WTP for Traceable Meat Attributes: A Meta-analysis[1]

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Abstract

Several researches evaluated consumers' Willingness To Pay (WTP) for each meat traceable attribute, generating a lot of information in this regard, although related to the conditions of each study. In light of this, WTP estimates for traceability characteristics largely differ across the literature, leading sometimes to contrasting interpretations. Seeking a full, meaningful statistical description of the findings of a collection of studies, the meta-analysis allows us analyzing the consistency across studies and controlling for factors thought to drive variations in WTP estimates. The meta-analysis has been conducted of 23 studies that, in aggregate, report 92 valuations for WTP.

1 Introduction

Economic literature is rich of contributes evaluating, through different methodologies, benefits linked to food safety policies, especially regarding specific food products. In particular, a plethora of studies have examined consumers' preferences and willingness-to-pay for mandatory and voluntary labeling programs associated with credence attributes, related to preferences for traceability assurances and origin of meet. In fact, different levels of traceability are implemented to guarantee credence attributes, which have captured the public attention in the last decades. Modern societies care about food safety, which has to be viewed from the peremptory perspective, and many other attributes, such as animal welfare, the respect of the environment and labor conditions, production technologies (GMO presence/absence, γ-rays, organic production, etc.) and the country of origin. Several researches evaluated consumers' Willingness To Pay (WTP) for each attribute mentioned above, generating a lot of information in this regard. Notwithstanding, this large amount of information is related to the conditions of each study. WTP estimates for traceability characteristics largely differ across the literature, leading sometimes to contrasting interpretations.

Seeking a full, meaningful statistical description of the findings of a collection of studies, in this paper a meta-analysis has been conducted. The meta-analysis on the body of literature on consumer's behavior, with respect to meat traceability allows us analyzing the consistency across studies and controlling for factors thought to drive variations in WTP estimates. The goal is to generate a set of findings about consumer WTP that are not conditional on the particulars of a single study, and to provide researchers and policy makers with a concise summary of the extant work.

Next section reviews some of studies on traceability benefits estimates, classified on the base of the method adopted. This is important to highlight differences in results due to the study conditions. Afterward, we discuss the method of selecting papers and describe the data collected from the selected studies. Aiming at the comprehension of traceability effects, a

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series of several methodological and conceptual factors are considered for inclusion in the proposed models. A description of the models is then presented. Finally, concluding remarks on obtained results conclude the paper.

2 WTP estimations on traceable meat attributes

Consumers' attitude towards traceability along the production chain of the meat sector has been largely discussed in several studies, starting from the beginning of ninety's until nowadays. The most common benefits estimation techniques are the stated preferences methods (contingent evaluation, conjoint analysis, choice modeling) and revealed preferences methods (hedonic pricing). Regarding to the use of the latter method, a remarkable example is given by Word et al. (2008). This study on unobservable characteristics of ground beef and steak, conducted in US, reveals that ground beef prices were not significantly influenced by quality grade signals, while steak showed significant price premiums for quality signals compared with products with no quality grade designation. Consumers would expect to pay more for higher quality grade steaks and less for lower graded products (Word et al., 2008). Instead, steaks labeled as "no hormones added" were priced lower than products with no special labels. This result conflicts with Lusk et al. (2003) estimates attained throughout a choice model, in France, Germany, UK and US. They found consumers were willing to pay significant premiums for steaks produced without growth hormones. According to the Authors, this may be attributable to the fact that the model already controls for other attributes, like the brand name, and thus the extra value of "no hormones added" has secondary importance.

A study in which a conjoint analysis is applied to estimate relative utilities, for US consumers, associated to beef steak characteristics, is the one of Mennecke et al. (2007). The analysis reveals that the most important characteristic is the region of origin, followed by the breed, on-farm traceability and type of feeding. The ideal steak for the national sample is from a locally produced choice Angus, fed with a mixture of grain and grass that is traceable to the farm of origin (Mennecke et al., 2006).

Concerning the use of choice models in studies about traceability of poultry and beef, we can list Loureiro and Umberger (2004; 2005; 2007). In last two of those studies the country of origin label seems to be the most important attribute of meat, but in Loureiro and Umberger (2004), where a comparison with additional safety cues were considered, then safety has elicited the highest premium.

About the use and findings attained for this topic trough the contingent evaluation, an example is Angulo e Gil (2007) research. Results show that safety perception is one of the most important determinants of Spanish consumers' WTP for beef certifications.

Another class of techniques aimed at estimating food safety policies benefits are the ones based on experimental markets. These try to overtake the limits of methods based on willingness to pay, which is the hypothetical scenario. In experimental auction markets, indeed, interviewees deal with actual money and actual foodstuff. This difference might lead to significant divergences in regard to benefits estimates. An example of use of this class of technique is given by Dickinson and Bailey (2002), who conducted experimental auctions to asses US consumers' preferences and WTP towards traceability, additional assurances for food safety, animal welfare (including non use of growth hormones) for beef and pork products. This study reveals that consumers were willing to pay a premium for on-farm traceability; anyway, such premium was higher for a multi-clue traceability. Dickinson and Bailey's results are consistent with the Hobbs' ones (2003), from an experimental study with a Canadian sample. Although in this study on-farm traceability has elicited the lowest willingness to pay, the highest bid has been declared for beef or pork products characterized

by on-farm traceability plus ex-ante assurances on "quality" (animal welfare and food safety). This result is due to the fact that traceability alone does not reduce information asymmetry about credence attributes, hence it becomes necessary but not sufficient condition for the control of unobservable attributes such as animal welfare or environmental friendly productions (Hobbs, 2003).
In general, what can be observed from literature on meat traceability is that same attributes are differently ranked across studies and sometimes even contrasting. This may depend on how WTP estimates are elicited, on the country where the analysis has been conducted, on the set of attributes considered and their relative importance, etc. Thus, all information we have now regarding meat traceable attributes represent only a partial picture.
A more complete review of studies on meat traceability is available in the table 1.

Table 1. Summary of studies on meat traceability

Study	Location of study	Sample size	Nature of valuation method	Product	Meat traceable attribute	Base price ($/lb)
Alfnes, 2004	Norway	1066	hypotetical	Beef	Food safety, place of origin	5
Alfnes e Rickertsen, 2003	Norway	106	non-hypotetical	Beef	Food safety, place of origin	5
Angulo e Gil, 2007	Spain	650	hypotetical	Beef	Food safety	9.12
Baley et al., 2005	US	104	hypotetical	Beef	Food safety	13.47
Bolliger e Réviron, 2008	Swizerland	450	hypotetical	Poultry	Place of origin	7.5
Checketts, 2006	US	264	hypotetical	Beef	Food safety, on-farm traceability	6.66
Dickinson and Bailey, 2002	US	112	non-hypotetical	Beef	Food safety, place of origin, on-farm traceability, animal welfare	3*
				Pork	Food safety, place of origin, on-farm traceability, animal welfare	3*
Dickinson e Bailey, 2003	US, Canada, UK, Japon	14	non-hypotetical	Beef	Animal welfare	3.02
				Pork	Animal welfare	2.65
Dickinson et al., 2003	US, Canada	56	non-hypotetical	Beef	Food safety, on-farm traceability, animal welfare	3
				Pork	Food safety, on-farm traceability, animal welfare	4
Enneking, 2004	Germany	321	hypotetical	Pork	Food safety	1.5
Hobbs, 2003	Canada	204	non-hypotetical	Beef	Food safety, on-farm traceability, animal welfare	2.62
				Pork	Food safety, on-farm traceability, animal welfare	2.64
Loureiro e Umberger, 2003	US	243	hypotetical	Beef	Place of origin	4

Loureiro e Umberger, 2004	US	632	hypotetical	Beef	Food safety, place of origin, on-farm traceability	8
Loureiro e Umberger, 2005	US	632	hypotetical	Beef	Place of origin	6.9
				Pork	Place of origin	3.6
				Poultry	Place of origin	2
Loureiro e Umberger, 2007	US	632	hypotetical	Beef	Place of origin, on-farm traceability	4.85
Lusk et al., 2003	France, Germany, UK, US	360, 210, 450, 725**	hypotetical	Beef	Food safety	6.88
Meuwissen et al. 2007	The Netherlands	1199	hypotetical	Pork	Food safety, place of origin, on-farm traceability, animal welfare	5.53
Menozzi et al, 2009	Italy	160	hypotetical	Poultry	Place of origin	1.9
Sanchez et al., 2001	Spain	247, 235•	hypotetical	Lamb	Place of origin	7.58
				Beef	Place of origin	6
Stainer e Yang, 2007	US, Canada	214	hypotetical	Beef	Food safety	3.54
Ubilava e Foster, 2009	Republic of Georgia	159	hypotetical	Pork	On-farm traceability	5.33
Umberger et al., 2003	US	273	non-hypotetical	Beef	Place of origin	4
Umberger et al., 2009	US	866	hypotetical	Beef	Place of origin	7.89

*The value of the sandwich in both the beef and ham auction is roughly the same (Dickinson and Baley, 2002).

** Sample size with respect to the Country, respectively.

•Sample size with respect to the type of meat.

3 Testing the robustness of empirical findings on meat traceability: Meta-analysis

A meta-analysis of meat traceability research helps answer to the following research questions:

- Is there empirical evidence that WTP for meat traceability is positive and increases when specific attributes are considered (Place of Origin, Food Safety, type of meat, etc.)?
- What is the attribute certified by traceability that, systematically, elicits the highest WTP?
- What are the studies' characteristics that influence WTP estimates?

In fact, meta-analysis allows examining the extent of traceability effect depending on study conditions, as different research designs, on several meat products, in several countries are adopted in every single study.
Although the meta-analysis is a technique very common in many fields of Science and Economics, at the best of our knowledge this is the first meta-analysis concerning the consumer behavior in regard to meat.
Our analysis consists in 3 consecutive steps, following the procedure already tested by Farley and Lehmann (1994) and Varlegh and Steenkamp (1999):

- A prior collection of empirical studies concerning WTP estimations with respect to meat traceable attributes;
- The identification of study factors thought to drive variations in WTP estimates;
- Model setting by using dummy variables to codify those factors.

3.1 Sample selection process

Our sample is given by findings from empirical studies about meat traceable attributes for the period 2000-2008. Those studies have been collected and selected through research databases, such:

- AgEcon Search (agriculture economics and applied economics),
- Blackwell Journals (interdisciplinary),
- EconLit (paper from economics journals);
- Emerald Insight (interdisciplinary),
- Google Scholar (interdisciplinary),
- ScienceDirect (technical, medical scientific literature, but also on business and economics).

Those databases represent a huge source of papers and government reports on applied economics, consumer's behavior, chain management, marketing and business.
From the six databases twenty-three separate studies have been selected on the base of their perceived importance with respect to the topic. Selected studies are those in which consumers' WTP for meat characterized by certain traceability systems cues has been estimated (tab 1). The 23 studies collectively provide 92 estimates of consumers' values for meat traceable attributes, giving a reasonably large and representative sample of such studies for the analysis.

3.2 Meat traceable attributes impact indicator

Aimed at attaining a comparison among meat traceable attributes impact, the indicator adopted is the associated premium, or WTP, as it results from collected studies. Each WTP estimate has been converted in percentage of the product's base price, so that problems like different currencies and different ways to express price premium (i.g. with respect to the weight unit, product unit) have been overtaken.
Since in some studies several WTP estimates, one for either each meat traceable attribute considered in the specific study and for each meat product (i.g. beef, pork), the number of WTP estimates is greater than the number of collected studies. Each observation in our meta analysis includes, as the dependent variable, the estimate of mean willingness to pay (MWTP) in percentage.

3.3 Studies factors

Factors that seem to have a systematic impact on WTP estimates have been identified in selected studies. Because they are likely to moderate the impact, those factors are considered moderator variables (Varlegh and Steenkamp, 1999), and tested in the proposed model.

A discussion on factors is reported below:

a. *Country*. The country where the single study was conducted is considered as a factor that may affects consumers' willingness to pay. In fact, due to cultural differences and to other macroeconomics variables (i.g. GDP, inflation, per-capita income, rate of unemployment) the WTP for food safety and other traceable attributes may largely differ. Also, we need to consider that consumers' sensitivity to some food attributes is somehow related to the emphasis given by governments, through for instance, advertising campaigns and regulatory restrictions.
b. *Research design*. Because individuals tend to overstate the amount they are willing to pay in hypothetical valuation tasks as compared to when real money is on the line (Lusk et al. 2005), we included in the model whether the valuation task was hypothetical or non-hypothetical.
c. *Sampling nature*. Whether the sample was comprised of students or randomly recruited subjects seems to embody a crucial aspect. Use of student subjects in experimental markets is more convenient and less costly than standard subject pools, and according to some Authors, there is ample evidence that students perform equally as well as professionals in economic experiments (Smith et al. 1988). Notwithstanding, those type of sample might be not representative of the general population either in terms of demographics or purchasing habits (Nalley e t al., 2006). Hence, the debate concerning students being actual consumers and their decisions being representative of market decisions is still open.
d. *Sample size*. Sample size can be an important factor affecting the reliability of single studies' findings.
e. *Base price*. This factor is thought to influence the premium price, in the sense that the additional amount of money that consumers may be willing to pay for credence attributes largely depends also on the original price of the meat. In fact, firstly, higher prices are quality cues *per se*; secondly, the percentage of WTP tends to decrease with higher prices, as consequence of a greater incidence on the total expenditure.
f. *Type of meat*. Different type of meat, meaning the animal species like pork, beef, poultry, etc., might affect consumers' WTP by reason of different degrees of trust toward rearing systems and control along the production chain (use of hormones, disease incidence potentiality), but also because of several scandals that have involved those meat sectors, seriously affecting quantity, price and searched guarantees in purchases.
g. *Type of cut*. As underlined in several studies, the type of cut of meat (steak, ground meat, ham, etc.) can make a difference in the WTP estimates.
h. *Food safety*. This category includes WTP for additional assurances on food safety, like for instance, USDA inspection label, BSE-free label, hormone-free label, GMO-free label.
i. *Place of Origin*. It considers WTP for a label declaring the country or the region where meat has been produced.
j. *On-farm traceability.* WTP for a label stating that meat is traceable from the farm of origin.
k. *Animal welfare.* It considers WTP for a label that declares respect of animal welfare.
l. *Multi-cues traceability.* This includes WTP for a level of traceability implementation able to assure several meat attributes concurrently.

The way in which moderator variables were defined into the model is shown in table 2.

Table 2. Summary Statistics and Definitions of Variables

Variable	Definition	Mean
	Dependent variable	
MWTP%	MWTP percentage per each meat traceable attribute	21.702 (3.221)
	Independent variables	
Food_safety	1 if the related WTP was estimated; 0 otherwise	0.505 (0.052)
Place_of_origin	1 if the related WTP was estimated; 0 otherwise	0.258 (0.046)
Animal welfare	1 if the related WTP was estimated; 0 otherwise	0.355 (0.050)
Multi_ cues_trac	1 if the related WTP was estimated; 0 otherwise	0.258 (0.046)
On_farm_trac	1 if the related WTP was estimated; 0 otherwise	0.258 (0.045)
Non_hyp_scen	1 if valuation involved actual scenario; 0 otherwise	0.591 (0.051)
Beef	1 if the type of meat was beef; 0 otherwise	0.581 (0.051)
Poultry	1 if the type of meat was poultry; 0 otherwise	0.064 (0.026)
Lamb	1 if the type of meat was lamb; 0 otherwise	0.011 (0.011)
Pork	1 if the type of meat was pork; 0 otherwise	0.344 (0.050)
Ham	1 if product valued was ham; 0 otherwise	0.123 (0.048)
Roast_beef	1 if product valued was roast beef; 0 otherwise	0.215 (0.044)
Ground_meat	1 if product valued was ground meat; 0 otherwise	0.032 (0.018)
Steak	1 if product valued was steak; 0 otherwise	0.344 (0.049)
Sausage	1 if product valued was sausage; 0 otherwise	0.011 (0.011)
Europeans	1 if data from Europe; 0 otherwise	0.269 (0.046)
US_people	1 if data from United States; 0 otherwise	0.452 (0.052)
Canadians	1 if data from Canada; 0 otherwise	0.236 (0.044)
Japoneses	1 if data from Japon; 0 otherwise	0.032 (0.018)
Sampling_nature	1 if sample comprised of students only; 0 otherwise	0.000
Sample	Number of observations in each subsample (study)	218.463 (28.226)
Base_price	Baseline price per each study and each meat product	4.026 (0.401)

3.4 Analysis

The most adopted model in meta-analysis studies considering WTP estimates as dependent variable is the multiple linear regression (Loomis and White, 1996; Lusk et al., 2005; Jacobsen and Hanley, 2009; Richardson and Loomis, 2008).
As pointed out by Lewis and Linzer (2005), because of the nature of the dependent variable, which observations are quantities estimated in previous analysis, the multiple regression procedure usually lead to inefficient estimates and underestimated standard errors. Indeed, such errors of measurement are often explicitly included in discussions of regression residuals (Maddala, 2001). Moreover, if the sampling uncertainty in the dependent variable is not constant across observations, the regression errors will be heteroscedastic and ordinary least squares (OLS) will introduce further inefficiency and may produce inconsistent standard error estimates. According to Lewis and Linzer's procedure (2005), if sampling error comprises a larger share of the variation in the dependent variable and this uncertainty varies greatly across observations, appreciable gains in efficiency can be achieved through the use of feasible generalized least squares (FGLS) estimators.

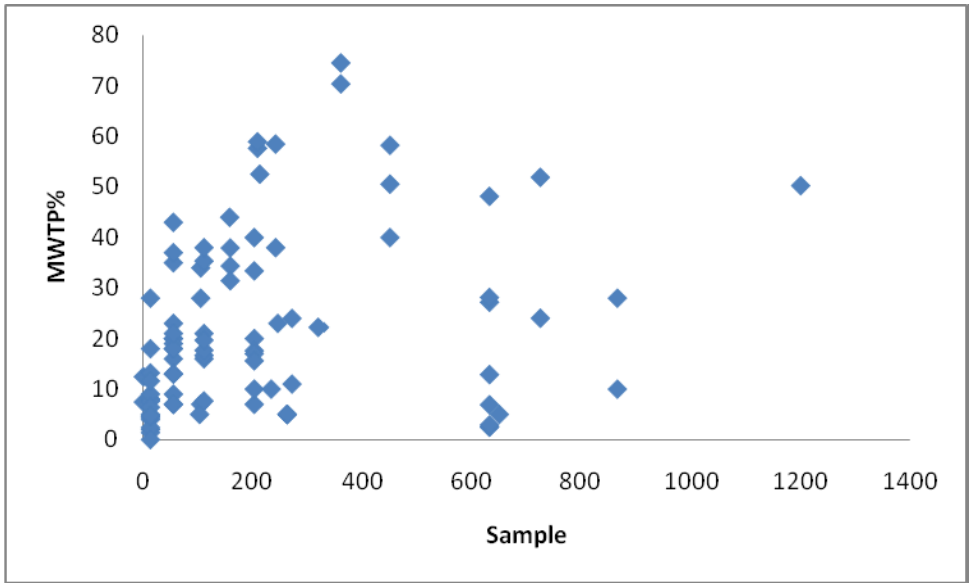

Figure 1. Variable *WTP%* against variable *Sample*, observations graph

We used also this approach to test the effect of the aforementioned variables on the premium for meat traceable attributes. The dependent variable is the percentage premium for those attributes, and independent variables are the dummy variables plus the continuous variables defined in table 2.
The FGLS estimates use the number of observations in each subsample (*Sample*) and the baseline price (*Base_price*) to correct for potential heteroscedasticity.
Results showed below (Table 3) correspond to the OLS and Feasible Generalized Least Squares (FGLS) estimates for the most complete specification, respectively. Because the variable "Sample" seems to have a logarithmic behavior with respect to the dependent variable (Figure 1), both models have been tested by using the natural log of that variable. Moreover, results are presented for the full meta-analysis regressions as well as the reduced models of variables significant at the 0.1 level or higher.
For sake of brevity, we do not report all the models in which the whole sets of the variables have been tested. All the variables that are not mentioned in Table 3 have resulted to be non-significant by any means. The criterion with which variables defined in the Table 2 enter in

the models is aimed at avoiding multicollinearity. That is why, for example, for variables like the nationality of the interviewees (Europeans, US people, Canadians, Japaneses), since the most numerous were the US people (45.2%), than this variable has not been included in the model being considered as a benchmark, while the others have been included as deviation with respect to it.
The variable "Sampling_nature" could not be tested because there were no observations in the sample regarding studies whose sample was comprised of only students.
The set of variables concerning the meat type of cut (steak, ground meat, rost-beef, ham and sausage) resulted to be non-significant, except for steak that is significant in all the models. In light of this, this variable has been re-codified consistently with its meaning respect to the other types of cut, that is as unprocessed meat.

Table 3. Ordinary least squares (OLS) and feasible generalized least squares (FGLS) estimates

	Full Models				Reduced Models			
Variable	OLS	FGLS	OLS log_Sample	FGLS log_Sample	OLS	FGLS	OLS log_Sample	FGLS log_Sample
Constant	8.656	3.679	-13.337	-13.070	0.362	-9.013	-23.645***	-33.415***
Food_safety	11.774**	15.601***	12.832***	15.162***	7.709**	15.711***	11.575***	14.719***
Place_of_origin	11.001*	12.456*	4.526	8.233*	8.234*	13.609**		7.6187*
Animal welfare	6.812	11.720*	10.097*	14.196***		10.181*	8.432*	12.638***
Multi_ cues_trac	-7.747	-14.564*	-9.904*	-11.248*		-13.934*	-8.548*	-10.144*
On_farm_trac	12.137**	16.391***	9.192**	11.071**	8.941**	16.514***	6.875**	9.696**
Non_hyp_scen	-8.664	-10.013	-4.977	-15.251**				
Poultry	-8.058	-13.314	-6.361	-12.854				
Lamb	-9.009	-11.127	-1.406	-5.766				
Pork	-5.777	-5.533	-4.778	-3.892				
Unprocessed_meat	-13.560**	-17.480*	-15.897***	-20.952**	-11.283**	-17.289*	-12.085**	-19.631**
Europeans	9.172**	17.209**	8.894**	8.2162*	5.703	15.331***	8.034**	8.382**
Sample	-0.004	0.005	[1]4.5096***	[1]6.021***			[1]5.865***	[1]7.090***
Base_price	2.329***	2.244***	2.028***	1.737**	3.063***	2.609***	2.077***	1.951***
Adj R^2	0.363	0.569	0.406	0.508	0.362	0.573	0.417	0.495
F	4.990***	10.261***	5.778***	8.221***	9.591***	16.244***	8.395***	10.927***

[1]Values of the variable "Sample" are natural log scaled

All the reduced models results to fit better than the full models at the Likelihood Ratio Test (LR test).
Although the test on the heteroscedasticity of the errors (White test) of the OLS models indicates that residuals are not heteroscedastic, the FGLS estimator turns out to be more efficient as well. In fact, the FGLS regressions explain the variation in MWTP amounts relatively better then the OLS regressions, as 49.5% to 57% of the variation in MWTP is explained by the included variables, versus 36.2% to 41.7%.

3.5 Results interpretation

Signs of the estimated coefficients for each regressor match quite well with our expectations, and the pattern of significance is pretty robust to alternative functional forms, especially for variables like "Food_safety", "Place_of_origin", "On_farm_traceability", "Unprocessed_meat" and "Base_price". Also the ranking among attributes is highly comparable among functional forms.

- The attribute that elicits the highest MWTP%, *ceteris paribus*, is the "Food safety". This means that, taking into account the body of literature on meat traceable attributes, consumers are seen to be willing to pay, on average, between 12% and 16% more, over the base price, in order to have further assurances about food safety.
- The other attribute that appears to be very important for consumers is the "On-farm traceability". In fact, on average, consumers assign a premium between 11% and 16.4% over the base price in order to be fully informed about the "meat's path" from the farm to the table.
- Another attribute which embodies particular importance to consumers, *ceteris paribus*, is a further assurance on "Animal welfare", which may elicit a premium that can vary between 7% to 14% on the base price, showing an increasing consumers' interest about the life quality of domestic animal.
- In contrast with our expectations, the "Place of origin" is not extremely significant in all of the estimations. This may depend on the fact that "On-farm traceability" to some extent, may offset the place of origin.
- Also the variable "Multi-cues traceability" does not show a high significance, but the negative sign denotes that the marginal WTP is decreasing with the increase of number of attributes.
- Switching to interpret the variables that correspond to study factors, it is possible to underline that the research design, in particular whether the valuation task was "Non-hypothetical", does not appear to have a significant influence on the WTP, although the negative sign is coherent with our expectations.
- Surprisingly, also the type of meat does not affect significantly consumers WTP. By contrast, for the "Unprocessed meat" consumers are willing to pay less than for variously processed meat (ham, roast-beef, sausages, etc.).
- Another important factor is the Country where the study has been conducted. Indeed, while the variables "Canadians" and "Japanese" were not significant, the variable "Europeans" has shown an overall significance in the various models, meaning that European people are, on average, willing to pay more for the meat traceable attributes than people from other Countries.
- The "Size of the sample" of each study results to be an important factor (in log scale) to determine the WTP. In general, the larger the sample, the higher is the differential of premium that can be elicited.
- In keeping with our expectations, the "Base price" influences significantly the premium. The sign of the coefficient is positive, meaning that a higher price affects positively the WTP, although of small percentage increase. This can be interpreted by considering that consumers may judge the price as a quality cue, and consequently they may find more valuable to pay a premium for a better product.

4 Conclusions

The meta-analysis on the body of literature on consumer's behavior with respect to meat traceability allowed us analyzing the consistency across studies and controlling for factors thought to drive variations in WTP estimates. Results from this study help summarize effectively the extant literature on consumers' WTP for meat traceability and permit the creation of some evidences that are not conditional on the results of one particular study.
For instance, our study clearly shows that consumers from different countries are placing an increasing importance on traceable meat attributes. In particular "Food Safety", "On Farm Traceability-Country of Origin" and "Animal Welfare" seems to be the most requested attributes.
Those credence attributes could be linked as direct and indirect indicators to food safety, even the "Animal Welfare", as suggested by Caracciolo et al. (2010) in a recent contribution on Pork meat attributes requested by European consumers. While food industry sector is increasing the amount of information on products sold, consumers seems to look for easily understandable cues that allow them to buy meat with high levels of safety.
Finally, industry might be interested in part of information released by this study, because results correspond to realistic premiums for each meat traceability levels. This can be very useful to achieve an efficient voluntary traceability program. Also Policy makers might find this information reliable, during cost-benefit evaluations, for the implementation of mandatory meat traceability programs.

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