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Article — Accepted Manuscript (Postprint)

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Agriculture and Human Values

Provided in Cooperation with:
Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Halle (Saale)

Suggested Citation: Drescher, Larissa S.; de Jonge, Janneke; Goddard, Ellen; Herzfeld, Thomas (2012) : Consumer's stated trust in the food industry and meat purchases, Agriculture and Human Values, Springer, Dordrecht, Vol. 29, Iss. 4, pp. 507-517, https://doi.org/10.1007/s10460-012-9375-9

This Version is available at:
https://hdl.handle.net/10419/149619

Consumer's stated trust in the food industry and meat purchases

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This is a "Post-print" accepted manuscript, which has been published in "Agriculture and Human Values".

Please cite this publication as follows:

Drescher, L. S., de Jonge, J., Goddard, E., Herzfeld, T. (2012). Consumer's Stated Trust in the Food Industry and Meat Purchases. Agriculture and Human Values 29, 507-517.

The final publication is available at Springer via:

http://dx.doi.org/10.1007/s10460-012-9375-9.

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Abstract: Research indicates that consumers are particularly concerned about the safety of meat. Higher processed meat is perceived as more unsafe than fresh or natural meats, i.e. consumers trust processed meat less. This paper studies the relationship between perceived trust and day-to-day purchase behavior for meat giving special attention to the degree of meat processing. Based on a trust and meat consumption framework, Canadian household's actual meat purchases are linked to answers from a commissioned food attitudes survey completed by the same households. Expenditures for processed and total meat (but not for fresh meat) are significantly different by three levels of trust in the food industry. Consumer with the lowest trust levels consume less (especially of processed meat) compared to those with higher trust levels. However, in a multivariate setting, trust shows no effect on fresh or processed meat purchases with or without socio-demographic control variables suggesting that the impact of trust on meat purchases is only small. However, the low trusting consumer segment could potentially be a target for marketing strategies focused on reputation and quality to increase sales in this particular group.

Keywords: Consumer trust; Engel functions; Processing; Preferences; Meat; Canada

1. Introduction

In surveys, consumers often express concerns about food safety (De Jonge et al. 2008a; Verbeke and Vackier 2004). In particular, meat products are considered a vulnerable category, a fact which can be partially explained by the occurrence of many meat related food safety incidents over the last decades. For example, in Canada the meat sector has been involved in food safety issues such as E. coli contamination of meat and a Listeria scandal which happened in 2008, and cost the lives of twenty-two consumers (Government of Canada 2009). A recent EU consumer survey revealed that the meat sector is the least trusted of all food sectors. More specifically, it belongs to the three worst performing goods markets (European Union 2010). When trust is harmed, this might lead to changes in consumption patterns, because consumers are motivated to engage in behaviors that enable them to cope with their concerns (Baron et al. 2000). One option consumers have is to reduce consumption of products they lack confidence in. Research has shown decreased consumption of meat products in

relation to food safety concerns, particularly in response to food safety incidents (Burton and Young 1996; Piggott and Marsh 2004). In addition, Verbeke and Viaene (1999) found that one third of Belgian respondents showed an intention to decrease their total meat consumption in the year following the survey. This intention was found to be related to perceptions of meat with respect to safety, trustworthiness, presence of hormones, or other harmful substances.

The relationship between perceived trust and day-to-day purchase behavior of meat has not been examined extensively. However, there is evidence that consumers are concerned about production-related aspects of meat beyond specific food safety incidents. That is, meat products are regarded as more unsafe, i.e., less trusted, the higher their degree of processing (Kjaernes et al. 2005). In addition, research has shown that consumers tend to have a preference for "natural", i.e. fresh meat (Verbeke et al. 2010). Therefore, consumers who have a low level of trust in food safety might be less likely to purchase processed meat. On the other hand, steady growth in meat convenience products, i.e. highly processed meat products, has also been observed (Grunert 2006). This indicates that for some consumers, processed meat does not seem to be strongly linked to food safety concerns. The extent to which individual differences in food safety perceptions translate into distinctive purchase patterns has not received much attention in the scientific literature, which has mostly focused on aggregate purchase behaviors (Piggott and Marsh, 2004; Verbeke 2001). The present paper goes beyond previous work by investigating if perceived trust in the food industry is related to actual meat purchase behavior at the individual household level. In particular, the focus is on purchases made in a no incident situation, thereby assessing the extent to which different levels of "structural" trust translate into day-to-day purchase behaviors. Since consumers appear to be particularly concerned about processed meat, this study tests whether the level of trust is related to the level of purchases made in each of the fresh and processed meat categories. In addition to consumer trust in food safety, the impact of socio-demographic variables on meat consumption is assessed. The study uses a unique dataset combining households' revealed preferences for meat purchases (actual purchases made), and the same household head's stated trust in the food industry assessed through a food attitudes survey.

2. Conceptual framework

2.1. Attitudes and food demand

The theoretical background of this study originates in neoclassical demand theory. Rational consumers are assumed to maximize their utility derived from the consumption of goods given prices and a limited budget. Subsequently, a consumer's purchase decision depends on her budget available and the prices of all goods. The effects of socio-economic characteristics (such as age or education) also influence purchase decisions and those effects have been tested in countless studies and are widely accepted (Taylor and Houthakker 2010). In Section 2.4. socio-demographic determinants specifically for meat demand are described. However, consumption decisions might also be driven by psychological variables, such as the level of trust consumers have in the safety of food. Many studies investigate actual purchase behaviors, however, attitudinal variables are only occasionally included. Researchers investigating actual purchase behaviors have typically accounted for attitudes by using proxy variables or aggregated attitude measures obtained from different individuals. For example, Piggott and Marsh (2004) used the number of media articles on different categories of meat as a proxy for consumer exposure to food safety information and as a predictor of meat demand. In other studies, consumption data have been linked to attitudinal survey data obtained from different subjects (Jensen et al. 1992). Some studies use survey data that has information on self-reported consumption and attitudes of the same people (Capps and Park 2002). These attitude answers can then be related to food demand. In order to investigate whether individual differences in the level of trust result in individual differences in meat purchases, non-aggregated data are needed. In the current study, household level meat purchases in the processed and fresh meat category are linked to the level of trust in food safety from the same households.

2.2. Consumer trust in the food industry

Linked to the increased complexity of the food chain and consumer disembeddedness in food production systems, consumers have to rely on actors in the food chain to provide safe food. Two important characteristics of trust are a consumer's willingness to accept personal vulnerability (Rousseau et al. 1998), and - linked to this - to rely upon others (Cvetkovich et al. 2002). Siegrist,

Cvetkovich and Roth (2000) defined trust as "the willingness to rely on those who have the responsibility for making decisions and taking actions related to the management of [...] public health and safety". Although trust consists of multiple dimensions, such as competence, openness, honesty, care, or fairness (Frewer et al. 1996; Johnson 1999; Poortinga and Pidgeon 2003; Renn and Levine 1991), a distinction can be made between two main trust concepts: relational and calculative trust (Earle 2010). Relational trust refers to trust in relationships (one person trusts another or a person-like entity) and looks at intentions. This dimension relates to openness, honesty, and care. Calculative trust relates to past behavior and restrictions on future behavior, and deals with abilities and perceived competence. It has been argued that the perceived intentions of others, such as actors in the food chain, are more important than the perceived competence of these actors in influencing, for example, consumer perceptions of food safety (Earle 2010). That is, an actor may be competent, but that doesn't mean that they share the same values as consumers, and put consumer interests first. In line with this, De Jonge et al. (2008) found that the extent to which different actors in the food chain were perceived to take care of consumer welfare was most influential on general consumer confidence in the safety of food, although for manufacturers, perceived competence was also very important.

Several studies propose a classification of distinct trust segments on conceptual grounds (Lewicki et al. 1998; Poortinga and Pidgeon 2003). Lewicki et al. (1998) made a distinction between trust (low vs. high) and distrust (low vs. high), resulting in four unique combinations: When there is low trust and low distrust, the involvement between the trustor and the trustee is minimal. Poortinga and Pidgeon (2003) refer to this situation as "distrust". High trust, low distrust indicates a kind of "active trust" where the trustor identifies with the trusted values. Poortinga and Pidgeon (2003) call this "acceptance". In a situation of low trust, high distrust the trustor perceives that the trustee has a different set of values and motives. The relationship is difficult; there is a lot of skepticism and cynism, referred to by Poortinga and Pidgeon (2003) as "rejection". The last combination, high trust, high distrust, refers to a situation of "critical trust" (Poortinga and Pidgeon 2003), where the trustor trusts the trustee, but does not take anything for granted; there is continuous verification and monitoring.

In an empirical setting, James and Marks (2008) discriminate between trust, distrust, nontrust and uncertainty. Trusting consumers are those who express trust in all actors in the food chain. Distrusting consumers express little or no trust in *one* specific actor in the food industry (e.g. they do not trust retailers, but do trust farmers), while nontrusting implies those consumers have no trust in any actor (ibid, p. 97). Moreover, a fourth group is formed by consumers who are uncertain whether they trust actors in the food chain. These consumers might experience ambivalence regarding trusting different food chain actors. In the current study, different trust segments will be empirically derived.

Little research has been conducted on the impact consumers' trust or distrust actually has on types of foods chosen. In one of the few studies on the relationship between consumer's self-reported confidence in the safety of food and meat purchase behavior, it was found, that Dutch consumers with low and high confidence did not differ significantly in terms of the average price paid for different types of meat (De Jonge 2008).

2.3. Meat processing types

This study pays special attention to the degree of meat processing. To differentiate the categories fresh and processed meat, the FAO definitions of fresh and processed meat are closely followed (Heinz and Hautzingner 2007). According to this definition, processed refers to salting, curing, raw-cooking, precooking, fermentation, dehydration (drying) as well as the addition of non-meat ingredients. Processed can include ready to eat meat such as cooked ham, but frying and cooking can still be necessary for some processed products, for example, chicken nuggets. The processed category includes traditional processed red meat products, semi-processed and further processed poultry products. Fresh meat is defined to be the raw meat as taken from the animal carcass that has not been treated with the methods mentioned above. Under fresh meat we are including meat from all livestock including poultry.

As different from some other definitions of processed meats – ground meat (without any other treatment) is considered to be part of the fresh category with ground beef (the largest category) representing 18.81% of all meat purchases in the data set (see Section 3 for the data description). Ground meat is normally sold in the fresh meat counter and as such may not be perceived to be

processed by consumers. Products such as frozen boxed hamburger patties are included in processed meats.[1]

Studies show that, in general consumers perceive food as less safe the higher the degree of processing (Kher et al. 2011); and those feelings appear to be especially strong for meat products (Kjaernes et al. 2005; Verbeke et al. 2010). This means that consumers who have low trust in food processing undertaken by food companies may have a preference for fresh food. This evidence illustrates the idolatry of fresh food products and the role they receive in supermarkets' marketing. Fresh products have a very positive image in general food marketing and are important for retail sales and profits (Nijssen and van Trijp 1998). Lockie et al. (2002), for example, show that consumers of organically produced foods believe that industrial food production and processing constitutes a threat to consumers. Despite these findings, convenience in food production has been clearly identified as important to consumers (Harris and Shiptsova 2007; Grunert 2006). Processed consumer goods are the fastest growing category of agricultural trade (Gehlhar and Coyle 2001). Verbeke and Viaene (1999) show analyses of household consumption data from Belgium indicating that the consumption of fresh meat products has been falling while further processed meat products and preparations have seen an increase in consumption.

2.4. Socio-demographic determinants of meat consumption

Previous studies have identified various socio-demographic determinants of meat consumption in general. The traditional economic variables, prices and income, are key determinants. Higher prices for beef have been responsible for declining US beef consumption levels and substitution effects towards higher chicken consumption (Putnam and Gerrior 1997). Meat price sensitiveness has been also documented for Canada (Lambert et al. 2006). While income does not influence total meat consumption in the US, it is positively related to beef consumption (Gossard and York 2003).

Typically, increasing age reduces meat consumption (Gossard and York 2003). Daniel et al. (2011) however show that meat consumption is different in different age categories. Except for seafood, US

[1] Based on Nielsen Market Track™ scanner data set, it is clear that most ground beef in Canada is sold as fresh random weight ground beef and makes up about C$ 367 million in expenditures or 61 million kg over the first 6 months of 2007 while packaged burgers represent about C$ 77 million or 11 million kg only.

consumers between 20-49 years of age have the highest meat consumption levels. It is not clear how age is associated with the degree of meat processing. Older households, such as those with a retired household head might have more time for meal preparation (Aguiar and Hurst 2005; Lambert et al. 2006) and therefore might purchase more fresh and less processed meat.

Previous studies are able to identify strong gender differences in meat consumption. Generally, women consume less meat than men (Daniel et al. 2011; Gossard and York 2003). Mixed results have been reported for the impact of education on meat consumption. While Rimal (2005) finds that higher education level has an effect only on chicken consumption (but not on beef), Daniel et al. (2011) observe that higher educated US consumers have higher average consumption levels of red meat and poultry. However, according to Gossard and York (2003) there is an inverse relationship between education and meat consumption: higher education equals lower meat consumption.

Household composition has been shown to determine meat consumption. Households with children present consume poultry less frequently (Rimal 2005). For fresh and processed meat, the size of a household can be expected to increase household expenditures for meat purchases. However, two counter-balancing effects can be at work determining household's choice of processed versus fresh meat. First, due to the time constraints in bigger households it is possible that these households buy meat products that are more convenient, i.e. a stronger increase of expenditures for processed meat. Second, an increasing household size can result in the realization of potential economies of size.[2] Based on theoretical considerations it not possible to determine whether the time constraint effect is larger than the economies of size effect or the opposite is true.

There are also regional differences in meat consumption as reported e.g. in Lambert et al. (2006) for Canada. It shows that the absolute values of meat own-price elasticities tend to be smaller in Central Canada compared to Western or Atlantic Canada. Moreover, meat demand is different in urban and in rural areas (Gossard and York 2003). Urban households have less time for meal preparation. Also, the percentage of working women is higher in urban than in rural areas (Regmi 2001). Furthermore, it has been argued that increased opportunity costs of women's time lead to a higher demand for fast food, i.e. highly processed food, in many countries (Regmi and Dyck 2001). Therefore, urban households

[2] Economies of size imply that the time and costs to prepare an additional serving of a meal increase less than proportional or, in other words, the time and costs per serving decrease.

might have higher expenditures for processed meat but lower ones for fresh meat compared to rural households.

To summarize, the current study investigates, on the individual household level, if and to what extent trust influences purchases of processed and fresh meat, also accounting for socio-demographic differences between households (see Figure 1).

Fig 1 Trust and meat consumption framework

[Insert Figure 1 about here]

3. Methods

3.1. Data collection and materials

For this study, unique data is used, which is an intersection of two connected data sets. The first data set is a subset from the Nielsen Homescan^{TM} panel data, covering the period July 2007 to July 2008, and contains household purchase data for meat by 9000 Canadian households. Of these 9000 households, 5000 were asked to respond to a commissioned Nielsen survey about trust in food in March 2008 and 4090 responded, comprising the second data set. Of the 4090 households, there are 3860 households (230 households) with (without) meat purchases in 2007-2008 that also completed the survey. For these 3860 households we have information about meat purchases (first data set) and answers to the trust survey (second data set). It has to be noted that the trust survey gives information about the attitude of one person of the household, the household head, while the purchase data contains complete household purchases. The effects of trust on meat purchases might be more distinct if both data sets measured trust and behavioral data for the same person. The main findings should not suffer qualitatively, however, as the interviewed person was the main purchaser for the household. This section introduces variables available in both data sets and explains their usage in modeling the trust and meat consumption framework.

3.2. Survey data

3.2.1. Socio-demographics

Several demographic characteristics were measured with the survey data. For this study, those identified in previous research to be most important to meat consumption (section 2.4.) are selected.

The first is *age*, which is represented by a categorical variable with nine groups. The large number of categories made it possible to treat age as a continuous variable, taking the mean value of the category a respondent belonged to. Age enters the model in logarithmic form (*ln of age*) to allow for a non-linear relationship between expenditures and age. To analyze household composition effects, *household size* is considered. Household size is measured as a metric variable. To discover possible discontinuities between single and non-single households the variable enters in natural logs (*ln of household size*). Furthermore, the squared form (*ln of household size squared*) controls for the economies of size mentioned above. The variables covering education level and region are categorical variables. Often dummy coding is applied for categorical variables, where the effect represents the deviation from the group mean of the reference group (e.g. expenditures of consumers with medium trust). However, in the current study effect coding is applied to investigate the effects relative to the grand mean of meat expenditures. Education is assessed on three levels: *low* (elementary and some high school), *medium (*completed high school, some technical or college and completed technical or college education), and *high education* level (some university or completed university education). Two effect coding variables were created to represent the effects of, respectively, low and high education level. Since the three effects add to zero, the difference between the effect of low and high education level represents the effect of medium education level. Characteristics of the region the household lives in are captured by two variables. The first differentiates between *rural* and *urban households*, again using effect coding. The second regional variable contains Canadian provinces, where some provinces are combined into one category. The following regions are distinguished: the Maritimes, the province Québec, the province Ontario, the provinces Manitoba and Saskatchewan as one region, the province of Alberta and the province British Columbia. Since households living in the *Prairies* (Alberta, Manitoba and Saskatchewan) traditionally have higher consumption of meat due to a strong livestock agriculture in these provinces, an additional variable named *Prairies* is added to distinguish between the Prairies and the other regions (effect coding). Although gender has a high impact on trust (Gossard and York 2003), unfortunately there is no information about gender in the data set available.

3.2.2. Assessment of trust levels

A categorization of consumer's stated level of trust in the food industry is carried out with a cluster analysis based on the commissioned Nielsen food attitudes survey. Distinct segments of consumers with different levels of trust were obtained based on consumers' general confidence in the safety of food (optimism and pessimism), as well as consumers' trust in different actors in the food chain.

Consumer's confidence in food safety in general is assessed through the constructs 'optimism' and 'pessimism' that have been defined by De Jonge et al. (2007). Items measuring optimism include "I am confident that food products are safe" and "I am satisfied with the safety of food products". Items to assess pessimism include "I worry about the safety of food" and "I feel uncomfortable regarding the safety of food". Consumer's trust in the food industry is measured for four different actors, namely farmers, retailers, food manufacturers and the government. Consumer's perceptions of the degree to which these actors were competent, open, and caring about food safety are assessed through six items per actor, which have been developed and validated by De Jonge et al. (2008a; 2010). Items included "Retailers have the competence to control the safety of food", "Retailers are sufficiently open about the safety of food", and "Retailers take good care about the safety of our food". A deliberate choice was made to assess trust in different actors in the food chain, since these are all involved in production, distribution and selling of both processed and unprocessed meat, as well as development of legislation and monitoring compliance with prevailing laws. For example, unprocessed meat also involves processors; retailers seldom buy cattle or carcasses to make ground beef or other cuts themselves, they tend to buy products, such as ground beef, from a processor and package it into retail ready packages. Research has shown that the trust variables for the different actors are positively correlated (data available from the authors upon request); people who trust one actor also tend to trust other actors. The participants answered the items on 5-point Likert scales ranging from strongly disagree to strongly agree. A mixture modeling approach (Wedel and Kamakura 2000) was used to uncover consumer segments that differ in the levels of food-safety confidence and consumer trust in farmers, manufacturers, retailers, and governments to provide safe food. Construct scores were filtered from extreme, midpoint and noncontingent response styles, which

may bias the mean scores on the underlying constructs (Baumgartner and Steenkamp 2001). Table 1 below shows the Cronbach Alpha's of the constructs.

[Insert Table 1 about here]

A segmentation analysis was conducted in LatentGold 4.0 (Vermunt and Magidson 2005). A three segment model was derived, which reflected a good trade-off between model fit and parsimony. The three segment model was also in line with McCarthy and Henson (2005) and Gellynck et al. (2006) who also identified three segments. To derive the segments, a finite-mixture model was estimated. To account for sub-optimal solutions due to particular starting values, each model was re-estimated ten times with different starting values, and the best solution was retained (Wedel and Desarbo 2002). The low-trust segment contains 24.1% of the sample population purchasing meat, whereas the medium- and high-trust segments represents 44.5% and 31.4% of the total sample, respectively.[3] For data analysis, two effect coding variables are created that reflect low and high trust levels using medium trust as a reference.

3.3. Meat demand and model specification

In order to investigate the (joint) impact of trust and socio-demographic characteristics on fresh and processed meat purchases, econometric estimations of Engel functions are used. Engel functions describe the expenditures on a commodity as a function of income keeping prices constant. Due to the cross-sectional nature of the data, where meat purchases have been aggregated for each household in the database, there is in fact no observable price variable. Here, weak separability between meat and other food items is assumed and, therefore, total meat expenditures are used to explain the expenditures for one of the two meat categories.[4] Total meat expenditures and the respective commodity expenditures (for fresh or processed meat) enter in their logarithmic form. Furthermore, the standard Engel function is expanded by the trust levels as explanatory variables. Subscript *i*

[3] Looking at the 230 participants with no meat purchases, 26.58% belong to the low-trust segment; 43.24% have medium trust and 30.18% of the non-meat purchasers have high trust. So it seems that the reason for no meat purchases is not related to trust and those households are excluded from the analysis.

[4] Meat expenditures is, as the first-stage equation, regressed on household's total income and demographic characteristics. Results are available upon request. Subsequently, the variable meat expenditures enters the two second-stage equations as endogenous variable. The two second-stage functions have been estimated as a system of demand functions. Furthermore, standard adding-up restrictions have been imposed before estimation.

indicates the meat category and subscript *j* refers to an individual household. Thus, Engel functions for each meat category are first estimated with a focus on the impact of trust only:

$$\ln EXP_{ij} = f\left(\ln MEAT\ EXPENDITURES_j,\ TRUST_j\right) \quad (1)$$

According to the "Trust and meat consumption framework" in Figure 1, the specification is extended in a second step by a set of explanatory socio-economic characteristics (Z_j) of the household and household head, including regional control variables (R_j). This gives the following complete Engel function estimation as:

$$\ln EXP_{ij} = f\left(\ln MEAT\ EXPENDITURES_j,\ TRUST_j, Z_j, R_j\right) \quad (2)$$

Out of a set of different functional forms, the double-log function was selected, because it had the highest explanatory power[5]

The data set at hand only contains households that actually did purchase any of the two meat categories during the year under study. Therefore, the data are representative for Canadian households that purchase meat. [6] In the dataset, there are households that consume both categories or only one of them. The latter consumption behavior pattern calls for using a censored regression model (Maddala and Lahiri 2009). While only nine households in the sample have zero expenditure for fresh meat, 67 of the 3860 households have zero expenditure for processed meat. The number of households with zero expenditure for fresh meat is low, but for the sake of consistency and comparability of the models (fresh and processed), whether the zero consumption and the corresponding sample selection problem pose a significant problem to both of the models is tested. Descriptive statistics of all variables used in the estimation are shown in Table 2.

[Insert Table 2 about here]

4. Results

4.1. Descriptive analysis

In the investigated period, the majority (76.67%) of meat bought is *fresh* which results in mean yearly expenditures of C$ 1939.33. A much smaller amount (23.33%) is *processed* meat making up a yearly average value of C$ 591.23 across all Canadian households in the sample (excluding non-buyers of

[5] Results of semi-log Engel function as well as two-step Heckman estimations are available upon request.
[6] Approximately 4% of the Canadian population is vegetarian (American Dietitians Association; Dietitians of Canada 2003). About 5.6% of our overall sample did not purchase any meat (n = 230).

meat). Future studies should analyze whether this very distinctive trend towards fresh meat in Canada reported here is country specific or if similar trends are evident in other countries also. In Table 3 the mean expenditures for total meat, as well as disaggregated fresh and processed meat expenditures, for the different trust clusters are described.

[Insert Table 3 about here]

Table 3 shows that consumers with a *high* level of *trust* in the food industry have the highest mean expenditures for total meat in the sample with C$ 2652.82 per year. Consumers with *low trust* levels have the lowest expenditures (C$ 2445.95 per year). Those consumers having *medium trust* in the food industry also have medium expenditures (C$ 2490.32 per year) although this value lies very close to the mean expenditures of low trusting consumers. The Kruskal-Wallis test is used as a non-parametric alternative to One-way Analyses of Variances. In general, the Kruskal-Wallis test provides more reliable results if ANOVA's assumptions of equal variances or normality are not fulfilled. It tests the null hypothesis of equal population medians. Findings show significant differences in expenditures by level of trust for processed and total meat (p=0.011 and p=0.033, respectively). According to Table 3, the differences are biggest between the groups of low and high trust across the meat groups.

4.2. Econometric analysis

Table 4 presents the results of the double-log Engel function following Equation (1) and explains the impact of trust on fresh and processed meat expenditures.

[Insert Tables 4 about here]

In the case of fresh meat (first column), neither the *low trust* nor the *high trust* coefficient are statistically significant at the conventional (5%) level. For processed meat (second column), again both variables are not statistically significantly related to meat expenditures. Thus, in a multivariate setting trust shows no effect while the results of univariate analyses (Kruskal-Wallis test) indicate significant expenditure differences. Low trusting consumers have lower levels for all meat categories considered, especially for processed meat. The fact that this result cannot be replicated in a multivariate analysis indicates that the impact of trust on real purchases is very small. Furthermore,

the result of the univariate analysis might suffer from the exclusion of other control variables. The low trusting consumer segment could potentially be a target for marketing strategies focused on reputation and quality to increase sales in this particular group.

For the extended "Trust and meat consumption framework", socio-economic characteristics are included into the model to explain meat expenditures.

[Insert Table 5 about here]

The results show that again, there is no significant effect of trust levels on meat purchases (Table 5). Larger households show no different meat purchase behavior than smaller households in a statistical sense.

The results suggest that meat expenditures for fresh meat are higher for higher educated consumers, while the opposite effect is found for processed meat. Consumers' with lower education levels spend significantly less on fresh meat but more on processed meat. This might indicate that higher educated people prefer fresh meat over processed meat, potentially pointing at a quality preference.

Households living in *urban areas* as compared to those living in rural areas buy significantly more fresh but less processed meat. This indicates that the time constraint of people living in cities is not restrictive and contradicts findings from previous studies (Regmi and Dyck 2001). People living in the *Prairies* tend to spend more on fresh but less on processed meat. Further analysis would be necessary to establish if the more traditional life-style in the *Prairies* or the high standing of the livestock industry in these regions determines this result. *Age* leads households to purchase more fresh but less processed meat. This could be explained by the fact that households with an older household head have more time for preparing meat and therefore buy less processed meat. They also may have been used over their lives to eating more fresh meat since the growth in processed meat is a fairly recent phenomenon. In general, processing restricts the variability of meals that can be prepared with a specific type of meat. Alternatively, older households might stick to learned eating habits and meals.

5. Discussion

In the current study, consumer purchase behavior regarding fresh and processed meat has been investigated, specifically focusing on the relation to consumer's trust in actors in the food chain.

Based on a “Trust and meat consumption framework”, Canadian household’s meat purchases are explained with the household head’s stated level of trust in the food industry using Engel functions. Univariate results show significant differences for processed and total meat expenditures by levels of trust. Especially consumers with low trust spend less on both processed and unprocessed meat. Interestingly, however, the effect of trust on meat purchases cannot be replicated in a multivariate analysis. This indicates that although trust affects purchases in general, the quantitative impact of trust on purchases is negligible. The main contributions of this paper are that it a) quantifies the relationship between perceived trust and day-to-day purchase behavior of meat and b) shows that individual differences in food safety perceptions hardly influence purchase patterns on a disaggregate consumption level.

However, it has to be noted that in this paper trust was measured with respect to food safety in general, not regarding the meat sector. This means that the trust measure was more general than the behavioral measures, which might have suppressed the strength of the association. Research has shown that the link between attitudes and behavior is stronger when both are measured with the same level of specificity (Ajzen et al. 1977). Moreover, trust is measured at the individual level (household head) and behavior is measured at the household level. If one person distrusts meat, family members might still eat meat. Nevertheless, the means to control for contradicting preferences of household head and household members are missing.

A potential explanation for the small effect of trust identified might lie in the meat purchase data basis. It is scanner data and originates from household supermarket shopping occasions. It might be that people with low trust buy from different sources such as a local outlet, a butcher or a farm. That is, a likely effect of trust on the willingness to purchase meat or the choice of the point of purchase cannot be analyzed with the scanner data set which we use here.

Another explanation for the weak link could be that trust and purchases have been measured in different situations. When asked to reflect on food safety in the trust survey, consumers might have been more inclined to critically think about food safety, because it is made a salient topic. In their real purchase situation, however, food safety issues might have been less salient (only for specific groups of consumers who are very involved in purchasing meat), and consumers might have been driven

more by other factors such as price, convenience, and contextual factors. A verification of this assumption seems challenging, however. The trust survey used in this paper was conducted three month before the Canadian Listeriosis outbreak. Thus, it might still be that trust is particularly influential on food choice behavior in the context of food safety incidents, where the impact is typically temporary, and less in day-to-day meat purchases.

Future studies should aim at extending the framework proposed. Empirically, future studies should test on a more disaggregated product level if consumers' level of trust in the food industry has a different impact on e.g. beef compared to pork demand. Furthermore, the inclusion of other purchase sources and a larger portfolio of food items could help to clarify the link between trust and meat consumption.

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Table 1
Cronbach Alpha's of optimism and pessimism constructs (n=2860)

Construct	**Alpha**
General optimism about food safety	0.900
General pessimism about food safety	0.794
Trust in the competence of (2 items per actor)	
Manufacturers	0.846
Government	0.847
Farmers	0.856
Retailers	0.871
Trust in the commitment of (4 items per actor)	
Manufacturers	0.928
Government	0.938
Farmers	0.930
Retailers	0.923

Table 2

Descriptive statistics of variables used

Variable	Description	Mean	Min (Max)
Dependent Variables			
Processed expenditures	Yearly expenditures for processed meat in C$	591.23	0 (6028.76)
Fresh exp.	Yearly expenditures for fresh meat in C$	1939.33	0 (12662.03)
Log of processed exp.	Logarithm of expenditure for processed meat	5.979	0.351 (8.704)
Log of fresh expenditures	Logarithm of expenditure for fresh meat	7.150	0.104 (9.446)
Characteristics of the Household Head			
Low trust	Effect coded variable indicating membership in Cluster 1: lower level of trust in the food industry (medium trust as reference, cluster 2)	-0.313	-1 (1)
High trust	Effect coded variable indicating membership in Cluster 3: higher level of trust in the food industry (medium trust as reference, cluster 2)	-0.204	-1 (1)
Low education	Effect coded variable for low education level of the household head (completion of Elementary School or some Elementary School) (medium education as reference)	-0.393	-1 (1)
High education	Effect coded variable for high education level of the household head (some University or completed University) (medium education as reference)	-0.235	-1 (1)
Age	Age of the household head	65.56	19.5 (89.5)
Log of Age	Logarithm of age of the household head	4.135	2.970 (4.494)
Characteristics of the Household			
Meat expenditures	Total meat expenditures per household in C$	2530.56	1.11 (16186.5)
Log of meat exp.	Logarithm of total meat expenditures	7.433	0.104 (9.691)
Household size	Size of the household, i.e. number of people living in the household	2.134	1 (9)
Log of household size	Logarithm of household size	0.636	0 (2.197)
Square of the log of household size	Square of the logarithm of household size	0.646	0 (4.828)
Urban	Effect coded variable indicating households living in urban areas (reference households living in rural areas)	0 .170	-1 (1)
Prairies	Effect coded variable indicating households living in Alberta, Manitoba or Saskatchewan (reference households living in the Maritimes, British Columbia, Montreal or Ontario)	-0.542	-1 (1)

Table 3

Descriptive results on expenditures in Canadian dollar (C$) for total, fresh and processed meat by different trust clusters

	Mean	Std. Dev.	Freq.
Total Meat			
Cluster			
1=*Low trust*	2445.94	2072.40	930
2=*Medium trust*	2490.32	2010.41	1719
3=*High trust*	2652.82	2091.73	1211
Total	2530.56	2052.34	3860
Fresh Meat			
Cluster			
1=*Low trust*	1881.02	1635.67	930
2=*Medium trust*	1909.09	1589.10	1719
3=*High trust*	2027.17	1644.11	1211
Total	1939.33	1618.46	3860
Processed Meat			
Cluster			
1=*Low trust*	564.92	498.10	930
2=*Medium trust*	581.23	486.90	1719
3=*High trust*	625.62	523.11	1211
Total	591.23	501.87	3860

Table 4
Impact of different levels of consumers trust in the food industry on fresh and processed meat purchases based on double-log Engel functions [a,b,c]

	Fresh meat	**Processed meat**
	Dep. var.: log of fresh meat exp.	Dep. var.: log of proc. meat exp.
	3SLS	*3SLS*
Log of meat expenditures	0.486*** (45.19)	0.514*** (47.79)
High trust	-0.007 (-1.04)	0.007 (1.04)
Low trust	0.011 (1.51)	-0.011 (-1.51)
Constant	0.697*** (8.68)	-0.697*** (8.68)
N	3835	3835
χ^2	2044.35***	2303.88***

[a]: z-values are displayed in parentheses
b: *** $p<.01$; ** $p<.05$;
[c]: For both meat types sample selection tests are not significant (results not shown). Zero expenditure for fresh or processed meat do not influence the models significantly and OLS is appropriate.

Table 5
Determinants of processed and fresh meat expenditures based on double-log Engel function [a,b,c]

	Fresh meat Dep. var.: log of fresh meat expenditures	**Processed meat** Dep. var.: log of processed meat expenditures
	3SLS	*3SLS*
Log of meat expenditures	0.585*** (11.73)	0.414*** (8.32)
High trust	-0.005 (-0.78)	0.005 (0.78)
Low trust	0.011 (1.62)	-0.011 (-1.62)
Log of household size	-0.110 (-1.46)	0.110 (1.46)
Square of log of household size	0.029 (1.01)	-0.029 (1.01)
Low education	- 0.021** (-2.47)	0.021** (2.47)
High education	0.024*** (3.45)	-0.024*** (-3.45)
Urban	0.019*** (3.81)	-0.019*** (-3.81)
Prairies	0.038*** (5.97)	-0.038*** (-5.97)
Log of age	0.089*** (5.37)	-0.089*** (-5.37)
Constant	-0.330 (-1.04)	0.330 (1.04)
N	3835	3835
χ^2	2388.05***	2625.82***

[a]: z-values are displayed in parentheses.
[b]: *** $p<.01$; ** $p<.05$;
[c]: For both meat types sample selection tests are not significant (results not shown). Zero expenditure for fresh or processed meat do not influence the models significantly and OLS is appropriate