.

When an individual makes not only one but several choices in a series, moreover, the probability that a particular sequence of choices occurs can be expressed by:

$$\mathrm{S_n} = \int \prod_{\mathrm{t=1}}^{\mathrm{T}} \prod_{\mathrm{j=1}}^{\mathrm{J}} \left[\frac{\exp(\mathrm{x'_{njt}}\beta)}{\sum_{j=1}^{J} \exp(\mathrm{x'_{njt}}\beta)} \right]^{y_{njt}} f(\beta \mid \theta)\, d\beta \tag{1.5},$$

where y_{njt} is equal to 1 if the alternative *j* is chosen in choice situation *t*, and equal to 0 otherwise.

Reflecting a potential difficulty for model evaluation, Train (2009) notes that the log likelihood,

$$\mathrm{LL}(\theta) = \sum_{n=1}^{N} \ln S_n \tag{1.6},$$

cannot be solved analytically. As such, the θ parameters can only be estimated by maximizing the simulated log-likelihood function of the following form:

$$\mathrm{SLL} = \sum_{n=1}^{N} \ln \left\{ \frac{1}{R} \sum_{r=1}^{R} S_n\left(\beta^r\right) \right\} \tag{1.7},$$

where *R* is the number of replications and β^r is the *r*-th draw from the density function $f(\beta \mid \theta)$ (Hole 2007). Using Equation (1.7), we can obtain coefficient estimates for all relevant attributes β_k. By using a similar approach to calculate the coefficient of the cost attribute β_c, it is possible to express the willingness to pay for an improvement in a given attribute *k* as the negative ratio of the respective coefficients of the attribute and cost attribute. Before doing so, however, our use of effects coding for the categorical independent variables means that we need to multiply the initial WTP estimates by -2 (Bech & Gyrd-Hansen 2005), resulting in the following equation:

$$WTP_k = -2\frac{\beta_k}{\beta_c} \tag{1.8},$$

where *k* is an effects-coded attribute and WTP_k represents the marginal WTP for attribute *k*. With regard to the joint WTP for two attributes and the interaction effect, i.e. WTP_{k*m}, this can be calculated as follows:

$$WTP_{k*m} = -2\frac{(\beta_k + \beta_m + \beta_k * \beta_m)}{\beta_c} \qquad (1.9),$$

where *k* and *m* are effects-coded attributes, and $\beta_k * \beta_m$ expresses the interaction between them.

4 Results and Discussion

A mixed-logit model specification with two way-interactions between the attributes is utilized to estimate the results of the DCE. Estimation is conducted via the *mixlogit* command in Stata 13.1 (Hole 2007; also Train 2009). As all the random effects are significant, this specification better reflects the preference heterogeneity in the sample than the corresponding multinomial and fixed-effects logit specifications.[8] All main effects are thus modelled as random parameters with the single exception of price, which must be fixed to have WTP estimates with a normal distribution (Train, 2009). Inclusion of two-way interactions between the attributes also provides superior fit to a standard mixed-logit model, a finding robust to choice of information criterion. Meanwhile, interactions between main effects and socio-demographic factors are also integrated, with these fourteen terms selected through a sequence of significance tests. As only three such interactions were significant in the final model, they will not be discussed further. However, we opt to include the interactions for the greater explanatory power provided and overall improvement in model fit. Results are presented in Table 4.

[8] Although generally advisable (Hoyos, 2010), a constant term is not included as this term became insignificant once the random effects were included. Furthermore, use of effects coding for the categorical independent variables limits the potential for correlation with the intercept, even if interactions are included (ibid.).

Table 4: Results of the mixed-logit model with two-way interactions

Attribute	Parameter estimate	*SE*	*p*-value	CI (95%) Lower limit	Upper limit
Main effects					
Local[1]					
Mean	1.64***	0.579	.005	0.51	2.78
SD	1.86***	0.285	.000	2.32	2.42
Mexico[1]					
Mean	-2.27***	0.464	.000	-3.18	-1.36
SD	0.80***	0.303	.008	0.21	1.40
Organic Retailer[1]					
Mean	-0.63	0.412	.130	-1.43	0.18
SD	0.92***	0.201	.000	0.53	1.32
Discounter[1]					
Mean	-1.68**	0.714	.019	-3.07	-0.28
SD	0.94***	0.211	.000	0.53	1.35
Organic[1]					
Mean	2.03***	0.727	.005	0.61	3.45
SD	1.96***	0.296	.000	1.38	2.54
Fair[1]					
Mean	3.74***	0.634	.000	2.50	3.45
SD	1.56***	0.251	.000	1.07	2.06
Price (fixed)	-3.60***	0.359	.000	-4.31	-2.90

Attribute interactions					
Local x Organic Retailer	1.37*	0.719	.057	-0.04	2.77
Local x Discounter	0.42	0.494	.392	-0.55	1.39
Local x Organic	-0.36	0.702	.605	-1.74	1.01
Local x Fair	-0.03	0.566	.956	-1.14	1.08
Mexico x Organic Retailer	3.04***	0.730	.000	1.61	4.47
Mexico x Discounter	1.27**	0.587	.030	0.12	2.42
Mexico x Organic	-0.30	0.721	.674	-1.72	1.11
Mexico x Fair	0.11	0.662	.874	-1.19	1.40
Discounter x Organic	-0.84*	0.504	.093	-1.83	0.14
Discounter x Fair	-0.17	0.514	.746	-1.17	0.84
Organic Retailer x Fair	-0.31	0.661	.635	-1.61	0.98
Organic x Fair	-1.07***	0.612	.001	-2.26	0.13

[1]Effects-coded variable. Notes: *p < .10, **p < .05, ***p < .01; SE = standard error; CI = confidence interval; SD = standard deviation; sample size N = 123; number of observations = 5334; log-likelihood = -697.80; BIC = 1592.89.

4.1 *Main Effects*

First, it is notable that six of the seven main effects are significant and with the expected signs. As the coefficient for price is negative, we can conclude that more costly tomatoes are less likely to be purchased. In addition, positive coefficients for 'organic', 'fair', and 'local' demonstrate the beneficial impact of quality claims related to sustainable production. Consistent with our use of effects coding for the categorical variables, interpretation of production location and retail format differs slightly, i.e. the impact on purchasing likelihood must be assessed relative to an (implicit) reference tomato from Spain and sold in a supermarket. As a result, we observe that only two levels are represented for both of these attributes. Since the coefficient for local production is significant and positive, it is evident that this

increases overall purchase likelihood, whereas the opposite is true for Mexico. Regarding the type of retail format, there is one significant result and one significant non-result – the latter that there is no difference in the effects of organic retailers and supermarkets. In contrast, the negative and significant effect of discounters implies that such formats are perceived to be generally inferior. That is, no matter the combination of attributes, people are willing to buy tomatoes from these formats only if sold at a discount, demonstrating one way that type of retail format is critical for sustainable purchasing decisions (cf. Schifferstein & Oude Ophuis, 1998; Thompson & Kidwell, 1998; Zepeda & Li, 2007).

4.2 *Interaction Effects*

Turning to the interaction effects, only three are determined to have a significant impact: Mexico x Organic Retailer (+); Organic x Fair (-); and Mexico x Discounter (+). First, the interaction of organic production and ethical standards (Organic x Fair) shows that the presence of both claims results in a cumulative impact less than the sum of their separate values. Contrary to findings that impacts of organic and fair-trade labels are not related (Onozaka & Thilmany McFadden, 2011), this study provides further support for a non-additive relationship (Bond et al., 2008b; Meas et al., 2015; Yue & Tong, 2009). Conversely, no interaction with local production is significant, suggesting this attribute has distinct meaning amid the set of sustainable claims. If this attribute exercises a separable impact, one explanation could be that local production has meaning for the environmental impact of transport across large distances, and is linked with the notion of 'food miles' (e.g. Coley et al., 2009). Whatever the reason, it is clear that additional value cannot be created by simply bundling multiple attributes into a single product.

Regarding the role of retail formats, the number of significant interactions involving one type of format illustrates their moderating influence on production practices and locations. For instance, organic retailers and discounters are both found to significantly impact (relative to supermarkets) the likelihood of purchasing Mexican tomatoes. In the case of the interaction between discounters

and Mexico (Mexico x Discounter), the negative (main) effect of discounters is therefore slightly diminished for this attribute pairing. Overall, these two results also indicate that produce from less familiar locations is perceived quite negatively if sold by a supermarket. Importance of type of format is further borne out if we consider two other interactions on the margins of significance. For instance, the negative interaction between organic production and discounters (Discounter x Organic; $p<.10$) reveals how size of the organic premium is contingent on the format involved. As the main effect for discounter is negative, the (detrimental) impact of discounters is thus even greater for organic produce. In contrast, the positive relationship between organic retailers and local production (Local x Organic Retailer; $p=.057$) hints at a link between purchase of locally produced tomatoes and shopping at alternative retail formats (cf. Bond et al., 2008a; Yue & Tong, 2009). Moreover, as the attribute of "organic retailers" is positively related to purchase of both local and Mexican tomatoes, we establish a potential relevance of such formats in relation to quality evaluation. Whereas discounters negatively impact purchasing decisions in a more general fashion, the influence of organic retailers instead operates though its interaction with certain types of quality claims.

4.3 *WTP Estimates*

If we wish to compare the relative desirability of the attributes, coefficient estimates are however not sufficient. As a result, mean WTP estimates for both attributes and interactions are presented in Table 5. Focusing on the WTP values for the main effects, the first thing to note is that a discount of 0.93€ is associated with any tomato sold at a discounter. In other words, irrespective of the combination of quality claims, the fact that a tomato is sold at a discounter reduces overall value by almost a Euro. On the one hand, this could simply reflect the commonplace association between this type of format and an emphasis on lower costs. However, it can also be noted that retailers provide valuable guidance by, e.g., 'choice editing' and only stocking products deemed as sufficiently sustainable (Mayo & Fielder, 2006). If such assistance is seen to be lacking, this is one reason

for the generally negative influence of discounters. Congruently, it is relevant that the impact of a healthier packaging design on quality evaluation is found to be apparent for a discounter – and not a 'green' supermarket – that is, where a wider variation between products is likely (van Rompay et al., 2016). In both cases, there is a real possibility of 'overgeneralizing' the importance of labels from one context to another so long as differences between retail formats are not considered.

Table 5: WTP Estimates for Main Effects and Interactions

Main Effects	WTP estimates	Interactions	WTP estimates [interactions]
Organic***	1.13 [0.37; 1.89]	… x Fair***	2.61
		… x Discounter*	-0.27
Fair***	2.08 [1.45; 2.71]	… xOrganic Retailer	1.56
		… x Discounter	1.05
Local***	0.91 [0.29; 1.53]	… x Organic	1.32
		… x Fair	2.97
Mexico***	-1.26 [-1.77; -0.75]	… x Organic	-0.30
		… x Fair	0.88
Organic Retailer	-0.35 [-0.79; 0.09]	… x Local*	1.32
		… x Mexico***	0.08
Discounter**	-0.93 [-1.72; -0.15]	… x Local	0.21
		… x Mexico**	-1.49

Notes: $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$. N = 124; Lower and upper limits for 95% confidence intervals. In the *Main Effects* column, significance levels consider if effect is statistically different from zero. In the *Interactions* column, we show whether interactions are statistically different from zero.

In addition, sizable premiums are apparent for all aspects of sustainable production. Surprisingly, ethical standards seem to provide the most value, fetching a premium of 2.08€. One potential explanation could be the tendency for consumers to link fairer and local, small-scale production with one another (Darby et al., 2008; Meas et al., 2015). However, since the interaction between 'local' and 'fair' (Local x Fair) is insignificant, this seems not to be the case. Moreover, it is not even certain that ethical standards provide the most value when one considers the entire range of origins. Recall that WTP for local and Mexican tomatoes (+0.91€ and -1.26€, respectively) are both calculated relative to Spain. Hence, if we specify Mexico as the base level, WTP for locality would be 2.17€, making this premium the highest of all sustainable attributes. This finding is in accordance with a number of other studies (e.g. Hu et al., 2009; Meas et al., 2015; Onozaka et al., 2011). In addition, as average cost of 500g of tomatoes is around 2€ in the experiment, the extent of the premium is close to Darby et al. (2008), who find WTP to be between 48% and 118% more for local products that those of unknown origin.

As with the coefficient estimates, we must consider how the WTP results change after interaction effects are included. Otherwise, these estimates only reveal the independent effects of attributes, i.e. after the impact of the other attributes has been filtered out. Since many attributes necessarily comprise a given product, the WTP estimates with interactions are therefore likely to be the most revealing. For instance, recall that the impact of an organic retailer is only evident vis-à-vis the interactions with the attributes. Hence, we can note that the premium for local tomatoes sold at an organic retailer (Local x Organic Retailer) is 1.32€, a sizable increase over the initial premium of 0.91€. Conversely, markdown for Mexican tomatoes sold at discounters (Mexico x Discounter) is less than initially expected owing to the positive interaction between the two, i.e. -1.49€ instead of -2.19€. In both cases, we see a pairing between the two highest and two lowest levels for each attribute: with, e.g., the 'lowest' level of retail format (Discounter) and 'lowest' level of location (Mexico) reinforcing one another. In this regard, we posit that the credibility problems that typically confront discounters may be less prominent

where quality is less expected. If a type of format is associated with lower quality, the fulfillment of existing quality expectations may foster a more beneficial evaluation of a given pairing, relatively speaking, in the minds of consumers. Of course, any improvement is still relative, as a 'discounter' tomato from Mexico is still valued much less than a 'supermarket' tomato from Spain.

More generally, the importance of type of retail format is evident throughout vis-à-vis the upward and downward shifts in WTP values of all production-related attributes. The clearest expression of this emerges if we contrast two distinct interactions: Mexico x Organic Retailer; and Organic x Discounter. After accounting for the interaction effects, we observe that Mexican tomatoes sold at organic retailers receive a premium of 0.08€ whereas organic tomatoes sold at a discounter require a discount of 0.27€. Regarding the Mexican tomato, the involvement of an organic retailer thus effectively overcomes any quality concerns of having a 'less desirable' origin. One potential explanation is that alternative retail formats are better able to address certain types of concerns, e.g. if information about production conditions is limited as a result of greater distance. Perhaps it is the case that a reputation for product quality could cause consumers to believe that the retailer is unlikely to stock a lower-quality product, at least not without a substantial loss in trust and credibility. In contrast, we find that organic 'discounter' tomatoes are about as desirable as conventional tomatoes sold anywhere else. As such, negative perceptions of discounters carry over into a reduced premium for organic production, even if the label remains the same. The presence of organic labels alone is thus unable to provide sufficient assurance with regard to product quality in all situations. Rather, given the heterogeneity existing within organic systems (Knoblauch et al., 1990; Bourn & Prescott, 2002; Pieper & Barrett, 2008), we can expect the type of retail format and other supply chain considerations to also represent a helpful source of credibility information and quality assurance. In total, moreover, these results demonstrate the 'preference reversals' that can occur due to differences across retail formats: with tomatoes

from less desirable locations seen as more valuable than those that are organic if and whenever the first come from a discounter and the second an organic retailer.

5 Conclusion

Bringing importance of retail formats to the fore, this paper uses a hypothetical DCE to explore interactions between the how and where of food consumption. In specific, we show that there are (at least) two mechanisms by which the type of retail format impacts purchasing behavior. First, as exemplified by discounters, the format can have a general influence on purchase likelihood. No matter the attribute, individuals are less likely to purchase produce from discounters. Second, as illustrated by the significant interactions, alternative retail formats represent another basis for quality assurance. As a result, one can distinguish 'distant' signals (e.g. certification systems and labeling schemes) from those more 'proximate' to actual production (e.g. local production and short supply chains). If there are questions about the former, e.g. because of fraudulent claims, the latter can play a compensating role and deliver the information needed for quality evaluation. In fact, there is anecdotal evidence of exactly this, as "interactions with producers serve as direct assurances for the effectiveness of … purchase decisions" and lessen the necessity of third-party certifications (Onozaka et al., 2011, p. 586; see also Thilmany et al., 2008). Besides certification systems and labeling schemes, retail formats are therefore understood to also play a crucial role for purchasing decisions: namely, by providing credible information about product quality.

As a possible issue, it is possible that some (non-)significant findings are a result of participants being clustered together in a single group. For instance, there may be individuals for whom the difference between organic retailers and supermarkets is indeed significant, though this result is 'drowned out' within the wider sample. Accordingly, future studies should utilize a latent-class specification to clarify how attribute significance varies for groups of individuals (Greene & Hensher, 2003; Lagarde, 2012). The opportunity to, e.g., focus on the distinct types

of alternative retail formats (community-supported agriculture, farmers' markets, and independent organic retailers) could thus help to better understand both the contextual factors that are crucial and the mechanisms by which the type of format impacts sustainable consumption. In specific, as an interaction between organic production and organic retailers was not included in this study, further research is needed to explore the influence of alternative retail formats on such purchases.

Besides exploring the relationship between retail formats and sustainable consumption, this study is the first to utilize the consumption histories of participants to make choice tasks more realistic. To enhance the usefulness of individual-specified status quos for DCEs, however, it is necessary to address some potential issues. First and foremost, effectiveness of this method is contingent on answers of respondents being realistic. In our study, this was not necessarily true, especially for the attributes of origin and ethical standards. While this may simply represent the 'growing pains' of any novel approach, it is equally possible that such issues reflect limited awareness on the part of consumers or that specific attribute levels were the subject of confusion. With regard to the former, perhaps participants, upon not finding the origin of their typical tomatoes available, opted for the highest level so as to approximate the perceived quality to which they are accustomed. In the case of the latter, meanwhile, any confusion could be resolved by seeking to avoid potentially troublesome options, e.g. Mexico in our case. Neither however represents an insuperable obstacle for the use of individual-specified status quos. On the other hand, the potential for hypothetical bias represents a more obvious limitation. In this regard, individual-specified status quos could benefit by being accompanied by, e.g., a 'cheap talk' strategy that directly informs individuals of s potential bias to report a higher WTP (Cummings & Taylor, 1999; Lusk, 2003) and non-hypothetical experiments with real economic incentives inviting them to buy one of the randomly drawn choices (Yue and Tong, 2009). By addressing the potential for hypothetical bias, both strategies can help to extend and refine use of individual-specified status quos for DCEs.

Finally, it must be acknowledged that the external validity of this study is somewhat limited due to its sample size. Notably, over-representation of students, while reflective of the local setting, makes it difficult to generalize to other contexts. For this reason, extending the current approach to facilitate a cross-country comparison is an interesting subject for future research, as would be the comparison of various product categories. As a potential modification, however, we note that a decision to purchase tomatoes from a farmers' market is not necessarily the same as opting to visit a farmers' market for the purpose of purchasing tomatoes. Given the growing tendency for consumers to shop at multiple formats, a two-stage process integrating format choice and product choice into one study thus deserves further consideration (cf. Hsieh & Stiegert, 2012). Through modifications such as these, we hope to better understand the role of retail formats for sustainable purchasing decisions and motivate future research into how where I shop influences what I buy.

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