# Brand Information Mitigating Negative Shocks on Animal Welfare: Is It More Effective to "Distract" Consumers or Make Them Aware?

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## Abstract

To create and sustain a competitive advantage in markets that increasingly value animal welfare attributes, meat companies need to meet public and private production standards while communicating to final consumers through their brands. Data are collected from a representative sample of 460 U.S. residents through an on-line experiment on McDonald's chicken breast sandwiches and analyzed with Latent Growth Modeling. This study assesses which content of positive brand information effectively mitigates the risk of negative information shocks on animal welfare. On average, brand information has the same positive impact on consumers' beliefs and attitudes, regardless of whether it is related or unrelated to animal welfare. However, there is strong market segmentation in terms of consumers' response when exposed to brand information, suggesting that brand managers would benefit from tailoring brand information according to consumers' age, education, gender and income.

**Keywords:** animal welfare; brand; information; consumer behavior; multivariate statistics.

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17

## Introduction

Animal welfare is currently one of the most contentious issues in animal agriculture (American Veterinary Medical Association 2006, Farm Foundation 2006). While there appears to be no standardized definition of "animal welfare", ongoing public discussions and agricultural economics literature generically use this phrase to define the subject of how production practices impact the treatment of farm animals. From the perspective of meat companies, tackling the issue of animal welfare requires both undertaking a significant change in practices and engaging in a complex net of interactions with governments, retailers, final consumers and non-governmental organizations (NGOs).

First of all, meat companies have to meet public standards of governments banning practices that make animals suffer while raised, transported and slaughtered. In the US, residents have recently expressed ethical concerns for animal welfare issues with successful ballot initiatives banning the use of gestation crates in swine production in three states (Videras 2006). In the European Union (EU), the Commission signed a protocol in 2006 obliging the European Institutions to pay full regard to the welfare requirements of animals when formulating and implementing Community legislation (EU Commission 2009). Furthermore, meat companies often have to meet the private requirements of major players along the supply chain. The European retailers' association GLOBALGAP, which *de facto* controls the access of the majority of food imports in Europe (Reardon et al. 2010), has set animal welfare species-specific standards at the production and processing level. Global fast food chains such as McDonald's and Burger King are sourcing an expanding share of their food from crate free sources (Martin 2007).

As meeting public and private standards on animal welfare brings additional costs to meat companies (Henson and Traill 2000, Stott et al. 2005), estimating consumers' willingness to pay a premium (WTPP) for animal welfare become necessary for assessing industry profitability. A large recent strand of the literature has evidenced that a segment of consumers are willing to pay a premium for pork, chicken and beef with animal welfare attributes (Harper and Nilsson 2006, Lagerkvist et al. 2006, Carlsson et al. 2007, Lijenstolpe 2008, Tonsor et al. 2009a, Tonsor et al. 2009c). Results from this research strand are consistent with qualitative studies on consumers' attitudes and perceptions for "animal welfare" products (Harper and Makatouni 2002, Schröder and McEachern 2004). Consumers' preferences for animal welfare do not seem to vary significantly depending on demographic variables (Nilsson et al. 2006, Carlsson et al. 2007, Tonsor et al. 2009c), although they may vary according to their altruism and tendency of free riding (Lusk et al. 2007).

However, in the new era of global food systems, meat companies cannot limit their efforts in meeting the public standards and their private buyers' requirements. They are also increasingly called to communicate directly to their final consumers by managing their brands effectively, especially to counteract the negative information from NGOs advocating either against the entire meat industry (Verbeke and Viaene 2000) or against targeted firms (Bracke et al. 2005, Fulponi 2006). The case of McDonald's and Burger King responding to negative information by the People for Ethical Treatment of Animals (PETA) (Hudson and Lusk 2004, Martin 2007) is emblematic and similar to other situations currently occurring in other food sectors (Mintel GNPD 2010, Rockwood 2010). Therefore, analyzing which positive information effectively

mitigates the risk of negative shocks affecting a brand would represent a timely and important implication for food managers.

Therefore, although literature on animal welfare is rapidly expanding, a significant knowledge gap that remains unexplored is how consumers change their perceptions and preferences for meat products when receiving information on animal raising, handling and processing practices. Only Tonsor et al. (2009b) appear to have so far explored the impact of media coverage with animal welfare information on consumer preferences for meat products. However, no study has so far analyzed the impact of different contents of positive information that aims at mitigating the impact of negative information on animal welfare. This paper seeks to start filling this gap by analyzing the differences in the impact on consumers' perceptions and attitudes of positive information which is either (1) about the brand or product but not about the specific issue contained in a negative shock on animal welfare (this is called "distracting" or "unrelated" information, consistently with the term used by Okada and Reibstein 1998), or (2) strictly about the issue in the negative shock (this is called "related" information), in this case, about animal welfare.

In the marketing literature, much research has focused on the effect on consumers of positive information which is directly related to the content of negative information shocks (Tybout et al. 1981, Smith and Vogt 1995, Okada and Rubstein 1998, Klein and Dawar 2004, Roehm and Tybout 2006), but rarely has positive information been given *before* negative information (Smith and Vogt 1995). In many circumstances, however, a company may find it appropriate to anticipate the risk of future negative shocks and provide *ex ante* positive information to effectively manage its brand. Therefore, in this paper we complete our analysis by assessing if results are robust when positive brand information is given either *ex ante* or *ex post* a negative shock on animal welfare.

To analyze the different impact of positive information related and unrelated to animal welfare on consumers' perceptions and buying intentions, data for this study were collected from 460 US residents through an experiment on fast food chicken breast sandwiches. The analysis is conducted with a Latent Growth Modeling (LGM) approach (Duncan et al. 1999), which is an application of structural equation modeling (SEM) to the context of changes in variables over time.

Similarly to SEM and other multi-variate techniques, applying LGM to the context of agri-food marketing provides two key features. First, LGM gives the researcher a means to assess a set of relationships among variables simultaneously as part of a unique model, rather than in separate analyses (Hair et al. 2006). Second, it offers the opportunity of exploring the mediators and the moderators playing a role in explaining the impact of an independent variable on a dependent variable (Kaplan 2009). In turn, this provides the opportunity of exploring *why* and *under which conditions* a piece of information or a claim on food attributes has an impact on consumers' buying intentions. This allows expanding knowledge on how consumers change their food perceptions and values and so ultimately on how they make their food buying and consumption decisions. Therefore, in a market where companies are increasingly pushed to be consumer-responsive to create and sustain competitive advantage by increasing their product benefits, tackling research questions with LGM responds to the needs of food marketing managers.

The remainder of this paper is organized as follows. In the next section, the literature on brand equity management, negative information shocks, the role of positive brand information and the concepts of consumers' perceptions and attitudes are reviewed. Hypotheses are developed in the following section, before the research methods and the model are presented. After illustrating the results, conclusions are provided in the last section.

## Literature Review

*Managing Brand Equity through Information*

From a customer perspective, brand equity is commonly defined as "the differential of brand knowledge on consumer response to the marketing of the brand" (Keller 1993, p.8). It is established in marketing theory and practice that building and managing brand equity is a primary source of sustainable competitive advantage and long-term financial performance (Aaker 1991; Keller 1993). Building brand equity means creating a brand that is familiar to consumers and that has strong, unique and favorable associations. Managing the brand means creating value by increasing consumers' brand awareness and/or by maintaining, changing or creating new favorable, strong and unique associations (Keller 1993). To effectively manage a brand, it is crucial 1) to understand the rational process that consumers undertake to evaluate and to make decisions related to the brand; 2) to know how consumers would respond to different types of marketing activities (Keller 1993).

For brand managers, a particularly challenging task is protecting the brand from the risk of harmful events (Shocker et al. 1994), such as the arising of sudden negative information shocks (Scott and Tybout 1981; Tybout et al. 1981). Very often, negative information shocks are related to brand attributes that were previously ignored or scarcely taken into consideration by consumers but that become "suddenly salient" attributes once the negative information reaches the consumers. The suspected presence of worms in McDonald's hamburgers (Tybout et al. 1981), the unethical labor conditions in multinationals' suppliers in Asia (Elliott and Freeman 2003) and the practice of sheep *mulesing* mutilation in Australian and New Zealand wool products (Chen 2008) are examples of attributes made "suddenly salient" by negative information shocks. Before the information shock, attributes such as the presence of worms, labor conditions and sheep mutilation practices were ignored, but after the shock these attributes suddenly become important in the evaluation of a brand at least for some consumer segments. Managing the brand and protecting it from the risks of negative information may be particularly difficult when the "suddenly salient" attribute is a credence attribute (Darby and Karni 1973) rather an experience attribute (Nelson 1970). In the case of credence attributes, when consumers are affected by a negative information shock about the brand, managers cannot easily restore consumers' perceptions and attitudes through product trials or other tangible verifying signals, but can only convince consumers through intangible signals such as positive information. Animal welfare is a clear example of credence attribute which suddenly became salient to consumers and so affected brands in different sectors after the release of negative information shocks by advocacy groups such as PETA (Hudson and Lusk 2004, Martin 2007).

In this paper, we investigate how positive information can be used with different contents - either related or unrelated to credence attributes - and at different times - either *ex ante* or *ex post* - to

prevent the negative effects of information shocks on credence attributes such as animal welfare, which became or is likely to become "suddenly salient" to some consumers groups. Therefore, we integrate the existing branding literature by exploring how brand equity can be managed effectively through information in a novel context, such as when the "suddenly salient" attributes stemming from negative shocks have credence nature.

*Negative Information Shocks*

Negative information shocks can be defined as strong evidence from a well defined source that suddenly makes an attribute salient to consumers (Dawar and Pillutla 2000, Klein and Dawar 2004, Roehm and Tybout 2006). In the field of agricultural economics, researchers have analyzed the impact of negative information shocks on consumer demand for food and agricultural products (Brown 1969, Dahlgran and Fairchild 1987, Smith et al. 1988, Robenstein and Thurman 1996, Piggott and Marsh 2004, Kalaitzandonakes et al. 2004). These studies have analyzed the impact of information shocks on food safety and healthiness, but not on animal welfare issues. In marketing, researchers have found negative information shocks can create negative brand associations (Klein and Dawar 2004), affect consumers' attitudes toward the brand, and ultimately harm brand equity (Dawar and Pillutla 2000).

Negative shocks can stem from media information of bad outcomes of the consumption of a brand's product, in the case of product-harm crises (Klein and Dawar 2004) such as food-borne disease outbreaks. Negative shocks can also be brought about by negative publicity of non-governmental organizations (NGOs) advocating against an industry or company practices, such as unethical treatment of workers (Elliott and Freeman 2003). However, negative information can also come from word-of-mouth (Scott and Tybout 1981, Tybout et al. 1981, Smith and Vogt 1995) and rumors, when the source of information transmitted through the word-of-mouth is not well defined (Kamins et al. 1997). There is evidence that word-of-mouth has a stronger negative effect on consumers' evaluation of an object than rumors (Smith and Vogt 1995).
The magnitude of the effect of negative information shocks on consumers' brand evaluations depends on various factors. First of all, it depends on the content of the information shock, which means whether the negative information is a product-harm crisis (Klein and Dawar 2004) or a scandal (Roehm and Tybout 2006). In the case of product-harm crises, such as the consumer outrage at contaminated Coca-Cola cans in Belgium and France in 1999 (Coombs 1999), consumers may perceive a threat for themselves that they were unaware of (Klein and Dawar 2004), experience fear and develop responses to cope with it (Rogers 1975, Floyd et al. 1990, Tanner et al. 1991). In the case of scandals revealing that a firm harms other entities, such as other people (Elliott and Freeman 2003), animals, or the environment, consumers may perceive compassion or solidarity (Batson 1998), as well as egregiousness towards the harming firm (Klein et al. 2004), which may lead to brand boycotting (Klein et al. 2004). However, consumers may also create inferences between scandals and product-harm crises. In the case of animal welfare, researchers have found consumers associate scandals about firms mistreating animals with food safety concerns and specifically to product-harm crises (Verbeke and Viaene 2000, Harper and Makatouni 2002).

A second key factor driving the magnitude of the effect of negative information shocks on consumers' brand attitudes is the initial equity of the targeted brand (Ahluwalia et al. 2000,

Dawar and Pillutla 2000, Pullig et al. 2006). In particular, when consumers have a strong positive attitude towards the targeted brand (Petty and Krosnick 1995) or commitment for it (Ahluwalia et al. 2000), negative information shocks have a weaker effect. Moreover, differentiation of a brand from competitors can limit the negative spillover from information shocks targeting a competing brand (Roehm and Tybout 2006). For example, the presence of strong consumers' beliefs that a brand owner follows corporate social responsibility (CSR) principles is likely to mitigate the effect of negative information shocks about that brand, when the negative information is unrelated to the CSR principles.

A third important factor that explains variation in the effect of negative information shocks on a brand is the target of the information shock. That is if the information shock targets the brand directly, one of its competing brands within the same industry, or instead the whole industry, without any specification about individual brands (Roehm and Tybout 2006). In some circumstances, the negative information shocks targeting a competing brand (Brand B) may have a negative effect on Brand A. In this case, an information shock on Brand B has a "negative spillover" on Brand A (Roehm and Tybout 2006), whereas "spillover" is commonly defined as any phenomenon in which information influences beliefs that are not directly addressed in a communication (Ahluwalia et al. 2000; Balachander and Ghose 2003).

Relative to this literature on negative information shocks, this research provides contributions in the following three areas. First, an analysis is presented on how the impact of negative information shocks on consumers' attitudes varies in the context of a scandal on animal welfare practices. Second, an analysis is done on how the impact of such a negative information shock varies when positive information is given beforehand. Third, an analysis is provided on how the effect of the negative information shock on consumers' attitudes varies according to whether the *ex ante* positive information is related or unrelated to animal welfare issues.

*Positive Brand Information*

Positive information about the brand can stem from the firm owning the brand, through advertising (Weinberger et al. 1981), or from external sources that are tied to the firm, such as sponsors or CSR partners (Klein and Dawar 2004). Positive brand information usually has the effect of creating or strengthening positive brand associations (Keller 1993) but it has also the role of moderating the effect of negative information shocks about the same brand (Weinberger et al. 1981; Okada and Reibstein 1998). In the agricultural economics literature, many studies on the interaction between negative and positive information has been applied to the case of genetically-modified food products (Fox et al. 2002, Rousu et al. 2002, Lusk et al. 2004, Wachenheim and VanWechel 2004, Nayga et al. 2005). Positive information usually has an impact weaker than negative information shocks (Smith and Vogt 1995, Fox et al. 2002), as it is recognized to attract less attention than negative information shocks (Scott and Tybout 1981, Tybout et al. 1981).

When it is used to moderate the effect of negative information shocks on consumers' brand attitudes, positive brand information has a different outcome according to two major dimensions: the order in which the positive information is received (Smith 1993, Smith and Vogt 1995) and the distance in the content of positive and negative information, that is, whether the two pieces of

information strictly contradict each other or are about different brand attributes (Tybout et al. 1981, Okada and Reibstein 1998, Klein and Dawar 2004). When provided *ex ante*, positive information generally mitigates the negative effect of word-of-mouth (Smith and Vogt 1995) and negative product trial (Smith 1993), even if the positive and the subsequent negative information contradict each other. When the positive information is provided *ex post* and denies a negative information shock or a rumor (i.e., it is "related" to the negative information), it might be ineffective in moderating the negative brand association or even strengthening it (Tybout et al. 1981, Okada and Reibstein 1998). When creating positive associations that are distant from the negative associations, *ex post* positive information (i.e., "unrelated" information) moderates the effect of negative information shocks (Tybout er al. 1981, Klein and Dawar 2004).

A third factor explaining variability of the positive information in mitigating negative shocks to competing brands is the initial brand differentiation (Roehm and Tybout 2006), which means having strength and uniqueness of brand associations (Keller 1993). When Brand A is not clearly differentiated from the brand targeted by the negative shock (Brand B) and the positive information on Brand A is an *ex post* denial message - such as "the bad thing happened to Brand B has not happened to our Brand A" – then the positive information can reduce or eliminate the negative spillover effect (Roehm and Tybout 2006). However, in the same circumstance, when Brand A is clearly differentiated from Brand B, positive information on Brand A that denies what happened to Brand B can create a negative spillover that would not otherwise exist and ultimately damage Brand A (Roehm and Tybout 2006).

Relative to this literature on the role of positive brand information mitigating negative information shocks, this research provides a contribution in the following two areas. First, an analysis is provided on how the mitigating role of positive information varies in the context of a scandal on animal welfare practices. Second, an analysis is presented on how the effect of positive information on consumers' beliefs, attitudes and buying intentions varies according to whether its content is unrelated to the subject of the scandal or directly related to it.

In the attempt to bring such a contribution to the animal welfare debate and to the literature on negative and positive information, this study proposes and tests a theoretical framework that builds upon the theory of attitude formation (Fishbein 1967; Fishbein and Ajzen 1975).

*Consumers' Beliefs, Attitudes and Buying Intentions*

Consumers' cognitive process to create their attitudes towards brands and ultimately to establish their buying behavior usually starts from evaluating brand attributes (Fishbein 1967). By processing information about the attributes of a brand, consumers establish both evaluations and belief strengths for each attribute, such that the combination of the two determines their attitudes towards the brand (Fishbein 1967). Brand attributes are a category of brand associations, which in turn are a key dimension of brand equity: when a brand has strong, favorable and unique associations, then it is clearly differentiated from other brands (Aaker 1991, Keller 1993). Brand attributes may be observed before consumption (search attributes) or only after consumption (experience attributes, Nelson 1970), but some of them may not be visible either before or after consumption (credence attributes, Darby and Karni 1973). In the case of credence attributes,

consumers' belief strengths play a crucial role in establishing their attitudes towards products, and brand information has a crucial importance in determining consumers' beliefs.
However, consumers' attitudes towards a brand do not always predict buying behavior (Fishbein and Ajzen 1975). On the other hand, consumers' attitudes towards buying the brand, moderated by their subjective norms, predict buying intentions much more accurately (Fishbein and Ajzen 1975, Sheppard et al. 1988). In turn, buying intentions predict behavior "unless intent changes prior to performance" or "unless the intention measure does not correspond to the behavioral criterion in terms of action, target, context, time-frame and/or specificity". The intention of buying a brand has various measurable dimensions. The most general one is the willingness to do an effort to perform to the buying action (Fishbein and Ajzen 1975, Eagly and Chaiken 1993), whereas the nature of the effort may vary according to the context: it may be the willingness to pay to obtain a product from that brand, the likelihood to pay a premium for that brand, or the likelihood to buy the product even if it is not sold in a favorite purchasing location. A second key dimension of buying intentions is the choice of the brand among alternatives (Fishbein 1967, Fishbein and Ajzen 1975), which is the process of comparing and selecting among the intentions associated with each alternative in the choice set.

This study borrows from these theories predicting the formation of attitudes and buying intentions to use the concepts of consumers' beliefs in the presence of an attribute associated to the brand and attitudes towards a brand (Fishbein 1967).

## Hypotheses Development

The conceptual framework of this study is built upon the theory of attitude formation (Fishbein 1967, Fishbein and Ajzen 1975) and the theories of the interaction between positive and negative information shocks developed in consumer economics (Fox et al. 2002, Rousu et al. 2002, Lusk et al. 2004, Wachenheim and Van Wechel 2004, Nayga et al. 2005) and consumer psychology (Tybout et al. 1981, Smith 1993, Smith and Vogt 1995, Okada and Reibstein 1998, Klein and Dawar 2004, Roehm and Tybout 2006).

When analyzing the interaction between the negative shocks and the positive brand information, two assumptions are made based on the extent literature. First, negative information has a stronger marginal impact than positive information, no matter neither the information sequence nor the content of positive information, as already found by Smith and Vogt (1995), Fox et al. (2002) and Lusk et al. (2004). Second, *ex ante* positive information has a larger effect on mitigating the effect of the negative shock than *ex post* positive brand information, as already tested in extant literature (Smith 1993, Smith and Vogt 1995, Klein and Dawar 2004). This assumption is also consistent with the theory explaining the impact of prior beliefs and the order of information on consumers' evaluations of objects (Russo et al. 1998, Carlson and Pearo 2004, Carlson et al. 2006).

Building upon these assumptions, two major hypotheses are tested. First, *ex ante* brand information which is related to the content of the following negative shock is more effective in moderating the negative effect of the information shock than brand information which aims at distracting from that content (i.e., unrelated information). Providing positive information on environment, social welfare and animal welfare attributes of a brand and of the brand owner may

be considered the strategy of companies that are trying to minimize the future risk of being affected by future negative information shocks caused by advocating Non-Governmental Organizations (NGOs) or other civil society organizations. From this perspective, major food companies that joined multi-stakeholder dialogue initiatives such as the Sustainable Agriculture Initiative Platform (SAI Platform 2009), may be interested in developing positive brand information on sustainability issues even if their consumers value other attributes of their brands more. Therefore, it is hypothesized:

> **H1.** Consumers receiving *ex ante* positive information related to animal welfare discount the following negative information shock on animal welfare more than consumers receiving *ex ante* unrelated positive information.

This hypothesis juxtaposes with findings from previous literature suggesting that positive information is more effective when it "distracts" consumers from the negative shock, as it creates negative associations or rational suspiciousness (Tybout et al. 1981, Okada and Reibstein 1998, Roehm and Tybout 2006). If data provide evidence supporting this hypothesis, then providing *ex ante* positive information on issues that are related to future information shocks may be considered as a form of insurance for protecting the brand from scandals. Moreover, if the positive brand information has the strength of differentiating the brand from competitors, then the brand may become immune to any negative information shocks affecting its industry, consistent with the finding of Roehm and Tybout (2006).

On the other hand, how should a company act when it has already been affected by a negative information shock? Should it react by developing brand information related to the content of the negative information, or should it choose to provide unrelated positive information? Consistent with existing literature on product crises (Tybout et al. 1981, Okada and Reibstein 1998), which highlights the risk that *ex post* information relevant to the negative shock just strengthen consumers' negative associations, it is hypothesized here that unrelated positive information has a more positive effect on consumers' attitudes than related positive information. In other words:

> **H2.** Consumers receiving *ex post* positive information unrelated to animal welfare issues after a negative information shock have a stronger increase in attitudes than consumers receiving *ex post* information related to animal welfare.

After these two hypotheses are tested, further exploration will be made of which consumers' demographic and attitudinal characteristics significantly explain variation across the effects of positive brand information related or unrelated to animal welfare issues.

## Methods

*Sample and Product Selection*

To test the hypotheses, data was collected from an on-line experiment focused on fast food boneless chicken sandwiches and animal welfare issues administered to 460 US-based residents in November 2009[1]. Data was collected randomly from a representative sample recruited

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[1] As we collected primary data from human subjects, before starting the data collection we obtained a formal approval by the  Institutional Review Board (IRB) at Michigan State University certifying that the researchers took

according to state, age, ethnic group and education level criteria by a professional survey company. Response rate was around 20%, while on-line questionnaire completion rate was around 75%. As agreed with the professional survey company recruiting the sample, we made sure that the population that completed the questionnaire was representative of the US population according to the criteria established. As some population segments were more responsive than others, it took four more days and one further sample draw to obtain a sufficient number of completed questionnaires from the less responsive population segments. Only one reminder was sent to the people belonging to the less responsive population segments that did not complete the questionnaires within two days from our first contact. On average, respondents took around 14 minutes to complete the questionnaire.

A fast food brand was chosen as the object of our experiment because, similarly to other private actors within the meat industry, they have been recently targeted by negative information shock about their animal welfare practices by advocating NGOs (Hudson and Lusk 2004, Martin 2007). Although other negative information affected both fast foods and other actors competing in different industries, the case of animal welfare and fast foods was chosen because it is a relatively new issue, where respondents are less likely to have strong beliefs prior to the experiment. Therefore, we expect to find more variation after each information treatment on animal welfare than for after treatments on, say, environmental issues, labor issues or genetically-modified issues. On these latter issues, US respondents received a much heavier information load in the past five to ten years and so they are likely to have stronger prior beliefs (Fox et al. 2002, Rousu et al. 2002, Lusk et al. 2004). Furthermore, fast food restaurants have been already the object of previous studies on negative information regarding different attributes (Roehm and Tybout 2006). Finally, chicken boneless sandwiches were chosen as the product of interest because various fast food brands offer a similar product and because many ethical concerns were focused on the quality of life of chickens.

*Research Design*

After accepting the invitation to participate in this study, respondents were redirected to a web link with the questionnaire page. The experiment was divided in three major parts. First, participants answered questions on demographics, on their food value and their consumption habits related to chicken consumption. In the initial demographics section, along with a few preliminary questions about age, gender, ethnic group and nationality, respondents were asked how much they value origin, naturalness, sustainability and taste when purchasing and consuming food. Moreover, they were asked how often they consume chicken products. Every question has been measured with a seven-point Likert-scale item.

Second, respondents were divided into four groups, each receiving a different set of treatments. The four treatments consisted of positive information *unrelated to* or *related to* animal welfare issues, as well as provided before a negative information shock (i.e. *ex ante*) or after the same shock (i.e. *ex post*) (see Figure 1). The positive brand information consisted of a set of reported declarations from differences sources: an advocating NGO (Greenpeace), a certifying NGO

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into consideration all the issues related to voluntariness of recruitment, informed consent, confidentiality and anonymity, research risks and benefits, adverse events and unanticipated problems involving risks to subjects or others, adverse events from exercise testing, and record retention.

(Animal Welfare Society), a university expert on meat and animal welfare and a self-claim from McDonald's. The negative information treatment, published by the People for Ethical Treatment of Animals (PETA), denounced that McDonald's suppliers mistreat chicken and inflict them terrible pains while stocking, transporting and slaughtering them.

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| **Group 1**<br><br>*Ex Ante* Positive Information<br>*Unrelated* to Animal Welfare Issues | **Group 3**<br><br>*Ex Ante* Positive Information<br>*Related* to Animal Welfare Issues |
| **Group 2**<br><br>*Ex Post* Positive Information<br>*Unrelated* to Animal Welfare Issues | **Group 4**<br><br>*Ex Post* Positive Information<br>*Related* to Animal Welfare Issues |

**Figure 1.** The Four Treatments Interacting Positive and Negative Information

Third, after each treatment, participant responses were elicited on animal welfare beliefs, attitudes towards McDonald's chicken sandwiches and willingness-to-pay a premium price (WTPP). Respondents' belief strength in the association between animal welfare and the brands was measured with a seven-point Likert-scale, where the respondents are asked to strongly disagree/strongly agree with the following statement: "I believe that McDonald's takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products sold in their restaurants." Respondents' attitudes towards the brands were measured with one seven-point Likert-scale question asking "How would you describe your attitudes towards McDonald's?" where the scale was from very negative to very positive. WTPP has been elicited with two consecutive questions. First, respondents were simply asked whether they were willing to pay a premium price or not for a McDonald's chicken sandwich, compared to a similar sandwich by a competing fast food brand. Participants responding "yes" were then asked which interval of price premium, expressed in percentage terms, were willing to pay. Therefore, we modeled WTPP as a continuous variable where the participants responding "no" had a zero value, while the participants responding "yes" had a value equal to the average value of the interval of price premium chosen. As the distribution of the variable WTPP was strongly skewed to the right, we added one point to each value and took the natural logarithm in order to make the WTPP distribution more normally distributed.

*The Model*

In order to capture the dynamic nature of the data we have collected, analysis was conducted through a set of latent growth models (LGMs). LGMs can be considered a specific category of structural equation models (SEMs) where the latent factors are the intercept and the slope of the growth of a variable across a group of individuals (Duncan et al. 1999). Compared to longitudinal panel modes, LGMs have the advantage of both describing single individual's development trajectory of variables and capturing individual differences in these trajectories over time (Duncan et al. 1999). In particular, the latter characteristic allows the researcher to explore the factors moderating the intercept and slope of the development trajectory. Similarly to SEMs, limitations of LGMs include the assumption of multi-normally distributed variables and the necessity of large samples (Duncan et al. 1999).

As common in use in LGMs (Duncan et al. 1999), we fixed the loadings from factors to the measured variables (i.e., respondents' animal welfare beliefs, attitudes and WTPP) at arbitrary values, while we let the model estimate the factors' means and variances, as well as the co-variances among factors. The factors' mean indicates the expected difference between the measurable variables at two different times, while the factors' variance indicates the inter-individual variability around the mean. Finally, the co-variance among factors indicates weather the initial levels of beliefs and attitudes are significantly associated with future changes or not.

In this study, to compare the impact of positive information related and unrelated to animal welfare issues, the LGM was built in four sequential steps: (1) with a simple piece-wise LGM for each respondents' group, (2) with an associative LGM for each respondents' group, (3) with a multi-group LGM and (4) with a predictive LGM for each respondents' group. Building the model in sequential steps is common in use in LGM as well as in SEM, such that it is easier to detect which added component to the basic model makes increase or decrease the overall fit with the data. First of all, we test a simple piece-wise LGM as it specifically allows analyzing trends that are affected by structural shocks over time (Duncan et al, 1999). In this study, the structural shocks are the contrasting pieces of information that respondents receive at two different times prior to each measurement of beliefs, attitudes and WTPP. Second, with an associative LGM we explore if changes across respondents' beliefs, attitudes and WTPP are significantly associated. Third, through a multi-group LGM we test the structural growth differences across treatments with different information contents (i.e., relevant versus distracting information). Therefore, with such a multi-group LGM we can formally test our hypotheses. Finally, with a predictive LGM we can explore what are the drivers of change in beliefs, attitudes and WTPP across different individuals. We evaluated each of these models both in terms of overall fit with the data and by analyzing the significance of individual effects among variables (Bagozzi and Yi 1988, Browne and Cudeck 1993, Hu and Bentler 1999).

The generic simple piece-wise LGM applied to the case of *ex ante* positive information treatments has the following form, consistent with LGM literature (Duncan et al. 1999) (see Figure 2):

$$(1) \ V_1 = l_{11}F_1 + l_{21}F_2 + l_{31}F_3 + e_1;$$
$$(2) \ V_2 = l_{12}F_1 + l_{22}F_2 + l_{32}F_3 + e_2;$$
$$(3) \ V_3 = l_{13}F_1 + l_{23}F_2 + l_{33}F_3 + e_3;$$

$$(4)\ F_1 = a_1M_1 + b_1D_1;$$
$$(5)\ F_2 = a_2M_2 + b_2D_2.$$
$$(6)\ F_3 = a_3M_3 + b_3D_3.$$

In these expressions, $V_1$, $V_2$ and $V_3$ stand for the measured variables of interest (i.e., respondents' animal welfare beliefs, attitudes and WTPP) at time 0, time 1 and time 2. $F_1$, $F_2$ and $F_3$ represent respectively the intercept, the growth factor caused by the positive information and the decrease factor caused by the negative information. Moreover, $l_{ij}$ represent the fixed loadings from the factors to the measured variables and $e_i$ are the errors. Along with the loadings, also the measured variable errors are fixed in order to make the model perfectly identified. Moreover, $M_i$ are the inter-individual means of the intercept and the slope, while $D_i$ are the inter-individual variances of the intercept of the slope to be estimated. Finally, $Cov(D_i,D_j)$ is estimated to understand if intercept and slope are significantly associated.
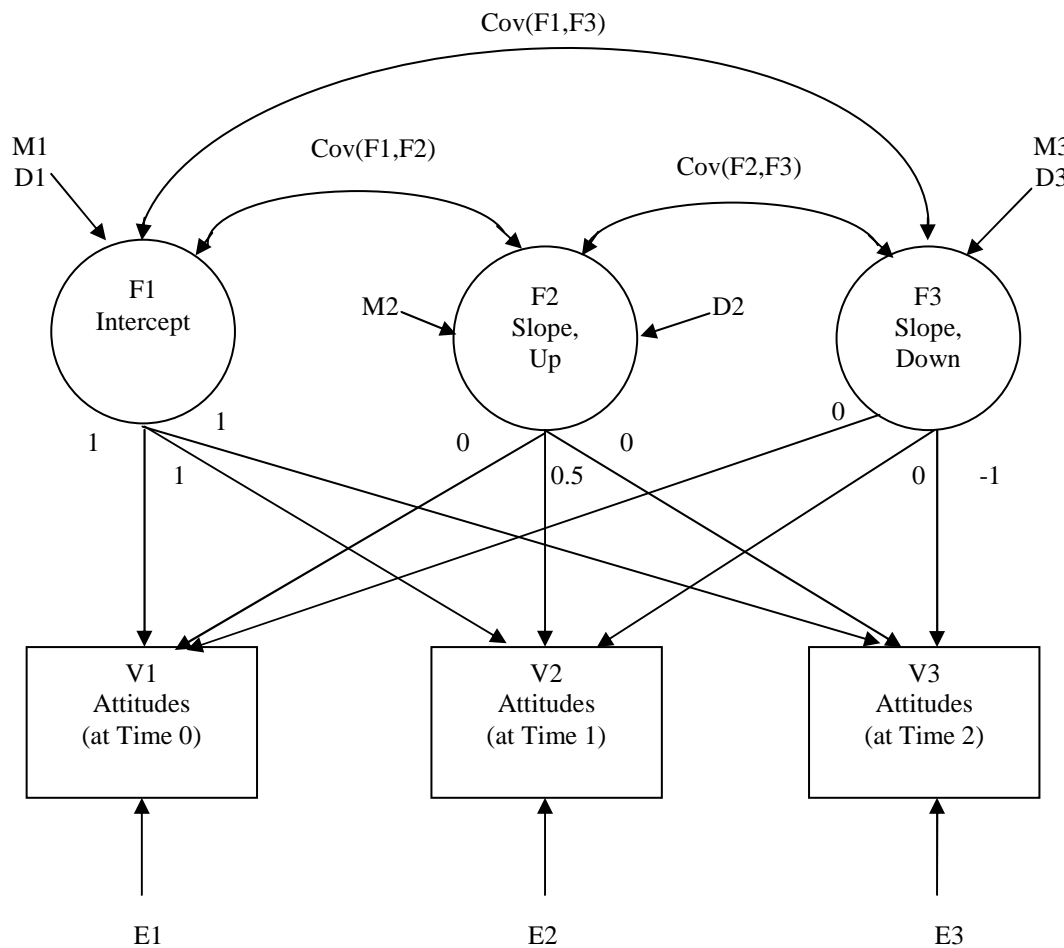


**Figure 2.** The Generic Piecewise Latent Growth Model
**Legend:** V1: Initial Consumers' Attitudes; V2: Consumers' Attitudes after receiving Positive Information; V3: Consumers' Attitudes after receiving Negative Information; F1: Latent Factor driving Prior Attitudes; F2: Latent Factor driving Attitudes after receiving the Positive Information; F3: Latent Factor driving Attitudes after receiving the Negative Information. M1, M2 and M3 respectively indicate the means of the Latent Factors F1, F2 and F3. D1, D2 and D3 respectively indicate the variances of the Latent Factors F1, F2 and F3. E1, E2 and E3 respectively indicate the estimated errors of V1, V2 and V3.

# Results

*Distracting versus Relevant Ex Ante Brand Information*

Results from the set of LGMs with data from the two groups of respondents receiving related and unrelated positive information *before* the negative information provide four major insights. First, respondents' beliefs on animal welfare, attitudes and WTPP increase significantly at 95% level both when they receive related and unrelated positive information. Based on the two associative LGMs with the two respondents' group, we find that when respondents receive positive information unrelated to animal welfare issues at McDonald's, their animal welfare beliefs increase on average from 3.41 points to 3.92 and then decrease to 2.91 points when negative information on animal welfare is provided (see Table 1, first column). This may seem odd, as the provided information aimed at distracting respondents from animal welfare issues, but it is likely that positive information about healthiness of McDonald's products has been used as a cue to increase beliefs on animal welfare. Also, their attitude towards the McDonald's product increase on average from 4.06 to 4.46 points and then decrease to 3.36 points, while their willingness to pay a premium for it increases from 2.8% to 4.6% and then decreases to 2.4%.

**Table 1.** Multi-Group Associative LGM: Unrelated versus Related *Ex Ante* Positive Information

|  | Unrelated Info | | Related Info | | Equality LM Test (Chi-Square) | |
|---|---|---|---|---|---|---|
|  | *Mean* | *Var.* | *Mean* | *Var.* | *Mean* | *Var.* |
| **AWBelief0** | 3.41 * | 1.894 * | 3.76 * | 2.515 * | 3.98 ** | 0.98 |
| **Attitude0** | 4.06 * | 2.679 * | 4.53 * | 2.427 * | 4.26 ** | 0.55 |
| **WTPP0** | 2.8% * | 0.007 * | 2.0% * | 0.003 * | 0.56 | 28.10 ** |
| **AWBelief1** | 3.92 * | 4.868 * | 4.79 * | 7.892 * | 14.59 ** | 4.40 ** |
| **Attitude1** | 4.46 * | 2.435 * | 4.93 * | 4.765 * | 0.19 | 14.36 ** |
| **WTPP1** | 4.6% * | 0.019 * | 3.6% * | 0.015 * | 0.06 | 0.74 |
| **AWBelief2** | 2.91 * | 2.357 * | 3.29 * | 2.953 * | 0.01 | 1.43 |
| **Attitude2** | 3.36 * | 2.070 * | 3.63 * | 2.901 * | 0.93 | 3.12 ** |
| **WTPP2** | 2.4% | 0.005 * | 1.8% | 0.003 * | 0.19 | 9.93 ** |
| *Overall Fit Indexes:* | | | | | | |
| **Chi-Square** | 805.25 with 45 d.f. | | 745.97 with 45 d.f. | | 1551.23 with 90 d.f. | |
| **CFI** | | | | | 0.920 | |
| **RMSEA** | | | | | 0.148 | |

**Legend:**
AWBelief0, Attitude0, WTPP0: initial consumers' Animal Welfare (AW) beliefs, attitudes and percentage of consumers with WTPP (time 0). AWBelief1, Attitude1, WTPP1: consumers' AW beliefs, attitudes and percentage of consumers with WTPP after the positive information shock (time 1). AWBelief2, Attitude2, WTPP2: consumers' AW Beliefs, attitudes and percentage of consumers with WTPP after a subsequent negative information shock (time 2). Note: *95% probability that the parameter is significantly different from zero; **90% probability of significant drop of chi-Square when the equality constraint is removed.

Similarly, when respondents receive related positive information on animal welfare practices at McDonald's, their beliefs increase on average from 3.76 points to 4.79 and then decrease to 3.29 points when negative information on animal welfare is provided (see Table 1, second column). Also, their attitude towards the product increase on average from 4.53 to 4.93 points and then decrease to 3.63 points, while their willingness to pay a premium increases from 2.0% to 3.6%

and then decreases to 1.8%. However, the analysis reveals that the decrease of respondents' willingness to pay a premium that received the negative information is not significant at 95% level, either when they *ex ante* received related or unrelated positive information. This is probably driven by high censoring of WTPP at 0%, which takes place around 85% of respondents. The two associative models with unrelated and related positive information have both a good overall fit with the data, as their chi-square is respectively 805.25 and 745.97 with 45 degrees of freedom (d.f.).

Second, there is a strong inter-individual variation around the average increase and decrease in respondents' beliefs, attitudes and WTPP. In both the associative LGMs with the two respondents' groups, the variance of all the measured variables is significant at 95% level (see Table 1, first and second column). This provides a strong justification for exploring the individual demographic drivers of changes in beliefs, attitudes and buying intentions as a response to positive and negative information in the following steps of the analysis.

Third, related *ex ante* positive information does not mitigate the effect of negative information significantly more than unrelated *ex ante* positive information. As a result from the multi-group LGM, the Lagrange Multiplier (LM) test does not show that overall fit would improve significantly when the equality constraints of the increase and decrease factors' means were released. As a matter of facts, chi-square would drop of only 0.01, 0.93 and 0.19 points respectively by removing the equality constraints on the factors describing the decrease in animal welfare beliefs, attitudes and WTPP (see Table 1, third column). Therefore, this result provides no evidence supporting hypothesis H1.

Fourth, although the average trend of increase and decrease in respondents' beliefs, attitudes and WTPP is similar across the two groups, there are still significant differences between the impacts of unrelated versus related *ex ante* positive information. As a matter of fact, the overall fit of the restricted multi-group model with the data is poor (chi-square is 1551.23 with 90 d.f., CFI=0.920 and RMSEA=0.148), which means that the two models with unrelated and related positive information cannot be effectively constrained to be equal (see Table 1, third column). Specifically, there are three significant differences across groups. The first difference is that when respondents receive relevant positive information, their animal welfare beliefs are significantly higher than when they receive unrelated positive information. The Lagrange Multiplier (LM) test indicates that the overall fit of the model would increase significantly (with a drop equal to 14.59 chi-square points) if this equality constraint is removed. The second difference is that the initial attitudes and animal welfare beliefs are significantly higher for the group receiving related positive information. We claim that this difference across group is casual rather than due to demographic differences across the two groups, as the differences across average age, income, education, gender and state of residency are not significant. However, from descriptive statistics, we found that the group receiving the relevant positive information had both higher initial attitudes for sustainability, naturalness and taste related to the other group, but obviously this was difficult to be controlled during the sample selection. The third significant difference across groups regards the variances of the increase and decrease factors. Specifically, when respondents receive related positive information, the variance of the increase and decrease factors in attitudes is significantly larger than when they receive unrelated information.

Moreover, the variance of the increase in their animal welfare beliefs is higher and the variance of the decrease in their willingness to pay a premium is smaller. This shows that related positive information on animal welfare causes a larger variation of individual responses compared to unrelated positive information. This provides further rationale to the search for demographic variables explaining the change in beliefs, attitudes and buying intentions caused by related positive information on animal welfare practices.

*Distracting versus Relevant Ex Post Brand Information*

Results from the set of LGMs with data from the remaining two groups of respondents who received unrelated and related positive information *after* the negative information can be summarized in the following four points.

First, respondents' animal welfare beliefs and attitudes increase at a 95% significance level both when they receive unrelated and related positive information even when positive information follows the negative information shock, but WTPP do not increase. Findings from the associative LGM show that when respondents receive positive information unrelated to animal welfare issues at McDonald's after the negative information shocks, their animal welfare beliefs increase from 3.18 to 3.56 points but are still lower than their initial beliefs before receiving the negative information shock (3.91 points) (see Table 2, first column).

Similarly, their attitudes towards the McDonald's product and their WTPP increase, but they are still lower than their initial attitudes before receiving the negative information shock. However, the analysis reveals that the increase of consumers' WTPP receiving the positive information is not significant at a 95% level. When instead consumers receive *ex post* related positive information on animal welfare practices at McDonald's, their beliefs increase from 2.94 to 3.66 points, which is higher than their initial beliefs before receiving the negative information shock (3.53 points) (see Table 2, second column). On the other hand, consumers' attitudes towards McDonald's and their willingness to pay a price premium for it increase, but they are still lower than their initial attitudes and WTPP before receiving the negative information shock. The two models have both a good overall fit with the data, as their chi-square is respectively 735.56 and 661.90 with 45 d.f. (see Table 2, first and second column).

Second, similarly to the case of *ex ante* positive information, there is strong inter-individual variation around the average decrease and then increase in respondents' beliefs, attitudes and WTPP. As a matter of fact, the variance of all the measured variables is significant at a 95% level. Again, this confirms that it is important to explore the individual demographic drivers of respondents' reaction to negative and positive information in the next stage of the analysis.

Third, similarly to the case of *ex ante* positive information, unrelated *ex post* positive information does not have a significantly more positive effect on respondents' attitudes and WTPP than related *ex post* positive information, nor vice versa. In the multi-group LGM, the LM test does not show that the overall fit would improve significantly when the equality constraints of the increase and decrease factors' means were released (see Table 2, third column). Therefore, our results provide no evidence supporting hypothesis H2. The LM test shows instead that respondents' animal welfare beliefs are significantly higher when they receive information

related to animal welfare rather than unrelated information, but this difference disappears when comparing respondents' attitudes and buying intentions.

**Table 2.** Multi-Group Associative LGM: Unrelated versus Related *Ex Post* Positive Information

|  | Unrelated Info | | Related Info | | Equality LM Test (Chi-Square) | |
|---|---|---|---|---|---|---|
|  | *Mean* | *Var.* | *Mean* | *Var.* | *Mean* | *Var.* |
| **AWBelief0** | 3.91 * | 2.484 * | 3.53 * | 2.216 * | 2.95 | 0.27 |
| **Attitude0** | 4.44 * | 2.144 * | 4.64 * | 2.267 * | 0.84 | 0.88 |
| **WTPP0** | 2.5% * | 0.006 * | 2.8% * | 0.008 * | 0.06 | 1.77 |
| **AWBelief1** | 3.18 * | 2.199 * | 2.94 * | 2.225* | 0.44 | 0.00 |
| **Attitude1** | 3.47 * | 2.640 * | 3.85 * | 2.412 * | 2.57 | 1.49 |
| **WTPP1** | 2.1 % | 0.002 * | 1.5% * | 0.005 * | 4.60 ** | 5.30 ** |
| **AWBelief2** | 3.56 * | 6.399 * | 3.66 * | 9.765 * | 6.18 ** | 5.46 ** |
| **Attitude2** | 4.20 * | 6.077 * | 4.30 * | 8.319 * | 0.19 | 1.18 |
| **WTPP2** | 2.2% | 0.008 * | 2.2% | 0.022 * | 0.05 | 5.02 ** |
| *Overall Fit Indexes:* | | | | | | |
| **Chi-Square** | 735.56 with 45 d.f. | | 661.90 with 45 d.f. | | 1715.96 with 90 d.f. | |
| **CFI** | | | | | 1.000 | |
| **RMSEA** | | | | | 0.000 | |

Legend: AWBelief0, Attitude0, WTPP0: initial consumers' Animal Welfare (AW) beliefs, attitudes and percentage of consumers with WTPP (time 0). AWBelief1, Attitude1, WTPP1: consumers' AW beliefs, attitudes and percentage of consumers with WTPP after the negative information shock (time 1). AWBelief2, Attitude2, WTPP2: consumers' AW Beliefs, attitudes and percentage of consumers with WTPP after a subsequent positive information shock (time 2). Note: *95% probability that the parameter is significantly different from zero; **90% probability of significant drop of chi-Square when the equality constraint is removed.

Fourth, differently from the case of *ex ante* positive information, the trends of decrease and increase in average respondents' beliefs, attitudes and buying intentions can be considered equal with a 95% statistical significance. The overall fit of the restricted multi-group LGM with the data is perfect as CFI=1.000 and RMSEA=0, indicating that the two models with unrelated and related positive information can be broadly constrained to be equal (see Table 2, third column). Still, the LM test suggests releasing three equality constraints across the two groups. The first difference is that, consistently with the previous finding, the average increase in consumers' animal welfare beliefs is significantly higher for consumers receiving related information than for those receiving unrelated information, as removing the equality constraint would lead to a drop of 6.18 chi-square points. The second difference is that the decrease in WTPP when negative information is provided is significantly higher in one of the two groups, although no difference in treatments was given beforehand. Also in this case, we believe that this is probably driven by high censoring of WTPP at 0%, which takes place around 85% of respondents. The third difference across groups regards the variances of two measured variables. Specifically, the variance of the WTPP decrease factor and the variance of the beliefs and WTPP increase factors is significantly higher in the group receiving the *ex post* related positive information. These differences in variances confirm that related positive information on animal welfare causes a larger variation of responses compared to unrelated positive information.

*Predictors of the Impact of Distracting versus Relevant Information*

Since there is strong inter-individual variation around the mean values of the decrease and increase factors both when positive information is provided *before* and *after* the negative shock, we explore the role of individual demographics and food values as drivers of the change in beliefs, attitudes and buying intentions.

Broadly speaking, results from the predictive LGM confirm that individuals of different age, sex, education, frequency of chicken consumption and food values react differently to different orders and contents of positive information. In particular, results provide the following four insights.

First, when positive information about McDonald's is given *ex ante* and it is distracting from animal welfare issues, respondents with higher income tend to be significantly more sensitive to positive unrelated information at a 95% level and to discount negative information on animal welfare, while males tend to discount positive unrelated information, which is relative to the healthiness of McDonald's products. The overall fit of this predictive LGM with the data is close as CFI is 0.989 and RMSEA is 0.097 (see Table 3, first column).

**Table 3.** Predictive LGM: Unrelated versus Related *Ex Ante* Positive Information on Respondents' Attitudes

| *Unrelated Info* | **Indep. Var.** | **Coeff.** | **Std. Err.** | *Related Info* | **Indep. Var.** | **Coeff.** | **Std. Err.** |
|---|---|---|---|---|---|---|---|
| **Intercept (F1)** | *Mean* | 4.23 * | 0.60 | **Intercept (F4)** | *Mean* | 5.85 * | 0.45 |
| | Male | 0.32 | 0.35 | | Education | -0.26 * | 0.09 |
| | Age | 0.06 | 0.12 | | Age | -0.01 | 0.09 |
| | Income | -0.13 | 0.09 | | Ev.Sustainable | -0.15 | 0.08 |
| | | | | | Ev. Taste | 0.28 | 0.14 |
| **Growth (F2)** | *Mean* | 0.20 | 0.49 | **Growth (F5)** | *Mean* | 0.62 | 0.64 |
| | Male | -0.74 * | 0.29 | | Education | 0.01 | 0.13 |
| | Age | 0.05 | 0.10 | | Age | 0.34 * | 0.12 |
| | Income | 0.20 * | 0.07 | | Ev.Sustainable | 0.06 | 0.11 |
| | | | | | Ev. Taste | -0.07 | 0.20 |
| **Decrease (F3)** | *Mean* | 1.44 * | 0.49 | **Decrease (F6)** | *Mean* | 2.73 * | 0.57 |
| | Male | -0.31 | 0.29 | | Education | 0.21 * | 0.09 |
| | Age | 0.05 | 0.10 | | Age | -0.22 * | 0.09 |
| | Income | -0.19 * | 0.07 | | Ev.Sustainable | 0.19 * | 0.08 |
| | | | | | Ev. Taste | 0.36 * | 0.15 |

| *Covariance Matrix:* | | | | *Covariance Matrix:* | | | |
|---|---|---|---|---|---|---|---|
| | **F1** | **F2** | **F3** | | **F4** | **F5** | **F6** |
| **F1** | 2.91 * | | | **F4** | 2.19 * | | |
| **F2** | -0.70 * | 1.92 * | | **F5** | -0.71 * | 4.45 * | |
| **F3** | 0.93 * | -0.31 | 1.91 * | **F6** | 1.00 * | -0.48 * | 2.38* |

| *Overall Fit Indexes:* | | *Overall Fit Indexes:* | |
|---|---|---|---|
| **Chi-Square** | 235.80 with 18 degrees of freedom | **Chi-Square** | 184.96 with 24 degrees of freedom |
| **CFI** | 0.989 | **CFI** | 1.000 |
| **RMSEA** | 0.097 | **RMSEA** | 0.000 |

**Note:** In the Predictive LGM, n=93 because there are 22 cases with missing income data that were excluded from the analysis.

Second, when positive information about McDonald's is given *ex ante* and it is related to animal welfare issues, respondents with higher education have lower initial attitudes towards McDonald's chicken sandwich and are more sensitive to negative information on animal welfare issues. On the other hand, elder individuals tend to be significantly more sensitive to positive related information while they tend to discount negative information. Finally, respondents with higher values for food sustainability and flavor tend to be more sensitive to negative information on animal welfare. The overall fit of this predictive LGM with the data is perfect as CFI is 1.000 and RMSEA is 0.000 (see Table 3, second column).

Third, when positive information about McDonald's is given ex post and it is unrelated to animal welfare issues, respondents with higher income tend to discount negative information on animal welfare, while people consuming chicken more frequently tend to be more sensitive to negative information on animal welfare. This direct association between frequency of chicken consumption and sensitiveness to negative information on animal welfare seems to contradict the common perception that frequent consumers of meat tend to discount information on animal welfare. A possible explanation of this association may be that frequent chicken consumers in the US are strengthening their inferences across the animal welfare attributes and both food safety and flavor, which are obviously salient attributes for frequent meat consumers. However, the overall fit of the model is poor, as RMSEA=0.145 and CFI=0.916 (see Table 4, first column).

Fourth, when positive information about McDonald's is given *ex post* and it is related to animal welfare issues, respondents with higher education have lower initial attitudes towards McDonald's products and they are more sensitive to positive information on animal welfare. The overall fit of the model is perfect, as RMSEA=0.000 and CFI=1.000 (see Table 4, second column).

Finally, independently from the individual demographics and food values, from the predictive LGM we could learn also how prior individual beliefs, attitudes and buying intentions influence respondents' response to positive and negative information.

Broadly speaking, consistently with established consumer psychology literature (Russo et al. 1998, Carlson and Pearo 2004, Carlson et al. 2006), results confirm that prior beliefs and attitudes can significantly explain individual response to information in the case of McDonald's chicken sandwiches with animal welfare attributes. In particular, results provide three major interesting insights.

First, respondents with higher initial attitudes towards McDonald's generally have a lower marginal increase in positive information and a higher marginal decrease in negative information, no matter whether the content of the  positive information. As a matter of fact, when *ex ante* positive information is given, the covariance between F1 and F2 and between F4 and F5 is negative and significant (respectively -0.70 and -0.71), while the covariance between F1 and F3 and between F4 and F6 is positive and significant (respectively 0.93 and 1.00, see Table 3). This partially contrasts the findings of Lusk et al. (2004), who found that consumers with stronger priors are less sensitive to genetically-modified information. Moreover, when *ex post* positive information is given, the stronger the decrease in attitudes, the weaker the following effect of positive information, no matter if related or unrelated to animal welfare issues (as covariance between F2 and F3 is -1.83 and covariance between F5 and F6 is -2.76).

Second, as an exception to the previous point, when *ex post* positive information tackles the animal welfare issue, initial attitudes are positively associated with the attitude increase. As a matter of fact, the covariance between F4 and F6 is 1.57 and is significant at a 95% level. On the other hand, this effect is not present in the case of *ex post* unrelated positive information (as the covariance between F4 and F6 is -0.63 and is not significant at a 95% level). This is an important point, as it illustrates that, once a negative shock occurred, related positive information on animal welfare can be more useful than unrelated information to restore the initial attitudes of those consumers that really like McDonald's.

**Table 4.** Predictive LGM: Unrelated vs. Related Ex Post Positive Information on Respondents' Attitudes

| *Unrelated Info* | Indep. Var. | Coeff. | Std. Err. | *Related Info* | Indep. Var. | Coeff. | Std. Err. |
|---|---|---|---|---|---|---|---|
| **Intercept (F1)** | *Mean* | 4.34 * | 1.07 | **Intercept (F4)** | *Mean* | 5.22 | 0.43 |
| | Income | -0.12 | 0.07 | | Education | -0.22* | 0.10 |
| | Freq. Cons. | 0.19 | 0.17 | | Ev.Sustainable | 0.02 | 0.08 |
| | Ev.Sustainable | 0.01 | 0.08 | | | | |
| | Ev. Taste | -0.08 | 0.09 | | | | |
| **Decrease (F2)** | *Mean* | 0.08 | 1.12 | **Decrease (F5)** | *Mean* | 0.94 | 0.45 |
| | Income | -0.20* | 0.07 | | Education | -0.19 | 0.10 |
| | Freq. Cons. | 0.36 * | 0.17 | | Ev.Sustainable | 0.11 | 0.08 |
| | Ev.Sustainable | 0.13 | 0.08 | | | | |
| | Ev. Taste | -0.09 | 0.09 | | | | |
| **Growth (F3)** | *Mean* | -0.13 | 0.11 | **Growth (F6)** | *Mean* | -2.03 | 0.84 |
| | Income | 0.20 | 0.11 | | Education | 0.42 * | 0.19 |
| | Freq. Cons. | -0.47 | 0.27 | | Ev.Sustainable | 0.04 | 0.15 |
| | Ev.Sustainable | 0.19 | 0.13 | | | | |
| | Ev. Taste | 0.08 | 0.14 | | | | |

| *Covariance Matrix:* | | | | *Covariance Matrix:* | | | |
|---|---|---|---|---|---|---|---|
| | **F1** | **F2** | **F3** | | **F4** | **F5** | **F6** |
| **F1** | 2.06 * | | | F4 | 2.16 * | | |
| **F2** | 0.60 * | 2.28 * | | F5 | 0.78 * | 2.30 * | |
| **F3** | -0.63 | -1.83 * | 5.24 * | F6 | 1.57 * | -2.76* | 7.97 * |

| *Overall Fit Indexes:* | | *Overall Fit Indexes:* | |
|---|---|---|---|
| **Chi-Square** | 163.92 with 24 degrees of freedom | **Chi-Square** | 144.26 with 13 degrees of freedom |
| **CFI** | 0.916 | **CFI** | 1.000 |
| **RMSEA** | 0.145 | **RMSEA** | 0.000 |

**Note:** In the Predictive LGM, n=93 because there are 22 cases with missing income data that were excluded from the analysis.

Third, only when information tackles *ex ante* the animal welfare issue, individuals whose attitudes increase most will be less sensitive to any following negative information on the same issue. In other words, when *ex ante* related positive information is given, the stronger their growth in attitudes with *ex ante* positive information, the smoother their decrease in attitudes following the negative information shock. As a matter of fact, the covariance between F5 and F6 is -0.48 and significant at a 95% level (see Table 3, second column). On the other hand, the same negative association is not significant in the case of respondents receiving *ex ante* unrelated positive information (as covariance between F2 and F3 is -0.31 and is not significant at a 95% level, see Table 3, first column). Therefore, related positive information is more useful than

unrelated information to mitigate the effect of negative information for those consumers that are more sensitive to positive information.

## Conclusions

In the new era of global food systems, effective communication of food quality attributes to final consumers through brands is becoming a managerial task that goes far beyond meeting public and private standards imposed by governments and private retailers.

This study provides insights for fast food company managers that are responsible for communicating the quality attributes of their brands to final consumers and that need to tailor brand information to specific consumer characteristics. To do that, we investigate which content and order of positive brand information is more effective to protect a brand from information shocks on animal welfare and which consumers are more sensitive to different information content. Results show that on average consumers' attitude growth and decrease do not differ significantly across different content of information, but different consumer groups have very different reactions when exposed to animal welfare information.

Specifically, results from this study provide relevant information to managers of a fast food company such as McDonald's on two possible scenarios. When negative information shock on animal welfare at McDonald's is released first, managers should consider that the most affected individuals would be frequent consumers of chicken and lower income individuals. Moreover, individuals having initial higher attitudes towards McDonald's would be more sensitive to related subsequent positive information. Finally, individuals with higher education, although less likely to have high initial attitudes towards McDonald's, would be more responsive to subsequent positive related information. In the scenario that positive information anticipates the negative shock on animal welfare at McDonald's, managers should instead consider that individuals with higher income would be more sensitive to unrelated information and then less sensitive to the negative shock. On the other hand, elder individuals would be more sensitive to related positive information and to the negative information shock. Moreover, males would be less sensitive to unrelated positive information than females. Finally, individuals with stronger values for food sustainability and flavor would be more sensitive to negative shocks.

By tackling such a research question and providing these insights to the industry, this study contributes to the rapidly expanding animal welfare literature (Lagerkvist et al. 2006, Carlsson et al. 2007, Lijenstolpe 2008, Tonsor et al. 2009a, Tonsor et al. 2009c), where only a few studies have so far analyzed how media coverage affects consumers' preferences for meat products (Tonsor et al. 2009b). Specifically, this appears to be the first study analyzing the interaction of positive and negative information about animal welfare on consumers' perceptions and intentions to buy a product. Outside the boundaries of the animal welfare literature, this study also attempts to integrate current knowledge on the impact of sequences of positive and negative information shocks on consumer behavior, developed across the fields of economics (Fox et al. 2002, Rousu et al. 2002, Lusk et al. 2004, Wachenheim and Van Wechel 2004, Nayga et al. 2005) and psychology (Russo et al. 1998, Smith and Vogt 1995, Roehm and Tybout 2006), by analyzing inter-individual and inter-group differential effects with a Latent Growth Modeling (LGM) approach (Duncan et al. 1999).

Although results have useful managerial implications, the analysis of this study has a number of limitations. First, we conducted this analysis only on one specific fast food brand, i.e. McDonald's, without any comparison with other competing brands. Therefore, although we captured initial respondents' beliefs, attitudes and buying intentions for McDonald's to avoid the presence of confounding effects, we did not tackled the question of how information affects different initial levels of consumers' perceptions and attitudes. By comparing initial consumers' attitudes towards competing brands, future research can investigate how different brands with different levels of initial equity would react to information on animal welfare. Second, the analysis of this paper is limited to the context of fast food industry and to the case of animal welfare. Future research should seek for a generalization of these results across industries and across content of attribute information. For example, it would be interesting to test if the same conclusion could be drawn in the same industry when consumers are exposed to environmental friendly production or on labor conditions. Moreover, it would be interesting to test if, when exposed to the same animal welfare attribute negative and positive information, consumers' perceptions change across meat products, across individual brands or across different levels of the supply chain of the product. Finally, in this study we created the treatments by choosing the information content and source arbitrarily, but other contents, images and source of information may have different effects. In future research, it would be useful to analyze how different contents and different sources of positive information act on mitigating the negative impact of information shocks. We believe that the suggested future research questions could be effectively tackled by applying the LGM analysis introduced in this study while changing the set of information treatments appropriately.

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# Appendix 1

## Survey Instrument

Thank you for participating to this research study. This study is conducted by the Department of Agricultural, Food and Resource Economics and the Department of Marketing at Michigan State University. Mr. Domenico Dentoni is the research coordinator and Prof. Christopher H. Peterson is the responsible principal investigator.

From this study, we hope to learn insights on how consumers perceive various attributes of meat products and process product information. You will be asked questions about both beef steak and chicken breast. Your participation to this research project is completely voluntary and we will preserve the confidentiality of your information. Your participation in this study will take no more than 20 minutes.

Feel free to ask the researchers any questions you may have at the following contacts:

- Mr. Domenico Dentoni, 409 Agricultural Hall, Michigan State University, 48825 East Lansing, Michigan. Email: dentonid@msu.edu. Phone: 517-488-9277.

- Prof. Christopher H. Peterson, 83 Agriculture Hall, Michigan State University, 48825, East Lansing, Michigan. Email: peters17@msu.edu. Phone: 517-355-1813.

**Demographics**

1. I am: ___ Male ___ Female

2. I am _____ years old (fill-in the blank or drop down).

3. The best description of my educational background is:

   a. Did not graduate from high school
   b. Graduated from high school, Did not attend college
   c. Attended College, No Degree earned
   d. Attended College, Associates or Trade Degree earned
   e. Attended College, Bachelor's (B.S. or B.A.) Degree earned
   f. Graduate or Advanced Degree (M.S., Ph.D., Law School)
   g. Other (please explain): _____

4. There are ____ adults and ____ children living in my household (please fill-in the two blanks)

5. My ZIP code is: _____.

6. What best describes your race?

    a. White, Caucasian
    b. Black, African American
    c. Asian, Pacific Islander
    d. Mexican, Latino
    e. American Indian
    f. Other (please describe): _____

**Food Attitudes and Values**

7. How frequently do you consume the following meat products at any meal, either at home or away from home consumption:

| | 4 or more times per week | 2-3 times per week | Once per week | 2-3 times per month | Once per month or less | Never |
|---|---|---|---|---|---|---|
| Chicken | | | | | | |
| Beef | | | | | | |

8. How much time have you spent residing outside the US during your entire life?

    a. None, I've always lived in the US
    b. Between 1 month and 6 months
    c. Between 6 months and 1 year
    d. Between 1 year and 2 years
    e. Between 2 years and 5 years
    f. Between 5 years and 10 years
    g. Between 10 and 20 years

Please rate to what extent you agree or disagree with the following statements:

9. When I choose the food I eat, an important thing I consider is the country or region where it is produced. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

10. When I choose the food I eat, an important thing I consider is if it is natural (that is, if it is produced without modern technologies) (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

11. When I choose the food I eat, an important thing I consider is if it is "sustainable" (that is, if it is produced by a company that respects the social and environment conditions within the area of production). (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

12. When I choose the food I eat, an important thing I consider is its taste and appearance (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

**Initial McDonald's Brand Equity**

Please answer the following questions about McDonald's.

**A McDonald's logo is placed here.**

13. How would you describe your attitude towards McDonald's? (Seven-point scale, from 1. Very Negative to 7. Very Positive)

Please rate to what extent you agree or disagree with the following statement.

14. I believe that McDonald's takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

15. Do you believe that McDonald's takes MORE, EQUAL or LESS effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants relative to its competitors?

    a. More
    b. Equal
    c. Less
    d. I don't know

Now please answer the following questions about Burger King.

**A Burger King logo is placed here.**

16. How would you describe your attitude towards Burger King? (Seven-point scale, from 1. Very Negative to 7. Very Positive)

Please rate to what extent you agree or disagree with the following statement.

17. I believe that Burger King takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

18. Do you believe that Burger King takes MORE, EQUAL or LESS effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants relative to its competitors?

    a. More
    b. Equal
    c. Less
    d. I don't know

19. If the price of a Boneless Chicken Sandwich were the same across the following brands, which brand would you choose?

    a. McDonald's
    b. Burger King
    c. Kentucky Fried Chicken
    d. Wendy's
    e. Others
    f. None

20. Would you be willing to pay a premium if it costs more to purchase a McDonald's Chicken Sandwich than another brand's Chicken Sandwich?

    a. Yes
    b. No

21. How much more are you willing to pay to get a McDonald's Chicken Sandwich rather than another brand of Chicken Sandwich?

    a. Between 0% and 10% more
    b. Between 10% and 20% more
    c. Between 20% and 40% more
    d. Between 40% and 60% more
    e. Between 60% and 80% more
    f. Between 80% and 100% more
    g. At least 100% more

**Information Treatment 1**

Please read this further piece of information about McDonald's.

   Havin' fun!!!

McDonald's is one of life's many small pleasures that millions of people around the world enjoy every day. Great food. Fun to eat. Casual environment. Local and familiar. And always something new!

You want the very best for your kids, and so do we at McDonald's. That's why we've made quality a top priority:

a. McDonald's coffee is made with 100% pure Arabica coffee beans.
b. McDonald's burger patties are cooked straight on the grill with no added fat or oil.
c. McDonald's Premium Chicken Sandwiches are made with all white meat real chicken.
d. McDonald's premium salads contain no preservatives, and are assembled fresh in the restaurant daily.
e. McDonald's Happy Meal Milk jugs contain real 1% low fat white or chocolate milk.
f. McDonald's Apple Dippers are made with farm-fresh apples selected for their crispness, color and texture.

**A picture with a group of McDonald's products is placed here.**

Now please answer the following questions about McDonald's.

**A McDonald's logo is placed here.**

22. How would you describe your attitude towards McDonald's? (Seven-point scale, from 1. Very Negative to 7. Very Positive)

Please rate to what extent you agree or disagree with the following statement about McDonald's.

23. I believe that McDonald's takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

24. Do you believe that McDonald's takes MORE, EQUAL or LESS effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants relative to its competitors?

a. More
b. Equal
c. Less

    d. I don't know

25. Would you be willing to pay a premium if it costs more to purchase a McDonald's Chicken Sandwich than another brand's Chicken Sandwich?

    a. Yes
    b. No

26. How much more are you willing to pay to get a McDonald's Chicken Sandwich rather than another brand of Chicken Sandwich?

    a. Between 0% and 10% more
    b. Between 10% and 20% more
    c. Between 20% and 40% more
    d. Between 40% and 60% more
    e. Between 60% and 80% more
    f. Between 80% and 100% more
    g. At least 100% more

Now please answer the following questions about Burger King.

**A Burger King logo is placed here.**

27. How would you describe your attitude towards Burger King? (Seven-point scale, from 1. Very Negative to 7. Very Positive)

Please rate to what extent you now agree or disagree with the following statement about Burger King.

28. I believe that Burger King takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

29. Do you believe that Burger King takes MORE, EQUAL or LESS effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants relative to its competitors?

    a. More
    b. Equal
    c. Less
    d. I don't know

30. If the price of a Boneless Chicken Sandwich were the same across the following brands, which brand would you choose?

    a. McDonald's
    b. Burger King
    c. Kentucky Fried Chicken
    d. Wendy's
    e. Others
    f. None

**Information Treatment 2**

Please read this further piece of information about production practices at McDonald's.

PETA's "McCruelty – I'm hatin' it" campaign message:

"McDonald's chicken suppliers in the United States kill birds with cruel methods. Chickens typically suffer broken limbs, they have their throats cut while they are still conscious and are often scalded to death in defeathering tanks.

It would cost McDonald's NOTHING to demand that its chicken suppliers switch to a far less cruel slaughter method. But McDonald's refuses.

Tell McDonald's to stop the cruelty."

**A "McCruelty: I'm hatin it" logo by PETA is placed here.**

Now please answer the following questions about McDonald's.

**A McDonald's logo is placed here.**

31. How would you describe your attitude towards McDonald's? (Seven-point scale, from 1. Very Negative to 7. Very Positive)

Please rate to what extent you now agree or disagree with the following statement about McDonald's.

32. I believe that McDonald's takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

33. Do you believe that McDonald's takes MORE, EQUAL or LESS effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for

production of food products (e.g., chicken nuggets and eggs) sold in their restaurants relative to its competitors?

   a.  More
   b.  Equal
   c.  Less
   d.  I don't know

34. Would you be willing to pay a premium if it costs more to purchase a McDonald's Chicken Sandwich than another brand's Chicken Sandwich?

   a.  Yes
   b.  No

35. How much more are you willing to pay to get a McDonald's Chicken Sandwich rather than another brand of Chicken Sandwich?

   a.  Between 0% and 10% more
   b.  Between 10% and 20% more
   c.  Between 20% and 40% more
   d.  Between 40% and 60% more
   e.  Between 60% and 80% more
   f.  Between 80% and 100% more
   g.  At least 100% more

**A Burger King logo is placed here.**

36. How would you describe your attitude towards Burger King? (Seven-point scale, from 1. Very Negative to 7. Very Positive)

Please rate to what extent you now agree or disagree with the following statement about Burger King.

37. I believe that Burger King takes effective measures to provide proper animal welfare to chickens and hens raised, transported, and processed for production of food products (e.g., chicken nuggets and eggs) sold in their restaurants. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

38. If the price of a Boneless Chicken Sandwich were the same across the following brands, which brand would you choose?

   a.  McDonald's
   b.  Burger King

    c.  Kentucky Fried Chicken
    d.  Wendy's
    e.  Others
    f.  None

Please rate to what extent you agree or disagree with the following statement.

39. When I buy meat products, I like to receive detailed information about product quality. I am not particularly bothered by receiving too much information on the product. (Seven-point scale, from 1. Strongly Disagree to 7. Strongly Agree)

40. My annual pre-tax, household income is:

    a.  Less than $ 20,000
    b.  $ 20,000-$ 39,999
    …
    j.  180,000 $ or more

41. When you buy a beef steak for your consumption, which one of this two products would you choose assuming that they have the same price:
    a.  A USDA-certified beef steak which is produced with animal welfare, environment friendly practices, from grass-fed animals.
    b.  A beef steak which is "simply a beef steak".
    c.  None of the two.

# Appendix 2

## Methodological Note

This methodological note provides a detailed report of the analysis conducted as part of this study. Results obtained from the analysis described within the paper are derived after undertaking the following intermediate steps:
- Simple Piecewise LGM
- Associative LGM
- Curve-of-Factors LGM
- Multi-group Associative LGM
- Predictive LGM with WTPP
- Predictive LGM with Attitudes

The entire analysis has been performed with the structural equation program EQS, copyright by P.M. Bentler, Multivariate Software, Inc., Version 6.1, 1985-2006 (B91).

## Simple Piecewise LGM

Piecewise LGM represent a specific case of LGM that describes structural changes in observed measures over time (Duncan et al., 1999). Therefore, in this study piecewise LGM is used to describe structural changes in consumers' beliefs, attitudes and WTPP created by the sequence of positive and negative information treatments. When building the models, the difference between piecewise LGMs and general LGMs is only in the arbitrary choice of the values of the fixed parameters (i.e., loadings) linking the factors to the observed variables. In general LGMs, the values of these loading is linearly dependent for all factors, such as:

(1) $V1 = 1*F_1 + 0*F_2 + 0*F_3 + e_1$;
(2) $V2 = 1*F_1 + 1*F_2 + 2*F_3 + e_2$;
(3) $V3 = 1*F_1 + 2*F_2 + 4*F_3 + e_3$;
(4) $F_1 = a_1M_1 + b_1D_1$;
(5) $F_2 = a_2M_2 + b_2D_2$;
(6) $F_3 = a_3M3 + b_3D_3$;

where the loadings of the linear growth $F_2$ are 0, 1, 2 and the loadings of the quadratic growth factor are 0, 2, 4 (Duncan et al., 1999). The interpretation of the parameters is the same as in the text of the paper. In a piecewise model describing a structural change, the fixed parameters of the loadings are not necessarily linearly dependent and can be of opposite directions among factors. For example, in the piecewise LGM described in Figure 2, the loadings of $F_2$ are 0, 0.5, 0, while the loadings of $F_3$ are 0, 0, -1. Then, in this case $F_2$ has to be interpreted as an increase factor, while $F_3$ as a decrease factor after the structural change (i.e., the negative information treatment) occurs.

A simple piecewise LGM model is first built for each measure individually. This provides information about the individual significance of coefficients describing growth and decrease

after the shocks (Mi), as well as a measure of each factor variance (Di). Results of the piecewise LGM for attitudes of respondents included in Group 1 of the experiment are reported in Table 5.

**Table 5.** Simple Piecewise LGM with Consumer Attitudes in Group 1

|            | Mean            | Std. Dev. |     | Mi    | Di    |
|------------|-----------------|-----------|-----|-------|-------|
| **V1**     | 4.07            | 1.64      | **F1** | 4.07* | 0.36* |
| **V2**     | 4.46            | 1.56      | **F2** | 0.78* | 0.39* |
| **V3**     | 3.36            | 1.68      | **F3** | 0.70* | 3.56* |
| **Chi-Square** | 0.000 with -3 d.f. | | | | |
| **CFI**    | 0.987           |           |     |       |       |

**Legend:** V1 to V3 indicate observed measures of attitudes from Time 0 to Time 2. F1 = Intercept Factor of Attitudes; F2 = Increase Factor of Attitudes; F3 = Decrease Factor of Attitudes.
**Note:** the asterisk (*) indicates significance at the 95% level.

Results provide evidence that the growth and decrease trends are significant when the information treatment is given and that variance is significantly large. The model is under-identified because the number of free parameters to be estimated is higher than the number of known parameters; therefore we add parameters in the following steps of building a LGM. A similar piecewise LGM model has been run for the measures of animal welfare beliefs and WTPP of respondents in Group 1 and for all respondents' measures in Groups 2, 3 and 4.

## Associative LGM

The associative LGM is one large model that describes the change factors for several measures at the same time to analyze if there is covariance among the change across the measures (Duncan et al., 1999). An associative LGM is built where the increase and decrease factors load to measures of beliefs, attitudes and WTPP simultaneously, where the co-variances among each of the nine factors (three factors for each measure) are estimated. The factor loadings are the same as in the simple piecewise LGM for each of the three variables. The co-variance matrix from the associative LGM is reported in Table 6.

**Table 6.** Co-variance Matrix of the Associative LGM with Consumer Attitudes in Group 1

|     | F1     | F2     | F3     | F4     | F5     | F6    | F7    | F8    | F9    |
|-----|--------|--------|--------|--------|--------|-------|-------|-------|-------|
| F1  | 2.68*  |        |        |        |        |       |       |       |       |
| F2  | 1.36*  | 1.89*  |        |        |        |       |       |       |       |
| F3  | 0.02   | 0.00   | 0.01*  |        |        |       |       |       |       |
| F4  | -0.86* | -0.03  | 0.03*  | 2.43*  |        |       |       |       |       |
| F5  | 0.79*  | -0.71* | 0.05*  | 0.26   | 4.87*  |       |       |       |       |
| F6  | 0.02   | 0.01   | 0.00   | 0.04*  | 0.08*  | 0.02* |       |       |       |
| F7  | 0.97*  | 0.38*  | 0.00   | -0.57* | 0.21   | 0.00  | 2.07* |       |       |
| F8  | 0.24   | 0.80*  | -0.02  | 0.20   | -1.21* | 0.00  | 1.31* | 2.36* |       |
| F9  | 0.00   | -0.01  | 0.00   | 0.02   | 0.00   | -0.01 | 0.03* | 0.02  | 0.01* |

**Legend:** F1 = Intercept Factor of Attitudes; F2 = Intercept Factor of Beliefs; F3 = Intercept Factor of WTPP; F4 = Increase Factor of Attitudes; F5= Increase Factor of Beliefs; F6 = Increase Factor of WTPP; F7 = Decrease Factor of Attitudes; F8= Decrease Factor of Beliefs; F9 = Decrease Factor of WTPP.
**Note:** values on the diagonal are factor variances Di; the asterisk (*) indicates significance at the 95% level.

Results provide evidence that there is covariance among the increase and decrease factors across the three measures of beliefs, attitudes and WTPP. The associative LGM model has also been run with data of the measures from respondents in Groups 2, 3 and 4.

## Multi-Group Associative LGM

The multi-group associative LGM is used to analyze if there are differences across the parameters from respondents' data in Group 1 and Group 3, which provide evidence also to test the stated hypotheses in the paper. In particular, a control has been performed to establish if there are differences across factor means and factor variances across Group 1 and Group 3, where respondents in Group 1 received positive information which is unrelated to animal welfare and respondents in Group 3 received positive information related to animal welfare.
To control for these differences across parameters in the two groups, an equality constraint is imposed to the model. Therefore, the LM test is performed to explore which constraints have to be released in order to obtain a significant fit improvement. Results are presented in Table 1 in the paper.

The same procedure has been used to compare differences in parameters across Group 2 and Group 4. An interpretation of these results is provided in the text of the paper.

## Curve-of-Factors LGM

The curve-of-factor LGM describes the change of several measures with only one set of factors to analyze if the same pace of change is the same across several measures or not (Duncan et al., 1999). In this case, a curve-of-factors LGM is built to analyze if a unique set of factors can describe the change occurring across beliefs, attitudes and WTPP.
When running the model with data from respondents in group 1, as the overall fit of the model with data is low (chi-square=248.68 with 30 d.f. and p-value<0.001; CFI=0.697; RMSEA= 0.285), results show that the changes in the three measures cannot be effectively described by only one set of factors and so that there are differences in the pace of change across beliefs, attitudes and WTPP. The same curve-of-factors LGM is also run with only two out of the three variables and repeated the same analysis with measures of respondents in Group 2, 3 and 4. In each evaluated case, the curve-of-factors LGM failed to provide an adequate fit.

## Predictive LGM with WTPP

As the curve-of-factors LGM suggests that no unique change factor can effectively describe the change in beliefs, attitudes and WTPP simultaneously, an analysis of what are the predictors of the change factor for each measure independently has been done.
First, a predictive LGM is run with the WTPP measures by adding all the expected predictive variables (i.e., demographics, chicken consumption habits, food values) to the simple piecewise WTPP model and estimating the impact of each of these variables on the intercept, increase and decrease factors.

The output indicates that parameters are linearly dependent, and so that the output of this model cannot be trusted. From the EQS 6.1 output, results indicate that linearly dependent parameters

are the errors of the three WTPP measures over time ($e_1$, $e_2$ and $e_3$ in the generic piecewise LGM). This is due to the fact that the majority of WTPP values are zero (around 85%), as only few respondents are WTP a premium price for McDonald's chicken sandwiches, no matter their demographics and the information treatments they receive. Output is similar when the same predictive LGM with WTPP from respondents' data in Group 2, 3 and 4 is run. Therefore, data collected do not allow analyzing predictors of WTPP changes over time. The same predictive LGM is then repeated with respondents' attitudes.

## Predictive LGM with Attitudes

Results of final predictive LGM are presented in Tables 15 and 16 in the Chapter. To build the final predictive LGM illustrated in these tables, a first preliminary predictive LGM is run with only demographic and chicken consumption habit predictors. A second preliminary predictive LGM with only food value predictors is also run. As overall goodness-to-fit with the data was bad, a Wald Test is performed to drop the independent variables that bring the least contribution in explaining the dependent variables and those that create serious problems of multicollinearity. Therefore, in the predictive LGM with attitudes measures from respondents in Group 1, respondents' education (which has high co-variance with income), chicken consumption frequency and value for food sustainability and origin (as suggested by the Wald test) are dropped.

Therefore, a third predictive LGM is run with all the predictors but the variables dropped previously, and then evaluated the model looking again at the overall goodness-to-fit, the Wald test and the co-variance among independent variables. At this stage, the respondents' value for taste variable is also dropped, as suggested by the Wald test. Therefore, a fourth and final predictive LGM is built with the remaining variables, which are respondents' gender, income and age, and obtained the results in Table 15 in the Chapter. The same procedure has been used to come up with the final predictive LGM with attitudes of respondents in group 2, 3 and 4.