

## **Behavior of agents at food market, especially asymmetric information on the Dairy Market**

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### ***Abstract***

*This study deals with the problem of analysis of the attitudes toward food that influence the behavior and decision-making of consumer when buying food from particular processors. Also Czech consumers do not easy discover the origin of milk in dairy product that milk is from nearby farmers. This is because this credence information is not regularly available on food labels. The information about food processor may explain that the origin of milk was from nearby farmers. This could be misinterpreting because most of processors repackaging the cheese in the Czech Republic. In 2010 - 2011, about 900 students of Universities in the Czech Republic participated in the questionnaire. Study results, which were obtained by Logit Regression Models, thus indicate that intension of buying from a particular processor is positively associated with the place of origin of milk, safety, as well as with information about how food is produced. The changes in attitude influence consumer intension in decision making process. Therefore, the results of the paper confirm the existence of "familiarity bias" in the Czech dairy market. As we have seen, asymmetric information in this study means that students are not well informed about the origin of foodstuffs.*

*Keywords: Decision making behavior, Logit Regresion, Assymetric information; Behavioral economic; Familiarity bias*

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### **1. Introduction**

Today the European Commission has introduced programs to promote EU agricultural products. The advantages of the European agricultural products are quality, food safety, hygiene, nutrition, animal welfare or environmental friendly production methods. However today, consumers can not react to these benefits of the

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European products, because information about origin of product foodstuff, processed methods are for most Czech consumers incomplete on the food labels. In the future, labelling and education about those advantages probably will change the situation in the Czech market. Even though nutritional and biological value of foodstuff products may differ, many consumers are loyalty to near-by processor.

The additional information about “processors” may be perceived by some consumers as a signal of other desirable product attribute such as “freshness”, “point of origins foods”, “environmental issue”, “food safety” and “local food standard”. For other people, the information that the product is from a local processor may influence their attitude because they want to support local farmers. However most of producers repackaging the cheese and labelling in the Czech Republic.

The presence of asymmetric information is especially of interest for consumer policy in Farm Europe’s working group for “thinking on labelling and food chain issue”. Various economic issues that could be studied from this point of view include an analysis of market failures related to imperfect information of market processes as well as the behavior of market stakeholders. One review occurred an asymmetrical information in relation to specific information concerning of ingredient of origin for processed food along the supply chain (Rischkowsky et al., 2008). The supplier provides only selective (or even false) information to the consumer in order to boost his market position. Thus consumers have limited knowledge of the production process and lack insight into the implications of their food purchase decisions on the food supply-chain (Verbeke, 2005).

Although the informational economic approaches only a particular problem of consumer decisions (i.e., imperfect information) it refers to the still existing necessity for a more widely applied theoretical funding for consumer policy (Rischkowsky et al., 2008). There are limited empirical studies examining the relation between information about “processors” and a signal of other desirable product attributes as well as the effects of milk of origin, and traceability system on consumers purchase decision in the Czech Re-

public. This study investigates, whether attitude associated with those attributes of food influenced purchase from a particular processor, specifically place of origin of milk in dairy product.

Today people reconnected with local food system, preserve natural resources and promote safer food supply, but local eating is a way to help local farming communities survive (Freenstra, 1997). These issues are gaining in importance, firstly because nutrition educators become more involved with issues related to developing a sustainable food system and secondly because the European Union established a regulation (EU) No 1151/2012 on quality schemes for agricultural products and foodstuffs to inform consumers of the specific characteristics of the product. Secondly, because in 2009 cheese imports represents 43% share in consumption in the Czech Republic.

## **2. Literature Review**

In order to investigate Asymmetric information in Czech dairy market, we primarily reviewed the literature on the theory of asymmetric information.

### **2.1. Asymmetric information in Czech dairy market**

In economic theory asymmetric information means that consumers do not know about products than sellers. Asymmetric information such as opportunistic behaviour have been theoretically and empirically linked to market failures of quality of the product.

Akerlof (1987) rejected the notion that human behavior is fully rational and theoretically describe the real world, it is necessary to take into account the assumption that people make systematic mistakes. He said that we must take in consideration how others may choose and, of course, under what conditions we decide.

The survey method to economic research introduced George Katona (1975). These methods had previously been used in his experimental psychology research. Katona's concern was to incorporate the question: 'Did our measures of change in the attitudes and expectations of the American people foreshadow their discretionary purchases?'. Katona found (1975) that the consumer is a human being, influenced by his experience. His social-economic norms,

attitudes and habits, as well as belonging to groups, all influence his decisions.

Hobbs (2004) focused on the analysis of information asymmetries of food safety and food quality attributes and functions of a traceability system. He identified that information asymmetry arises from experience or credence attributes and noted that many process quality attributes are credence attributes for buyers in the absence of monitoring or quality signals (sustainable standard under which a food was produce).

## **2.2. Familiarity with a product**

There are some empirical analysis of relationship between uses information about the product and familiarity with a product in the literature review. Park and Lessig (1981) examine decision (evaluation) biases and heuristics in different levels of familiarity of the product with specific attention to the impact on such information processing heuristics. The familiarity heuristic technique is typically useful only when the situation is not different from the time before previous consumers' behavior. It is expected to be found firstly high familiarity consumers' evaluation and decision biases among consumers who currently own the product and have relevant product knowledge. Secondly among low familiarity consumers', those who do not have prior product-usage experience, are not equipped with relevant information about brand differences and the functional product attributes, next among consumers' with medium familiarity, who have some product-usage experience, possess relevant information, but do not currently own the product.

Unless there exists some consumer loyalty to attributes to locally grown products. Dentoni (2009) analyzed the impact of credence attributes, including locally grown on consumers' attitudes towards agri-food products. He explained that a "locally grown" attribute is more used by low-familiarity consumers as a stereotype to evaluate the presence of other attributes of a product, such as its flavor or its safety. Similarly Rao and Monroe (1988) found that consumers with different levels of product familiarity use different cues to form their beliefs about the quality of a product.

### **2.3. Consumer perception of information about origin of milk in product**

Also Czech consumers do not easy discover the origin of milk in dairy product that milk is from nearby farmers. This is because this credence information is not available.

At the same time there is some evidence that cheese import and raw milk export is growing. In 2003, Cheese imports reached 15 709,4 tonnes, this represents a 12,5 % share in consumption in 2009 increased to 64 277 tonnes, which represents 42,8 % share in consumption in the Czech Republic. Many of them are from Germany and Poland, because the prices in retail stores are more competitive.

Consumers are looking for simple ways to identify characteristics of origin of milk in dairy products. The information about processor of foods may explain that the origin of food was from nearby farmers. In other words, the question that we address concerns the existence of familiarity bias in the Czech dairy market. This is the term which describes the biased behavior of agents who prefer the products related to place of origin or products they are well informed about (Park and Lessig, 1981). Some consumers believe that local processors buy the milk from nearby farmers. Customers prefer the food based on “a place of origin” and do not take into account availability of other information. This could be misinterpreting because most of producers repackaging the cheese and labelling in the Czech Republic. Finally Takayama and Judge (1971) noted that consumer preference for fresh milk is a fundamental element of market demand.

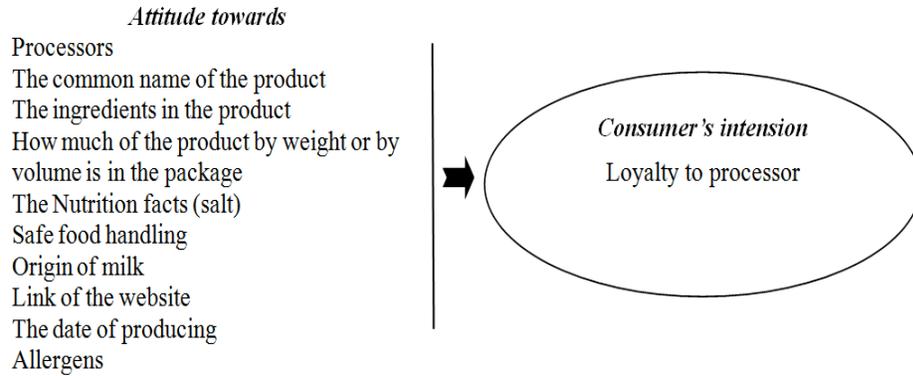
### **2.4. Research model**

On these basis we formulated hypotheses to confirm the existence of “familiarity bias” that intension of buying from a particular processor is positively associated with place of origin of milk, safety, as well as healthy. Customers do not take into account availability of other information.

The form of the model is:

Buying from a particular processors = f(attitudes towards information of food)

The model is displayed in Figure 1.



**Figure 1. Research model: Estimates of the research model**

### 3. Data and methods

Only a summary of the methods are provided, since the full study methodology was reported by Hrubá (2014).

In 2009, about 900 students of top Universities in the Czech Republic participated in the present study. The questionnaire was used to measure the effect of “origin of food” on loyalty to processors. Measure covered Czech consumers’ attitudes regarding information about product, beliefs concerning producers. Students were asked to describe their attitude association with information and purchase intension to buy a product from particular processor. Responses to 10 attitudinal statements and 1 purchase intension statement, were selected from the study and categorized into 2 groups for this study, namely:

Intension to buying from particular processor: decision regarding consumer loyalty to producers.

Statements regarding consumer attitudes towards the information’s about product.

The 10 statements regarding consumer attitudes concerning the information, which are measured on a scale from 1 to 3 (1 being unimportant, 2 important, and 3 very important); intension to purchase decision was measured on a scale from 1 to 4 (1 being never, 2 rarely, 3 sometimes, and 4 always). The dependent variable is defined as buying from particular processor during purchasing a new type of cheese. The explanatory variables used in the model include attitudes towards attributes on the food.

To explore the relationship between loyalty to processor and human thinking concerning food and nutrient security, we used econometric models ordered probit regressions that take into account ordered responses. The model is called probabilistic models because dependent variable is binary. In these types of econometric models the goal is to find determinants of probability of an event (intension to purchase from particular processor) and to analyse in a greater detail the factors that influence behaviour and decision-making of this group of consumers.

Furthermore, the model for multi-numerical data is inefficient, since they ignore the ordering information. The linear regression model cannot be appropriate either, due to the implicit assumption of an interval scale, as pointed out by Winkelmann and Boes (2006).

The findings of the regression analysis demonstrate whether human thinking concerning food and nutrient security towards information of food are directly and/or indirectly related to intentions buying from particular processor.

While we introduce econometric models that take into account ordered responses, we consequently use ordered probit regressions to explore the relationship between decision-making and human thinking concerning food and nutrient security. There are several models for ordinal outcomes, which are used in micro-economic theory. The model for ordered dependent variables are an underlying continuum by latent variable  $Y_i^*$  using the structural model as shown in Equation 1.

$$Y_i^* = x_i' \beta + \varepsilon_i, \quad (1)$$

The vector  $x_i'$  is a set of  $K$  covariates that are assumed to be strictly independent of  $\varepsilon_i$ ,  $\beta$  a vector of  $K$  parameters. Where  $\varepsilon$  has mean zero and follows a symmetric distribution (i.e., normal).  $Y_i^*$  gives us information about independent variables and it shows us probability of buying from a particular processors for consumer  $i$ .

Our dependent variable is going to be whether a consumer is loyalty to processors in decision making process. Independent variables that will be used are attitude towards information about food products. We cannot observe the latent continuous variable  $Y_i^*$ , with discrete values. Since the score is an ordered ranking but still a binary measure, the equivalence is based on the following relationship between the observed discrete response and the continuous latent variable  $Y_i^*$  is observed in discrete form through a censoring mechanism (Greene, Hensher, 2008). The predicted probability of a behavior is the area under the function between a part of cut points as given frequency of the behavior. We present summary statistics in Table 1.

Follow, we focus on predicting of loyalty to processors, irrespective of consumers' values and their level of confidence in the processors of the dairy product. In the ordered probit regression model, the probability of a particular outcome is determined by the area under the density function between relevant thresholds.

First, we estimated the linear function of the behavior as independent variables and a set of cut-points. The cut points are coded  $\kappa_0, \kappa_1, \kappa_2$ . We used each attitude on information to predict the behavior as an ordinal independent variable, defined simply as a set of mutually exclusive states that are ordered in terms of the characteristic of interest. We will attempt to draw focus to an attitude concerning in food and nutrient security such as predictors of the models. We tested whether attitudes are significant and fit of measure.

**Table 1: Descriptive statistics**

Variables	Number of Observa- tion	Mean
How important is the following information on Edam for you?		
Processors	909	0,78
The common name of the product	909	0,99
What ingredients are in the product	909	1,12
How much of the product by weight or by volume is in the package	909	1
The Nutrition facts (salt)	909	0,79
Safe food handling	909	0,83
Origin of milk	909	0,78
Link of the website	909	0,16
The date of producing	909	1,53
Allergens (healthy) food safety	909	0,71
When are you deciding for a new cheese product, do you in general?		
Buy from particular processors	909	1,64

Source: Authors own estimation

Second, we focus on predicting behavior with to differentiation of attitudes on food and nutrient security. In the ordered probity regression model, the probability of a particular outcome is determined by the area under the density function between relevant thresholds. This means that the probability of behavior corresponds to the probability that the estimated linear function, plus random error, is within the area of the cut-points estimated for the variation of behavior (Equitation 2). Where  $\beta_1, \dots, \beta_4$  are the regression coefficients,  $Y_i$  is the dependent variable. The model provides predictors of each level of behavior for the level of attitudes of food and nutrient security. Hence, the discrete probability effect for all level of attitudes is defined Equitation (2). Following the distributional assumption at the error terms yields the conditional possibility function of the latent variable,  $f(Y_i=j/X_i)$ .

$$P(Y_i=j \mid x_j) \left\{ \begin{array}{l}
 0 \text{ never buy from processors} \\
 Pr(y=0) = F(\kappa_0 - X_i\beta); (y^* \leq -0,44) \\
 1 \text{ rarely buy from local processors if} \\
 Pr(y=1) = F(\kappa_1 - X_i\beta) - F(\kappa_0 - X_i\beta); \\
 (-0,44 \leq y^* \leq 0,20) \\
 2 \text{ sometimes buy from local processors if} \\
 Pr(y=2) = F(\kappa_2 - X_i\beta) - F(\kappa_1 - X_i\beta); \\
 (0,20 \leq y^* \leq 1,19) \\
 3 \text{ always buy from local processors if } Pr(y=3) = \\
 1 - F(\kappa_2 - X_i\beta); (y^* \leq 1,19)
 \end{array} \right. \quad (2)$$

Statistical analysis was done with the Statistic software (Stata). Based on the Wald test, rejected models hypothesize a zero coefficient. The significance test confirms that group attitudes are significantly different from zero. A comprehensive test of the significance of the model is given by the "Log Likelihood Ratio Chi-square". The predicted regression model coefficients are different from zero. Number was included interviewers 909. Models leads to increased likelihood of accuracy behavior. The model is supplemented by three factors; e.g. the threshold points ( $\kappa_1$ ;  $\kappa_2$ ;  $\kappa_3$ ), the threshold point between behavior never buy from particular processors and occasionally when attitude to information in the subject is negative (-0,44) and threshold point  $\text{cutt2}$  takes the value 0,20 and  $\text{cutt3}$  1,19.

When approximately linear, the marginal effect can used to summarize the effect of changes in attitude toward food and nutrient security on the probability of each level of behavior. The marginal probability effect of behavior (MPE) of the level of attitude towards information of food ( $x_i$ ) (Equitation 3) can be obtained in general form from equation (2), by taking first derivatives, as stated by Winkelmann and Boes (2006). We compare the probability for low level of attitudes with marginal probability effect.

$$MPE_{ij} = \frac{\partial \Pi_{ij}}{\partial x_{ij}} = [f(\kappa_j - 1 - X_i'\beta) - f(\kappa_j - X_i'\beta)] \beta_1 \quad (3)$$

## 4. Results

### 4.1. Familiarity bias in the Czech dairy market

Students tended to purchase product from a particular processor (15% never, 20% rarely, 50% sometimes, 15% always). Among students who sometimes buy cheese from a particular producer high value on milk of origin (42% important, 19% very important), such as types of cheese (42% important, 30% very important), ingredients in the product (52% important, 32% very important), processors (55% important, 14% very important). In fact, students have a proper knowledge about origin of food. It appears that students may believe that information about processors is a sign of an other desirable product attributes such as origin of ingredient.

Data from a survey of students is used in a probit model to examine the effect of attitude towards the information that significantly increase the probability that consumers purchase from a particular processor. Probit model and significance all variables are presented in Table 2.

Based on the statistically significant coefficients among consumers those who are interested in nutrient, weight of the product, the date of production, the links of web site have no significant impact on the probability of buying from a particular processor.

However, consumers having interest in the processor, the method of food production, origin of ingredients, what ingredients are used in the product and food safety significantly increase the probability of buying from particular processor. While allergen in the food significantly decreases the probability.

Only variables with positive and significance level were chosen for the prediction of behavior in the next ordered logit analysis. The significance level chosen for this analysis was less than 0,05. Table 3 reports the results of followed regression analysis.

**Table 2: Probit Analysis of Purchase decision**

Description of variables	Loyalty to processors	
	Coefficients	Significance
How important is the following information on Edam for you?		
Processor	0,39	0,00
The common name of the product	0,10	0,03
What ingredients are in the product	0,079	0,359
How much of the product by weight or by volume is in the package	0,0589	0,233
The Nutrition facts (salt)	0,538	0,359
Safe food handling	0,1257	0,029
Origin of milk	0,108	0,054
Link of the web site	-0,114	0,215
The date of producing	0,018	0,755
Allergens	-0,091	0,067

Note: Responses range from 0 to 2, where coded as follows: 0 = unimportant, 1 =important, 2 = very important.

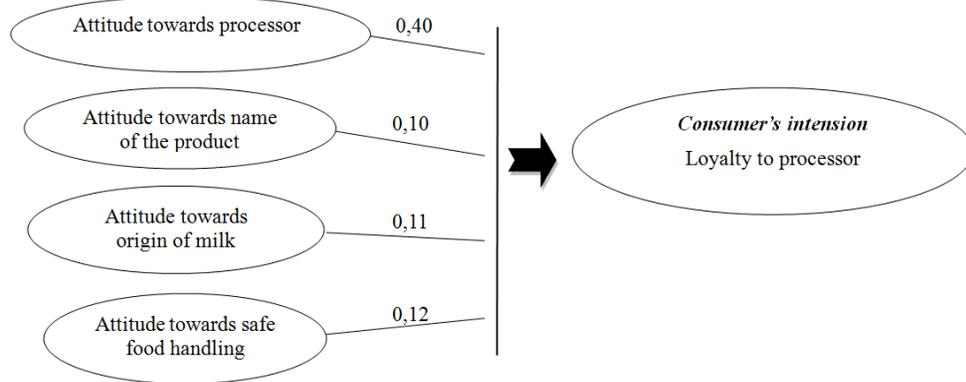
**Table 3. Probit Predicting of behavior**

Description of variables	Loyalty to processors	
	Coefficient	Significance
How important is it to you the following information on Edam?		
Processor	0,4071	0,000
The common name of the product	0,1067	0,026
Safe food handling	0,1194	0,020
Origin of milk	0,1099	0,036

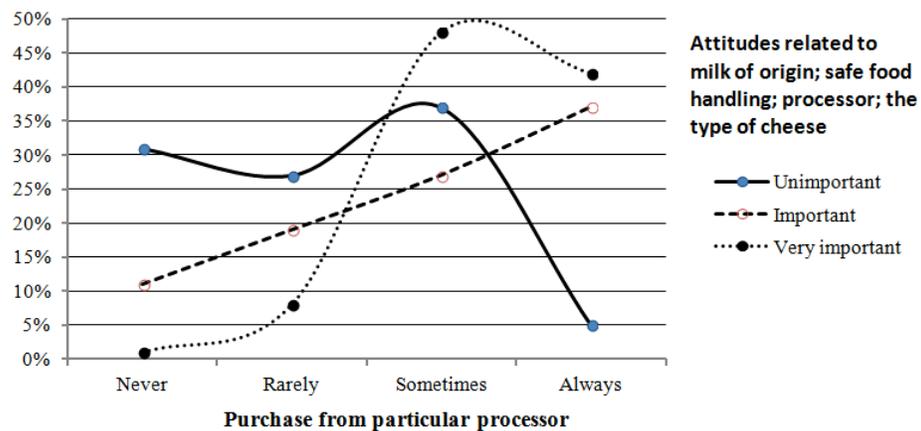
Responses range from 0 to 2, where coded as follows: 0 = unimportant, 1 =important, 2 = very important.

The regression analysis demonstrate that all four variables of origin of food products and nutrient security are directly and/or indirectly related to intentions of buying from particular processor (Figure 2). We calculate marginal effect at level of attitude to-

wards information. Figure 3 shows marginal effects of each level of attitude of independent variable on probability to buy from particular processors. In specific, safety and origin of milk exert influence up a direct effect on decision-making (Figure 2).



**Figure 2: Research model: Estimates of the research model solving problematic issue related to the food**



**Figure 3: Prediction behavioral patterns related to loyalty to processors**

Attitudes about those attributes of food being more important increase the chances of buying from particularly processors by 42 %, while a negative attitude toward these information's decrease the probability by 5 %. No interest in these attributes raises the

chances of never buying from particular processors by 31 %, while an attitude of great important reduces the chance by 1 %.

## 5. Discussion and conclusion

In this study the regression model showed that the variance in intention to purchase dairy product e.g. to be confidence to particular processor, was explained by the combination of attitudes, perceived origin of ingredients in the dairy products, and specific characteristics of the product. It seems that for consumers, the value of products partly depends on how much confidence they have in the safety of the foods, they need a better understanding of the food they eat in the terms of the quality and the safety of their food. Transparency and information are therefore cornerstones of modern consumer policy (BMEL, 2015). Moreover only 3,3% of students buying the food products if the information about product are unclear for them (Hrubá, 2014).

Consumers believe Czech inspection and rules of food system with respect to use of agricultural chemicals and food processing in the Czech Republic (Orth, 2001). In addition the most of these attributes are concerned in the mandatory quality standards, such as sustainable food production in European Union Common Agriculture Police. The reason for these rules is to protect quality and eliminate opportunistic behavior among stakeholders. Sustainability is defined as a combination of economic (profit), ecological (planet) and social (people) aspects. A sustainable food and agriculture system requires economically viable farms and productive farmland to provide quality food. Sustainable production methods were formally adopted by the member state of the European Union. In this context the European Union developing the Common Agriculture Policy to make the agriculture greener shows scarce resources can be managed more effectively. Farmers have to manage their land in sustainable ways and receiving payments to respect EU environmental an other legislation, for instance, by protecting soil, to keep land in good agricultural and environmental condition. However only the information about processor, not the origin of foodstuffs, is provided on the labelling.

Regardless this and the result of the model, the additional information about food of origin and education of consumers about

food systems both may help expand the market reach of local farmers and can expand access to fresh, local food and local distribution system. Consistently to other research survey on local food consumption found that knowledge and attitudes about food and shopping behavior, rather than demographics or health and environmental attitudes influence local food purchases (Zepeda and Li, 2009).

Attitudes were the main predictor of behavioural intentions based on the theory of Planned Behavior (Ajzen, 1991), irrespective of consumers' values and their level of confidence in the processors of the dairy product considered. A positive attitude towards processor of dairy product is a good starting point to stimulate local food consumption. Changes in attitude towards those information have a great effect on consumer intention to buying product from particular processor (by 73%).

The previous research in 2006 explained the behavior of subjects to each type of food information (Verbeke and Ward, 2006). The authors attempted to explain that attention levels are strongly correlated with importance levels of food product. Their analysis did not confirm this assumption. Then they focused their analysis on the impact of marketing campaigns which educated consumers about attribute of origin of foodstuff. They found that new information about the origin of beef influenced the behavior of subjects (Verbeke, 2005). On the other hand, if the information is incomplete, consumers are more likely not to buy the products (Chiles and McMackin, 1996). Similarly to the analysis by Chen and Huang (2013) show that the Food Traceability System can decrease an individual's perceived uncertainty. They concluded that with these systems in information is increased but consumers' believe farmers. Thus this study offers little information of processors and origin regarding the role of milk in consumer intension to buy products.

The present number of studies have shown that many food consumers are seeking to build community and establish trust with their food system through development of personal relationships with farmers and like-minded food consumers. In addition, as a reason for buying from particular processors may be motivations over health concerns, particularly reduced soil degradation (Zepeda

and Deal, 2009). Furthermore some nutrition professionals have expressed an interest in exploring the interconnected issues of food, health, agriculture, environment, and sustainable (Conner et al., 2010).

Most programs in food transparency around the globe have become evidence-based. Consumers have also become more concerned about food safety, which has led to an enhanced public expectation of higher accountability from national regulators, as argued by Charlebois and Hielm (Charlebois and Hielm, 2012). One example is sharing the market can also contribute to reducing uncertainties and diminishing opportunistic behaviour. In practice milk producers in Canada share the market and provide clear information about milk of origin. In this system of supply chain effective information is used, the price between processor and producer is transparent. Under supply management all milk from producers is sold to provincial milk marketing boards who sell this milk to processors. This system in other words, eliminates opportunistic behavior and reduces moral hazard among stakeholders. In fact National resort statistics vary widely between Canada and Czech Republic. The lack of transparency in Czech Republic accounts for these huge variations. Consumption of all components and dairy products is clearly visible and affords the farmer and producer a clear market goal, whereas in Czech Republic the farmer and producer not having transparency are at a significant disadvantage.

Based on known published research this study found that those who frequently buy from particular processors value safe food handling and how food is produced. Promoting a safer food supply, preserve natural resources should change students behavior and their better understanding of how food is produced. Similar recommendation has Freenstra (1997).

Results generally suggest that effect on consumer attitude towards a processor exists and the available information such as attributes about “producers” does not fulfil its function. The changes in attitude influence consumer intension in decision making process.

Therefore, the results of the paper confirm the existence of “familiarity bias” in the Czech dairy market. In the words of the paper, customers prefer the food based on “a place of origin” and do not take into account availability of other information. In this context the study also highlight the importance of attributes “origin of milk”. Because familiarity to this information explains students loyalty to processors in dairy market. As we have seen, asymmetric information in this study means that students are not well informed about the origin of foodstuffs.

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