Are consumers willing to pay for in-vitro meat? An investigation of naming effects

Article

Accepted Version

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Are Consumers Willing to Pay for In-vitro Meat? An Investigation of Naming Effects

Daniele Asioli[1], Claudia Bazzani[2] and Rodolfo M. Nayga, Jr[3]

ABSTRACT

Currently, there is an ongoing debate about whether "in-vitro meat" (IVM) should be labeled and communicated differently from conventional meat. Naming and labeling IVM can have significant implications and consequences for consumers' acceptance of this new product as well as for future labeling policies. We provide, for the first time, information on how the use of different terms (i.e., "cultured," "lab-grown," and "artificial") shapes United States consumers' preferences and marginal willingness to pay for IVM. Using a choice experiment involving chicken meat products that vary across four attributes (i.e., production method, carbon trust label, antibiotics use, and price), our results show that consumers prefer chicken meat produced through the conventional production method and tend to generally reject IVM. However, the term "cultured" is less disliked than the terms "lab-grown" and "artificial," while "artificial" is less disliked than "lab-grown". Results also indicate that consumers' valuations are heterogeneous over differing consumer attitudes. Our findings provide insights into the psychology of consumers' level of acceptance and attitudes, which can be useful in communicating the nature of the IVM to the public. They also have important implications for future labeling policies.

Key words: Chicken meat; Consumers' willingness to pay; In-vitro meat; Labeling policy; Naming effects; United States.

JEL classifications: C93**,** D12, D91, Q02, Q18, Q21

[1]Daniele Asioli is the corresponding author (d.asioli@reading.ac.uk), and is in the Department of Applied Economics and Marketing, School of Agriculture Policy and Development, University of Reading, Reading, United Kingdom.
[2] Claudia Bazzani is in the Department of Business Administration, University of Verona, Verona, Italy.
[3]Rodolfo M. Nayga, Jr.is in the Department of Agricultural Economics, Texas A&M University, College Station, TX, United States.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

1. INTRODUCTION

Continuing growth in world population, incomes, and urbanization has significantly increased the demand for meat products (OECD-FAO, 2013). Meat production, however, can generate large greenhouse gas emissions (Gerber et al., 2013), and is a major user of land, energy, and water (FAO, 2006). There are also increasing societal concerns about food safety, human health issues related to meat consumption (Godfray et al., 2018), and animal welfare (Lymbery and Oakeshott, 2014).

For these reasons, there is increasing interest in innovative alternatives to conventional meat. While plant-based food, mycoproteins, or insect food products are starting to enter in the food market, consumer desires for meat similar to conventional meat is encouraging the development of what is termed "in-vitro meat" (IVM) (Post and Hocquette, 2017). IVM is the result of recent scientific advances in regenerative medicine techniques, where muscle-specific stem cells are taken from an animal and then grown to form muscle tissue as edible meat (Yuan, 2018).

In the last few years, a growing number of new start-up businesses (e.g., Memphis Meat, Mosa Meat) as well as large companies such as Tyson Foods Inc., Google, and Cargill have invested large amounts in developing IVM (CBS News, 2018; Garfield, 2018). While several companies are aiming to sell IVM in the coming years (Shapiro, 2018), Singapore has recently approved the sale of IVM chicken produced by the company Eat Just, Inc. (Noyes, 2020).[4]

One of the key advantages of IVM technology is that it could produce meat in unlimited quantities that could potentially be produced more sustainably in terms of lower greenhouse gas emissions, land use, and water use (Mattick, Landis, and Allenby, 2015)[5]. In addition, IVM should not raise any

[4] On December 16, 2020, the first world commercial sale of IVM chicken was served in the restaurant "1880" in Singapore (Ho, 2020).

[5] However, recent research has been inconclusive as to the environmentally sustainable advantages of IVM over conventional meat (Lynch and Pierrehumbert, 2019). Specifically, the lower environmental impact of IVM compared to conventional meat production depends on the availability of decarbonized energy generation and the specific production systems that are realized. Indeed, initially IVM results in less warming compared to conventional meat production, but this gap narrows in the long term and in some cases the latter causes far less warming. This is because CH_4 emissions from conventional meat production do not accumulate, unlike CO_2 which is the type of GHG mainly produced by IVM (Lynch and Pierrehumbert, 2019).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

animal welfare concerns (Chriki and Hocquette, 2020). However, in addition to current technical challenges and high production costs, some researchers are claiming that consumers' acceptance is the most relevant barrier to market development for IVM (Sharma, Thind, and Kaur, 2015). A few studies have investigated consumers' acceptance of IVM and find that a majority of consumers would at least be willing to try IVM, while a substantial number would consume it regularly or as a replacement for conventional meat, suggesting the existence of potential markets in North America, Europe, and Asia for IVM (for an extensive review on consumers' acceptance of IVM, see Bryant and Barnett, 2018, 2020).

One of the most critical issues related to IVM consumers' acceptance is its nomenclature (Friedrich 2016; Ong, Choudhury, and Naing, 2020) which affects marketing and communication strategies as well as labeling policies for IVM and hence could be a major factor in its success (Watson, 2020). Furthermore, before IVM goes to market, regulators will likely first have to decide how to term IVM products (Johnson, Maynard, and Kirshenbaum, 2018), with substantial implications for both IVM and conventional meat producers. For example, several farm groups and the conventional meat-processing interests have affirmed their allegiance to traditional meat by loudly voicing their opposition to IVM and demanding that it not be called "meat" at all.[6] In addition, the lack of regulations and standardization of IVM have generated several ambiguities in terms of its nomenclature (Ong, Choudhury, and Naing, 2020).

To our knowledge, few studies have investigated consumers' preferences regarding IVM and whether these are influenced by the terminology used to identify IVM products. Bryant and Barnett (2019) found that the term "clean meat" led to higher acceptance than "lab-grown meat," while the terms "cultured meat", and "animal-free meat" scored in the middle (Bryant and Barnett, 2020). Two other non-refereed consumer studies on how nomenclature affects consumers' acceptance of IVM have also been carried out. The Good Food Institute found that the terms "slaughter-free," "craft," "clean," and "cultured" held some appeal. The terms "slaughter-free" and "cell-based" performed best in terms of descriptiveness and differentiation, while the terms "slaughter-free" and "craft" performed best in regard to the likelihood of trying and purchasing IVM (Szejda, 2018). In addition, the Animal Charity

[6]This issue is now one of the U.S. National Cattlemen's Beef Association's top policy priorities, with the purported goal of protecting people from what they called misleading labels (USCA, 2018).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Evaluators found that the term "clean" led to significantly greater consumer acceptance than "cultured" (Greig, 2017). None of these studies, however, has examined consumers' valuation of IVM products using different terminology.

Our study fills this gap by using a choice experiment (CE) to investigate consumers' willingness to pay (WTP) for hypothetical IVM fresh skinless boneless chicken breast products, hereafter called "chicken products". Specifically, we performed an online experiment with consumers in the United States using different treatments to test how sensitive consumers' preferences and marginal WTP (mWTP) for the chicken product attributes are to different terms associated with IVM (i.e., "cultured," "lab-grown," and "artificial"). Although other terms are also widely used (e.g., clean meat, synthetic meat, etc.), we decided to test terms that are conceptually different from each other and that have been used by several published studies, advocacy groups, and the media. We chose fresh skinless boneless chicken breast products for three main reasons: (i) chicken breast is one of the most consumed meats in United States (National Chicken Council, 2018b), (ii) the United States chicken industry is the largest in the world (National Chicken Council, 2018a), and (iii) several large companies and startup businesses (e.g., Tyson Foods, Eat Just Inc.) are investing in IVM chicken (Tyson Foods, 2018; Lucas, 2019).

1. MATERIALS AND METHODS

1.1 CE Design

In the CE, four attributes were used in all treatments to describe the different types of chicken products, as follows: "production method," "Carbon Trust label," "antibiotics use," and "price" (Table 1). First, we included "production method" because we wished to test consumers' mWTP for different chicken production methods. Thus, two levels of production method were specified "conventional", and "IVM". We randomly assigned respondents to three treatments to test the effect of different IVM terms. Thus, IVM was termed "cultured" for treatment 1 ("Cultured"); "lab-grown" for treatment 2 ("Lab Grown"); and "Artificial" for treatment 3, ("Artificial"). Specifically, the term "cultured" may evoke associations to science, which are not rated negatively (Bryant and Barnett, 2019). Moreover, it has been widely used in the IVM community, including by the NGO New Harvest as well as by a number of studies (e.g., Bryant and Barnett, 2019; The Golden Food Institute, 2019), and it seems to be preferred by IVM companies (Ong, Choudhury, and Naing, 2020). "Lab-grown

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

meat" is a term often used by the media, perhaps because it intuitively describes the concept in lay terms, and is, perhaps, more sensational compared to other terms (Bryant and Barnett, 2019; Smith, 2014). In addition, the "lab-grown meat" term may serve as shorthand to distinguish IVM from meat harvested from slaughtered animals (Watson, 2020), and it seems to be preferred by traditional meat producers (Ong, Choudhury, and Naing, 2020). "Artificial" is a lesser-used term typically deployed by opponents of the IVM technology (Watson, 2020), and used in the media (Dahlgreen, 2013; Heid, 2016).

Second, we included information about the environmental impact of meat production because it is currently one of the top key concerns of the conventional meat production method (Godfray et al., 2018). Specifically, we used the "Carbon Trust label," referring to the environmental impact of food production, transportation and use of the food products in terms of CO2 emissions, against no label. Third, we included the information about "antibiotics use" given the fact that antibiotics might be used during chicken production (Chriki and Hocquette, 2020). This information is a top concern when consumers are purchasing meat (Boyer, Neth, and Nunlist., 2017). Therefore, "antibiotics use" was specified by the phrase "No antibiotics ever", or no information about this was reported. Lastly, four price levels were specified based partly on the current market prices for chicken products in retail stores in the United States ($2.50/lb, $5.50/lb, $8.50/lb, and $11.50/lb).[7]

Table 1

The selected attributes and their levels were then used to generate an orthogonal, fractional factorial design that resulted in the creation of 24 choice sets,[8] which were then divided into two blocks of 12 choice tasks each to prevent respondents' fatigue. We used the Ngene 1.2 software to generate our choice design. Specifically, we used a sequential orthogonal design approach. In the sequential method, an orthogonal design is first generated for the first alternative, and then the allocation of

[7]The prices for fresh skinless boneless chicken breast products were based on prices recorded in different U.S. stores, including grocery stores, farmers' markets, specialty stores, organic stores, and supermarkets.

[8]The suitability of the adoption in this study of an orthogonal design approach with no prior information is given by the use of treatments differing in terms of the naming frame, that is, the production method. As we expected, the use of different naming frames might have affected consumers' evaluation of the products' attributes. As such, the use of an experimental design based on prior information might have more efficiently worked in the case of one treatment (i.e., the treatment where the same naming frame was specified) but not for all them (Bliemer and Collins, 2016).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

attributes and attribute levels is derived based on the first alternative (Choicemetrics, 2018). This type of design is implemented for unlabeled designs like ours, where the utility function of each alternative has the same attributes and attribute levels[9]. Each choice task was composed of two product alternatives (options A and B) and an "opt-out" option (option C) (see example in Appendix A, on-line). The choice tasks within each block, and the products within each choice task (options A and B) were randomly ordered.

The CE was introduced to the respondents with an explanation, and description of the attributes and levels. Before the choice tasks, respondents were asked to read a cheap talk (CT) script in an attempt to mitigate the possible hypothetical bias that typically affects WTP estimates in stated preference studies (Cummings and Taylor, 1999) (see Appendix B, on-line, for the CT script). Upon completion of the 12 choice tasks, the respondents were then asked to fill out a questionnaire to collect several consumers' attitudes. A pre-test involving 50 consumers was performed to test the survey. The complete questionnaire is available in Appendix C, on-line.

1.2 Experimental Treatments and Research Hypotheses

To test our research hypotheses, we implemented a between-subjects design based on the use of three CE treatments. Hence, each respondent was randomly assigned to only one of the CE treatments. The three treatments differed only in terms of the name given to the IVM. Specifically, in treatment 1, termed "Cultured", 210 consumers were exposed to chicken products with the IVM product being termed "*cultured*." In treatment 2, termed "Lab Grown", 208 respondents were exposed to chicken products with the IVM product being termed "*lab-grown*." In treatment 3, termed "Artificial", 207 respondents were exposed to chicken products with the IVM product being termed "*artificial*." To avoid providing information that could potentially bias consumers' responses, we provided the same definition of IVM across all the treatments (see Appendix D, on-line).

With these CE treatments, we were able to test a series of hypotheses aimed at testing whether the term used for the IVM affected consumers' mWTP for the IVM technology. To determine the effect

[9] In the generation of the orthogonal design, interaction terms between the production method and the remaining non-price attributes were included. However, in this study we focused on the treatment effect on the attributes' main effect; hence we did not take into account the interaction terms in our model estimation.

of terms on individuals' mWTP, the estimates from the three treatments were compared. Accordingly, we conducted the following three tests:

First, we tested Treatment 1 (Cultured) vs. Treatment 2 (Lab Grown) to investigate whether the two naming frames affected consumers' WTP for "cultured" vs. "lab-grown" meat. Thus, we tested the following hypothesis:

$$H_{01}: (mWTP^{LABGROWN} - mWTP^{CULTURED}) = 0$$

$$H_{11}: (mWTP^{LABGROWN} - mWTP^{CULTURED}) \neq 0$$

Second, we tested Treatment 1 (Cultured) vs. Treatment 3 (Artificial) to investigate whether consumers are willing to pay different price premiums for "cultured" vs. "artificial" meat. Thus, we tested the following hypothesis:

$$H_{02}: (mWTP^{ARTIFICIAL} - mWTP^{CULTURED}) = 0$$

$$H_{12}: (mWTP^{ARTIFICIAL} - mWTP^{CULTURED}) \neq 0$$

Third, we tested Treatment 2 (Lab Grown) vs. Treatment 3 (Artificial) to investigate whether consumers' evaluations for "lab-grown" vs. "artificial" meat differ. Thus, we tested the following hypothesis:

$$H_{03}: (mWTP^{ARTIFICIAL} - mWTP^{LABGROWN}) = 0$$

$$H_{13}: (mWTP^{ARTIFICIAL} - mWTP^{LABGROWN}) \neq 0$$

Moreover, the existing literature shows that attitudinal factors may shape consumers' perceptions of IVM. For this reason, we also tested hypotheses related to the effect of attitudinal variables on respondents' mWTP formation for the different IVM chicken products. We particularly focused on 6 major factors.

(i) The effect of having heard or not heard about IVM (HEARING). Following past studies, our hypothesis is that consumers who have heard about IVM have a higher mWTP for IVM products in the case of "Cultured" but a lower mWTP in the case of "Lab Grown", and "Artificial". This is because studies have shown that "cultured" may evoke positive associations to science (Bryant and Barnett, 2019), while "lab-grown" (Bryant and Barnett, 2019) and "artificial" may sound more sensational and may be negatively associated with human manipulation of nature (Bryant and Barnett, 2019; Watson, 2020).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

(ii) The effect of pro-animal welfare attitude (AAS). Our hypothesis is that consumers who have a higher pro-animal welfare attitude have a higher mWTP for IVM since by using IVM technology no animal is slaughtered, and previous consumer research found that animal welfare is one of the most important perceived benefits of IVM (Bryant and Barnett, 2018). We do not expect differences among the IVM terms for this effect.

(iii) The effect of the degree of neophobia toward new food technologies (FTNS). Previous research has shown that a high degree of neophobia toward new food technologies may reduce consumers' acceptance of foods produced using new technologies (Asioli et al., 2019). However, prior consumer studies on IVM show ambiguous results (Dupont and Fiebelkorn, 2020; Gómez-Luciano et al., 2019). Thus, given the previous literature, we are unsure of what to expect.

(iv) The effect of pro-environmental attitude (NEP). Authors have reported that environmental benefits are one of the major perceived benefits of IVM (Bryant and Barnett, 2018), while others have found that consumers perceive that IVM can be harmful to the environment (Gómez-Luciano et al., 2019; Specht, Rumble, and Rhoades, 2020). Thus, given the previous literature, we are unsure of what expect. We do not expect differences among the IVM terms for this effect.

(v) The effect of religious orientation (RELIGION). Prior research has shown that religion could affect consumers' acceptance of IVM. Indeed, Marcu et al. (2014) found that consumers characterize IVM as "playing God," while other authors found that, in principle, religious people were open to IVM if it comes from animal species allowed in their religion (Bryant, 2020). Thus, given the previous literature, we are unsure of what to expect.

(vi) The effect of political preferences (POLITICS). Previous research has found that left-wing/liberal consumers tend to accept IVM more than right-wing/conservative people (Bryant and Barnett, 2018). Thus, we hypothesize that left-wing/liberal consumers have a higher mWTP for IVM. We do not expect differences among the IVM terms for this effect.

Specifically, we aim first at testing within each treatment whether attitudinal factors shape mWTP formation for IVM. Second, we test the above hypotheses related to naming effects across different attitudinal subsamples in order to investigate how the naming of the IVM impacts the evaluations of

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

individuals with different attitudinal characteristics.

1.3 Data

The data[10] used in this study are drawn from an online survey involving 625 consumers in the United States using the online platform Qualtrics LLC (Provo, USA), carried out in fall of 2017. Consumers were randomly recruited by Qualtrics using sampling quotas in terms of age, gender, and income based on official statistics (United States Census Bureau, 2015). Only consumers who were at least 18 years old were included in the study.

Given the randomization to treatments, we checked if we had achieved balance for the observable characteristics across the treatments. The results are presented in Table A2, on-line and show that the hypotheses of equality of means between socio-demographic characteristics across treatments failed to be rejected at the 0.05 level.

~~**Table 2**~~

After the choice tasks described above, we included questions to test our hypotheses concerning attitudinal factors, as described in section 2.2.

2. ECONOMETRIC ANALYSIS

To test the research hypotheses, we estimated the effect of the treatments on mWTP formation using discrete choice models, which are typically used to analyze choice data (Hensher, Rose, and Green, 2015). Specifically, discrete choice models are based on modeling "utility" that is to say, the net benefit a subject obtains from selecting a specific product in a choice situation as a function of the attributes that are embedded to the product under consideration (Hensher, Rose, and Green, 2015). There are different specifications of discrete choice models, from multinomial logit (MNL), which assumes homogeneity in individuals' tastes, to the mixed logit model (MIXLM), which accounts for preference heterogeneity.

[10] We obtained informed consent from all the participants in the study. Our study was approved by an institutional review board (IRB).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

In addition, in discrete choice models, it is necessary to specify the utility function, which could be in either preference space or WTP space (Train, 2009). In preference space models, mWTP values are derived by dividing the coefficients of the non-price attributes by the negative of the price coefficient, while in WTP space models, the attributes' coefficients enter the utility function directly as mWTP. Studies have shown several advantages of WTP space models over preference space models, including accounting for interpersonal scale variations (Scarpa and Willis, 2010), greater stability in the WTP estimates (Balcombe, Chalak, and Fraser, 2009), and more reasonable WTP distribution (Train and Weeks, 2005). Hence, we opted for the MILXLM, with the specification of the utility function in the WTP space. Consistent with the Lancaster Theory (Lancaster, 1966), discrete choice models assume that the total utility consumers derive from a product can be segregated into the marginal utilities given by the attributes of a product. As such, the specification of the utility (U) function in our study can be defined as follows:

$$U_{njt} = \alpha_n(ASC - PRICE_{njt} + \theta_{n1}PRODUCT_{njt} + \theta_{n2}CARBON_{njt} + \theta_{n3}ANTIBIOTICS_{njt}) + \in_{njt,} \quad (1)$$

where n refers to the individual, j denotes each of the three options available in the choice set, t is the number of choice occasions, and α_n is the price scale parameter that is assumed be random and to follow a log-normal distribution. The ASC is the alternative constant indicating the selection of the opt-out option. The price ($PRICE_{njt}$) attribute is represented by four experimentally defined price levels (i.e., \$2.50/lb, \$5.50/lb, \$8.50/lb, and \$11.50/lb). $PRODUCT_{njt}$ is a dummy variable representing the production method, taking the value of 0 if the production method is "Conventional" and 1 if it is "cultured" for $CULTURED_{njt}$, "lab-grown" for $LABGROWN_{njt}$, and "artificial" for $ARTIFICIAL_{njt}$. $CARBON_{njt}$ is a dummy variable representing the "Carbon Trust label," taking the value of 0 if no label is reported and 1 if the Carbon Trust label is reported. $ANTIBIOTICS_{njt}$ is a dummy variable for information about antibiotics use, taking the value of 0 if no information is reported and 1 if the phrase "No antibiotics ever" is reported. θ_{n1}, θ_{n2}, and θ_{n3} are the coefficients of the estimated mWTP values for the production method, the Carbon Trust label, and the "No antibiotics ever" claim, respectively. Finally, $\in_{njt}$ is an unobserved random term that is distributed following an extreme value type I (Gumbel) distribution, independent and identically distributed (i.i.d.) over alternatives.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

The parameters corresponding to the three non-price attributes were modeled as random parameters assumed to follow a normal distribution, while the opt-out parameter was modeled as a fixed parameter.

The differences in the mWTP among the three treatments involved in our hypotheses (i.e., H_{01}, H_{02}, and H_{03}) can be tested by conducting pairwise tests using data from the two respective treatments involved in the particular hypothesis. Then, following Bazzani et al. (2017) and De-Magistris, Gracia, and Nayga (2013), we created interactions between the non-price attributes and the treatment (*dtreat)* parameters, which were modeled as a fixed parameters. Precisely, the interaction effects were specified as dummy variables to differentiate one treatment over another (*dtreat*). Accordingly, the model can be specified as follows:

$$U_{njt} = \alpha(ASC - PRICE_{njt} + \theta_{n1}PRODUCT_{njt} + \theta_{n2}CARBON_{njt} + \theta_{n3}ANTIBIOTICS_{njt} + \eth_1 (PRODUCT_{nj} * dtreat) + \eth_2 (CARBON_{nj} * dtreat) + \eth_3 (ANTIBIOTICS_{nj} * dtreat) + \in_{njt}, \quad (2)$$

where *dtreat* is coded as 1 for the first treatment in the analyzed hypothesis (i.e., "Lab Grown" for H_{01}, "Artificial" for H_{02}, and "Artificial" for H_{03}), and 0 otherwise. The significance of the estimated ð coefficients and their signs indicate the effect of the treatment on the mWTP for the attribute of interest.

Finally, to test our hypotheses concerning consumer attitudinal factors, we conducted subsample analyses based on the factors described in section 2.2 above. Again, the estimated mWTP for the different subsamples as well as the differences in mWTP for the different subsamples among the three treatments can be tested using the same models, (1) and (2), used for the pooled samples.

All the models were estimated using STATA 16.1 software (Stata-Corp LP, College Station, USA).

3. RESULTS

3.1 WTP Estimates: Pooled Samples

The results from the estimation of the mixed logit models using equation (1) in the WTP space for the three treatments are shown in Table 3. Specifically, we report the estimates (mWTP) of the

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

production method, Carbon Trust label, antibiotics use, price, and opt-out parameters.

In all three treatments, the mean estimate for the opt-out option is negative and significant, suggesting that consumers tend to prefer one of the two product alternatives as opposed to the "opt-out" option. On average, consumers prefer chicken products produced through the conventional production method, branded with the "Carbon Trust label," and labeled with the claim "No antibiotics ever." Specifically, if we look at the mWTP magnitudes for the individual attributes, we notice that the production method has the highest magnitude, suggesting that it is the attribute that mostly influences consumers' mWTP. The second most important attribute that affects the mWTP is antibiotics use. On average, consumers prefer chicken products with the label claiming "No antibiotics ever", with relatively similar mWTP across the treatments. The Carbon Trust label is the least valued attribute, with relatively similar mWTP across the treatments. The estimated price coefficients indicate that the "cultured" description is less rejected than the "lab-grown" or "artificial" with consumers are willing to pay a higher price (or less lower price) for IVM on average when it is termed "cultured" rather than "lab-grown" or "artificial".

Table 3

Next, we test the hypothesis that the different terms associated with IVM significantly affect mWTP estimates using the model specified in equation (2). Specifically, we estimated three separated models to test: 1) our first null hypothesis (H_{01}: $mWTP^{LABGROWN}$ - $mWTP^{CULTURED}$ = 0) using pooled data from the Lab-grown and Cultured treatments; 2) our second null hypothesis (H_{02}: $mWTP^{ARTIFICIAL}$ - $mWTP^{CULTURED}$ = 0) using pooled data from the Artificial and Cultured treatments; 3) our third null hypothesis (H_{03}: $mWTP^{ARTIFICIAL}$ – $mWTP^{LABGROWN}$ = 0), using pooled data from Artificial and Lab-grown treatment. Table 4 reports the estimates of the main effects and the interaction between the production method, the Carbon Trust label, antibiotics use, and the interaction parameters accounting for treatment effect (*dtreat*). From column 1, we observe that our first null hypothesis (H_{01}: $mWTP^{LABGROWN}$ - $mWTP^{CULTURED}$ = 0) is rejected, since the interaction effect between the production attribute and the treatment variable is statistically significant. Specifically, consumers' mWTP is significantly lower when the production method for IVM chicken products is termed "lab-grown" rather than "cultured" (-$4.82/lb). The statistically significant parameter of the "Lab Grown"

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

treatment interaction indicates that our second null hypothesis (H_{02}: $mWTP^{ARTIFICIAL}$ - $mWTP^{CULTURED}$ = 0) is also rejected. Specifically, the negative sign of the treatment parameter indicates that consumers' mWTP is significantly lower when IVM chicken products are termed "artificial" rather than "cultured" (-$4.03/lb). Finally, we reject our third null hypothesis (H_{03}: $mWTP^{ARTIFICIAL}$ – $mWTP^{LABGROWN}$ = 0) since the treatment parameter is statistically significant. Specifically, consumers' mWTP is significantly higher when the production method for IVM chicken products is termed "artificial" rather than "lab-grown" (+$2.19/lb).

Table 4

3.2 WTP Estimates: Subsample Analysis

The results from the estimation of the MIXLM models using equation (1) in the WTP space for the subsample analysis of the three treatments are shown in Table 5 (see also Table F1, on-line, for the model fit statistics). We performed the analysis in three steps. First, for each treatment, we identified subsamples based on the attitudinal factors described above (section 2.2~~). In Table 6, we describe the subsamples we have identified with the respective acronyms~~ (see Table E2 in Appendix E, on-line, for details on how the subsamples were created). ~~within each treatment, for each identified subsample, we estimated the MIXLM in the WTP space, which is specified in equation (1).~~ For each subsample, we extracted the conditional individual mWTP (i.e., mWTPi) to check for significant differences across the subsamples within each treatment by using the non-parametric Mann Whiney U test (Mann and Whitney, 1947). Specifically, Table 5 reports the estimates of the production method[11] and the corresponding standard errors. The reported *p-values* are the results of the Mann Whiney U tests, which explain the statistical differences in terms of mWTP for the IVM attribute across the attitudinal subsamples.

Table 5

~~**Table 6**~~

[11] In Table 5, we included only the production method estimates because it is the only attribute that differs across the treatments and that we are interested to test. In addition, adding all the other estimates would have created an information overload. However, the complete results are available upon request.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Some interesting findings can be identified. First, we observe that consumers who have heard and who have not heard (H/NH) of the IVM term prior to the study have different mWTP depending on the IVM term. Specifically, in Treatment 1 "Cultured", consumers who have heard (H) the term "cultured" have a higher mWTP than those who have not heard (NH) the term (+$4.09/lb). Interestingly, there are no significant differences in mWTP between the two subsamples in Treatments 2 "Lab Grown", and 3 "Artificial". Second, for the subsamples identified by pro-animal welfare attitude (AAS), we find that in Treatment 3 "Artificial", consumers who have a higher pro-animal welfare attitude (HAAS) have a lower mWTP (-$4.73/lb) than those who have a lower pro-animal welfare attitude (LAAS). We find no significant differences, however, in mWTP for the IVM product across the two subsamples in Treatments 2 "Lab Grown", and 3 "Artificial". Third, as for the subsamples related to the degree of neophobia toward the adoption of new food technologies (FTNS), the results indicate that consumers who have a lower degree of food technology neophobia (LFTNS) have a higher mWTP for cultured (+$5.11/lb), lab-grown (+$10.63/lb), and artificial (+$6.11/lb) meat than consumers who have a higher degree of food technology neophobia (HFTNS). Fourth, the results suggest that there is no heterogeneity in results in all three treatments across those who have a higher vs. a lower pro-environmental attitude (HNEP v. LNEP). Fifth, as for religiosity (REL/NREL), we find that consumers who are not religious in "Cultured" and "Lab Grown" have a higher mWTP for cultured (+$1.12/lb) and lab-grown (+$2.03/lb) meat, respectively, than those who are religious. In addition, we find significant differences in terms of mWTP across the two subsamples in Treatment 3 "Artificial" but at the 0.10 level of significance. Finally, as for political preferences, the results suggest that moderate consumers tend to have a higher mWTP for artificial meat than conservatives (+$1.46/lb) and liberals (+$3.52/lb) and that conservatives have a higher mWTP for artificial meat than liberals (+$2.06/lb).

Finally, for each subsample, we tested the hypothesis that the different terms associated with IVM significantly affect the mWTP estimates using equation (2). Specifically, Table 7 (see also Table F2 in the on-line appendix F for the model fit statistics) reports the estimates of the production method parameters, the standard errors, and the corresponding significance (i.e., at 1%, 5%, 10% level *p-value*) of the *t* tests for the dummy variables. The findings reveal that in all the subsamples, the term "cultured" is less rejected than the terms "lab-grown", and "artificial." In addition, in some

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

subsamples, such as hearing (H), religious (REL), and moderate (MOD), the term "artificial" is less rejected than the term "lab-grown" at the 5% level *p-value*.

Table 7

4. DISCUSSION

Our goal was to investigate the sensitivity of United States consumers' evaluations of In Vitro Meat (IVM) chicken products to different descriptive names (cultured, lab-grown, or artificial). We found some interesting results. First, consumers value IVM chicken products less than conventional chicken, confirming the results of Van Loo et al. (2020) for beef. Second, the name given to IVM can significantly affect consumers' mWTP values. Overall, the term "cultured" gets the least negative mWTP valuation compared to the terms "artificial" and "lab-grown." This finding is corroborated by Bryant and Barnett (2019), who found that the term "lab-grown" meat was evaluated more negatively than the term "cultured." We speculate that the terms "lab-grown", and "artificial" have stronger negative connotations than the term "cultured" because consumers might perceive the former terms as less natural than 'cultured' due to perceptions related to human manipulation and intervention. Third, we found that consumers who have heard of the name "cultured" meat prior to the study are willing to pay more for IVM than those who have not heard the term, while we found no significant differences in mWTP for the terms "lab-grown" and "artificial" in this respect. This finding corroborates our conjecture, based on the study of Bryant and Barnett (2019), that the term "cultured" may evoke associations to science, which are not rated negatively. Fourth, we observe ambiguous findings about pro-animal welfare attitudes. Indeed, consumers who have a higher pro-animal welfare attitude have a lower mWTP than those who have a lower pro-animal welfare attitude only in the case of IVM termed as "artificial." Fifth, in all the treatments, we found that consumers who have a high degree of neophobia toward the adoption of new food technologies have a lower mWTP for IVM than those who have lower food technology neophobia, which contrasts with Gómez-Luciano et al. (2019) for IVM. Sixth, in all treatments, we found that consumers' pro-environmental attitude does not affect consumers' mWTP for IVM, which contradicts previous consumer research pointing out that environmental benefits are one of the major perceived benefits of IVM (Bryant and Barnett, 2018; Weinrich et al., 2020), although other studies indicate that consumers negatively perceive IVM since it can be harmful to the environment (Gómez-Luciano et al., 2019; Specht, Rumble, and

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Rhoades, 2020). Seventh, we found that in all three treatments, consumers who are not religious have a higher mWTP for IVM. This finding could be explained by the fact that some consumers characterize IVM as "playing God" (Marcu et al., 2014). Eighth, as for political preferences, we found ambiguous results. Indeed, political moderates tend to have a higher mWTP for artificial meat than conservatives and liberals, and in turn, conservatives have a higher mWTP for artificial meat than liberals. This finding is in contrast with previous research showing that liberal consumers tend to accept IVM more than conservative consumers (Bryant and Barnett, 2018; Wilks et al., 2019). Finally, we found that, consistent with the pooled samples, the term "cultured" is less rejected than the terms "lab-grown" and "artificial" in all the subsamples, while only in some subsamples (i.e., hearing, religion, and moderate), the term "artificial" is less rejected than the term "lab-grown."

5. CONCLUSIONS

Our results give some insights into the growing controversy over whether IVM products should be labeled differently in the market. While plant-based foods that look like meat can now be bought in supermarkets, it could be just a matter of time before retailers stock their shelves with IVM, as illustrated by the recent approval in Singapore for the commercialization of IVM chicken (Noyes, 2020). This obviously worries many conventional meat producers. Verbeke et al. (2015) found that consumers want regulations that would require IVM to be clearly labeled as such, while Van Loo et al. (2020) found that the majority of consumers prefer that the use of the label "beef" should be prohibited for IVM. If consumers value IVM significantly differently than conventional meat, this indicates a need for labeling regulations to help consumers make more informed purchase decisions by allowing them to identify IVM specifically. Thus, it is of crucial importance to have an established regulatory framework controlled by authorities to ensure effective and standardized IVM labeling that consumers can trust and use to make more informed choices (Ong, Choudhury, and Naing, 2020). Our results generally imply that consumers' valuation of IVM is quite different (i.e., lower) from that of conventional meat, at least in the context of our choice experiment. This suggests that consumers will likely demand the right to know whether or not the product they are buying is produced in-vitro. In other words, consumers will likely demand that IVM be labeled differently from conventional meat. At the same time, however, our results indicate that the term that consumers find on the package of IVM on the supermarket shelves could have a strong effect on consumers' acceptance or rejection

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

of IVM. However, we should note that our sample size for our choice experiment is relatively small for an online study performed in a large country, such as the United States.

In terms of the future of the IVM market, the significantly lower valuations given by consumers to IVM compared to conventional meat could pose a non-trivial challenge for IVM producers given the higher production costs currently associated with IVM (Post, 2012). Our results suggest that different names for IVM could affect consumers' rejection of this food technology, and that consumers who are less neophobic toward new food technologies and are not religious could be the initial consumer segments to target for IVM.

While this study represents a first investigation of how consumers value IVM descriptions in terms of their marginal willingness to pay, more research is needed to definitively answer questions about the market potential of IVM. Moreover, given lobbying efforts from the meat industry to persuade the government to enact policies that would disallow the naming of IVM as "meat," future studies should investigate how such policies would influence consumers' valuation of IVM products. Finally, it would also be interesting to test the robustness of our results for other types of meat (i.e., beef, pork, lamb) and in other countries given the expected increase in meat demand in many parts of the world.

Acknowledgements. Thanks to the European Commission through the Marie Curie Actions Intra European Fellowship (IEF), call FP/-PEOPLE-I2012-IEF – project title ''Innovative Methodologies for New Food Product Development: combining Sensory Science and Experimental Economics – NEFOMET" for the support. Thanks also to the Nofima AS (Norway) and the University of Reading (United Kingdom) for the support.

REFERENCES

Asioli, D. *et al.* (2019) 'Microwave-dried or air-dried? Consumers' stated preferences and attitudes for organic dried strawberries. A multi-country investigation in Europe', *Food Research International*, 120, pp. 763–775.

Balcombe, K., Chalak, A. and Fraser, I. (2009) 'Model selection for the mixed logit with Bayesian estimation', *Journal of Environmental Economics and Management*, 57(2), pp. 226–237.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Bazzani, C. *et al.* (2017) 'Testing commitment cost theory in choice experiments', *Economic Inquiry*. Wiley Periodicals, Inc., 55(1), pp. 383–396.

Bekker, G. A., Tobi, H. and Fischer, A. R. H. (2017) 'Meet meat: An explorative study on meat and cultured meat as seen by Chinese, Ethiopians and Dutch', *Appetite*, 114(Supplement C), pp. 82–92.

Bliemer, M. C. J. and Collins, A. T. (2016) 'On determining priors for the generation of efficient stated choice experimental designs', *Journal of Choice Modelling*, 21, pp. 10–14.

Boyer, A., Neth, J. and Nunlist., M. (2017) 'Consumer chicken consumption survey results', *Chicken Marketing Summit*. Available at: https://www.wattglobalmedia.com/chickenmarketingsummit/2017-presentations/.

Bryant and Barnett, J. (2019) 'What's in a name? Consumer perceptions of in vitro meat under different names', *Appetite*, 137, pp. 104–113.

Bryant and Barnett, J. (2020) 'Consumer Acceptance of Cultured Meat: An Updated Review (2018–2020)', *Applied Sciences*.

Bryant, C. *et al.* (2019) 'A Survey of Consumer Perceptions of Plant-Based and Clean Meat in the USA, India, and China', *Frontiers in Sustainable Food Systems*, 3, pp. 1–11.

Bryant, C. and Barnett, J. (2018) 'Consumer acceptance of cultured meat: A systematic review', *Meat Science*, 143(September), pp. 8–17.

Bryant, C. J. (2020) 'Culture, meat, and cultured meat', *Journal of Animal Science*, 98(8).

CBS News (2018) 'Lab-grown meat could be in restaurants by 2021', *CBS News*. Available at: https://www.cbsnews.com/news/mosa-meat-lab-grown-meat-could-be-restaurants-by-2021/ (Accessed: 20 August 2018).

Choice Metrics (2018). Ngene v1.0.1 User Manual and Reference Guide. Sydney, Australia: Choice Metrics Ltd.

Chriki, S. and Hocquette, J.-F. (2020) 'The Myth of Cultured Meat: A Review', *Frontiers in Nutrition*, 7, p. 7.

Cummings, R. G. and Taylor, L. O. (1999) 'Unbiased Value Estimates for Environmental Goods: A Cheap Talk Design for the Contingent Valuation Method', *The American Economic Review*. American Economic Association, 89(3), pp. 649–665.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

533 Dahlgreen, W. (2013) 'No British demand for fake meat'. Available at:
534 https://yougov.co.uk/topics/politics/articles-reports/2013/08/05/no-demand-fake-meat.

535 De-Magistris, T., Gracia, A. and Nayga, R. M. J. (2013) 'On the Use of Honesty Priming Tasks to
536 Mitigate Hypothetical Bias in Choice Experiments', *American Journal of Agricultural Economics*,
537 95(5), pp. 1136–1154.

538 Dupont, J. and Fiebelkorn, F. (2020) 'Attitudes and acceptance of young people toward the
539 consumption of insects and cultured meat in Germany', *Food Quality and Preference*, 85, p. 103983.

540 FAO (2006) *Livestock's Long Shadow - Environmental Issues and Options*. Rome, Italy.

541 Friedrich, B. (2016) '"Clean meat": The "clean energy" of food'. Available at:
542 https://www.gfi.org/clean-meat-the-clean-energy-of-food.

543 Garfield, L. (2018) 'The battle between the beef industry and Silicon Valley's lab-grown meat
544 startups is heating up', *Business Insider*. Available at: http://uk.businessinsider.com/beef-companies-
545 file-petition-against-lab-grown-meat-startups-2018-2?r=US&IR=T.

546 Gerber, P. J. *et al.* (2013) *Tackling climate change through livestock. A global assessment of*
547 *emissions and mitigation opportunities*. Rome, Italy.

548 Godfray, H. C. J. *et al.* (2018) 'Meat consumption, health, and the environment', *Science*, 361(6399),
549 pp. 1–8.

550 Gómez-Luciano, C. A. *et al.* (2019) 'Consumers' willingness to purchase three alternatives to meat
551 proteins in the United Kingdom, Spain, Brazil and the Dominican Republic', *Food Quality and*
552 *Preference*, 78, p. 103732.

553 Greig, K. (2017) '"Clean" meat or "Cultured" meat: A randomized trial evaluating the impact on self-
554 reported purchasing preferences'. Animal Charity Evaluators. Available at:
555 https://animalcharityevaluators.org/blog/clean-meat-or-cultured-meat-a-randomized-trial-
556 evaluating-the-impact-on-self-reported-purchasing-preferences/.

557 De Groot, B. *et al.* (2004) 'Does the use of antibiotics in food animals pose a risk to human health?
558 A critical review of published data', *Journal of Antimicrobial Chemotherapy*, 53(1), pp. 28–52.

559 Heid, M. (2016) 'You asked: Should I Be nervous about lab-grown meat?', *Time*. Available at:
560 http://time.com/4490128/artificial-meat-protein/.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Hensher, Rose, J. M. and Green, W. (2015) *Applied Choice Analysis*. 2nd edn. Cambridge: Cambridge University Press.

Ho, S. (2020) 'Eat Just Makes First-Ever Commercial Sale Of Cultured Meat In Singapore', *Green Queen*, 16 December. Available at: https://www.greenqueen.com.hk/eat-just-makes-first-ever-commercial-sale-of-cultured-meat-in-singapore/#:~:text=Eat Just has revealed today,in Robertson Quay in Singapore.

Johnson, W., Maynard, A. and Kirshenbaum, S. (2018) 'Burgers grown in a lab are heading to your plate. Will you bite?', *The Washinghton Post*, 9 September. Available at: https://www.washingtonpost.com/national/health-science/burgers-grown-in-a-lab-are-heading-to-your-plate-will-you-bite/2018/09/07/1d048720-b060-11e8-a20b-5f4f84429666_story.html?noredirect=on&utm_term=.3f91b8401e4b.

Lancaster, K. (1966) 'A new approach to consumer theory', *Journal of Political Economy*, 74, pp. 132–157.

Van Loo, E. J., Caputo, V. and Lusk, J. L. (2020) 'Consumer preferences for farm-raised meat, lab-grown meat, and plant-based meat alternatives: Does information or brand matter?', *Food Policy*, p. 101931.

Lucas, A. (2019) 'Lab-grown meat start-up raises $14 million to build production plant'.

Lymbery, P. and Oakeshott, I. (2014) *Farmageddon: The True Cost of Cheap Meat*. London, UK: Bloomsbury Publishing.

Lynch, J. and Pierrehumbert, R. (2019) 'Climate Impacts of Cultured Meat and Beef Cattle ', *Frontiers in Sustainable Food Systems* , p. 5.

Mann, H. B., & Whitney, D. R. (1947). On a test of whether one of 2 random variables is stochastically larger than the other. *Annals of Mathematical Statistics*, 18, 50-60.

Marcu, A. *et al.* (2014) 'Analogies, metaphors, and wondering about the future: Lay sense-making around synthetic meat', *Public Understanding of Science*. SAGE Publications Ltd, 24(5), pp. 547–562.

Mattick, C. S., Landis, A. E. and Allenby, B. R. (2015) 'A case for systemic environmental analysis of cultured meat', *Journal of Integrative Agriculture*, 14(2), pp. 249–254.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

National Chicken Council (2018a) 'Broiler Chicken Industry Key Facts 2018'. Available at: https://www.nationalchickencouncil.org/about-the-industry/statistics/broiler-chicken-industry-key-facts/.

National Chicken Council (2018b) 'Per Capita Consumption of Poultry and Livestock, 1965 to Estimated 2018'. Available at: https://www.nationalchickencouncil.org/about-the-industry/statistics/per-capita-consumption-of-poultry-and-livestock-1965-to-estimated-2012-in-pounds/.

Noyes, A. (2020) *Eat Just Granted World's First Regulatory Approval for Cultured Meat*, *Business Wise*. Available at: https://www.businesswire.com/news/home/20201201006251/en/Eat-Just-Granted-World's-First-Regulatory-Approval-for-Cultured-Meat.

Oates, L., Cohen, M. and Braun, L. (2012) 'Characteristics and consumption patterns of Australian organic consumers', *Journal of the Science of Food and Agriculture*. John Wiley & Sons, Ltd, 92(14), pp. 2782–2787.

OECD-FAO (2013) 'Agricultural Outlook 2012–2021'.

Ong, S., Choudhury, D. and Naing, M. W. (2020) 'Cell-based meat: Current ambiguities with nomenclature', *Trends in Food Science & Technology*, 102, pp. 223–231. doi:

Post, M. (2012) 'Cultured meat from stem cells: Challenges and prospects', *Meat Science*, 92(3), pp. 297–301.

Post, M. and Hocquette, J.-F. (2017) 'New Sources of Animal Proteins: Cultured Meat', in *Woodhead Publishing Series in Food Science, Technology and Nutrition*. Woodhead Publishing, pp. 425–441.

Scarpa, R. and Willis, K. (2010) 'Willingness-to-pay for renewable energy: Primary and discretionary choice of British households' for micro-generation technologies', *Energy Economics*, 32(1), pp. 129–136.

Shapiro, P. (2018) *Clean meat*. New York: Gallery Books.

Sharma, S., Thind, S. S. and Kaur, A. (2015) 'In vitro meat production system: why and how?', *Journal of Food Science and Technology*. New Delhi: Springer India, 52(12), pp. 7599–7607.

Siegrist, M., Sütterlin, B. and Hartmann, C. (2018) 'Perceived naturalness and evoked disgust influence acceptance of cultured meat', *Meat Science*, 139, pp. 213–219.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Smith, A. (2014) 'U.S. Views of technology and the future: Science in the next 50 years'. Pew Research. Available at: https://www.pewinternet.org/2014/04/17/us-views-of-technology-and-the-future/.

Specht, A., Rumble, J. and Rhoades, E. (2020) '"You Call that Meat?" Investigating Social Media Conversations and Influencers Surrounding Cultured Meat', *Journal of Applied Communications*, 104.

Szejda, K. (2018) 'Cellular Agriculture Nomenclature: Optimizing Consumer Acceptance'. The Golden Food Institute, p. 37. Available at: https://www.gfi.org/images/uploads/2018/09/INN-RPT-Cellular-Agriculture-Nomenclature-2018-0921.pdf.

The Golden Food Institute (2019) *Clean Meat: The Naming of Tissue-Engineered Meat*. Available at: https://www.gfi.org/the-naming-of-clean-meat.

Train, K. (2009) *Discrete choice methods with simulation, New York*. Edited by C. U. Press. Cambridge University Press (Discrete Choice Methods with Simulation).

Train, K. and Weeks, M. (2005) 'Discrete Choice Models in Preference Space and Willingness-to-Pay Space BT - Applications of Simulation Methods in Environmental and Resource Economics', in Scarpa, R. and Alberini, A. (eds). Dordrecht: Springer Netherlands, pp. 1–16.

Tucker, C. (2018) 'Using environmental imperatives to reduce meat consumption: perspectives from New Zealand', *Kōtuitui: New Zealand Journal of Social Sciences Online*. Routledge, 13(1), pp. 99–110.

Tyson Foods (2018) 'Tyson Foods Invests in Cultured Meat with Stake in Memphis Meats'. Springdale, US.

United States Census Bureau (2015) 'US census'. Available at: https://www.census.gov/programs-surveys/acs/data/pums.html.

USCA (2018) 'Petition for the imposition of beef and meat labeling requirements: To exclude products not derived directly from animals raised and slaughtered from definition of "beef" and "meat"', p. 18. Available at: https://www.uscattlemen.org/Templates/pdfs_USCA/2018-PDFs/2-9-18USCA-AMS-Petition-re-definition-of-beef-and-meat.pdf.

Verbeke, W. *et al.* (2015) '"Would you eat cultured meat?": Consumers' reactions and attitude

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

formation in Belgium, Portugal and the United Kingdom', *Meat Science*, 102(Supplement C), pp. 49–58.

Watson, E. (2020) 'USDA to launch rulemaking process for labeling of cell-cultured meat; "success will turn, in large measure, on the nomenclature used," says attorney', *FoodNavigator*, August. Available at: https://www.foodnavigator-usa.com/Article/2020/08/04/USDA-to-launch-rulemaking-and-public-comment-process-for-labeling-of-cell-cultured-meat# (Accessed: 10 January 2021).

Weinrich, R., Strack, M. and Neugebauer, F. (2020) 'Consumer acceptance of cultured meat in Germany', *Meat Science*, 162, p. 107924.

Wilks, M. *et al.* (2019) 'Testing potential psychological predictors of attitudes towards cultured meat', *Appetite*, 136, pp. 137–145.

Wilks, M. and Phillips, C. J. C. (2017) 'Attitudes to in vitro meat: A survey of potential consumers in the United States', *PLOS ONE*. Public Library of Science, 12(2), pp. 1–14.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

TABLES

Table 1 – Attributes and levels.

ATTRIBUTES	LEVELS
Production method	"Conventional" "IVM" (i.e., "cultured," "lab-grown," and "artificial")
Carbon Trust label	No label reported Carbon Trust label
Antibiotics use	No information reported "No antibiotics ever"
Price	$2.50/lb $5.50/lb $8.50/lb $11.50/lb

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

664 **Table A2 – Socio-demographic characteristics of the sample.**

VARIABLE	CULTURED (*N=210*)	LAB GROWN (*N=208*)	ARTIFICIAL (*N=207*)	TOTAL (*N=625*)
Gender				
Male	53%	53%	54%	53%
Female	47%	47%	46%	47%
Pearson chi2(2) = 0.03				
Pr = 0.99				
Age				
18-35	33%	35%	34%	34%
36-53	30%	29%	28%	29%
54-71	32%	31%	31%	31%
>71	5%	6%	7%	6%
Chi-squared = 0.05 with 2 d.f.				
Probability = 0.98				
Household size (n° member)				
1	45 (21%)	48 (23%)	36 (17%)	129 (21%)
2	74 (35%)	60 (29%)	69 (33%)	203 (32%)
3	38 (18%)	44 (21%)	53 (26%)	135 (22%)
4	32 (15%)	34 (16%)	25 (12%)	91 (42%)
5	15 (7%)	13 (6%)	16 (8%)	44 (7%)
6	5 (2%)	7 (3%)	4 (2%)	16 (3%)
7	0 (0%)	1 (0%)	1 (0%)	2 (0%)
8	1 (0%)	1 (0%)	1 (0%)	3 (0%)
10			1 (0%)	1 (0%)
22			1 (0%)	1 (0%)
Chi-squared with ties = 0.93 with 2 d.f.				
probability = 0.63				
Education				
Elementary/some high school	2%	1%	1%	1%
High school diploma	21%	21%	22%	21%
Some college	17%	22%	17%	19%
Technical school diploma	3%	3%	4%	3%
Associate's degree	10%	11%	9%	10%
Bachelor's degree	31%	28%	29%	29%
Master's degree	10%	10%	13%	11%
Doctorate	5%	3%	4%	4%
Other	0%	0%	0%	0%
Chi-squared = 0.89 with 2 d.f.				
Probability = 0.64				
Income				
Less than $10,000	5%	5%	5%	5%
$10,000-$19,999	7%	6%	9%	7%
$20,000-$29,999	7%	8%	6%	7%
$30,000-$39,999	12%	15%	11%	13%
$40,000-$49,999	10%	7%	9%	8%
$50,000-$59,999	9%	9%	10%	9%

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

$60,000-$69,999	10%	11%	8%	10%
$70,000-$79,999	6%	7%	9%	7%
$80,000-$89,999	5%	2%	2%	3%
$90,000-$99,999	3%	5%	4%	4%
$100,000-$149,999	15%	14%	15%	15%
More than $150,000	11%	10%	13%	11%
Chi-squared = 0.44 with 2 d.f.				
Probability = 0.80				
Race				
White	82%	81%	80%	81%
Hispanic	6%	5%	5%	5%
Native American	0%	1%	0%	1%
African American	5%	6%	9%	7%
Asian/pacific islander	4%	7%	3%	5%
Other	1%	1%	2%	2%
Pearson chi2(10) = 7.94				
Pr = 0.64				
Presence of child under 18 y				
Child	34%	40%	38%	37%
No child	66%	60%	62%	63%
Pearson chi2(2) =1.70				
Pr = 0.43				
Area of growing up				
Rural area	20%	20%	25%	21%
Urbanized cluster	47%	42%	36%	42%
Urban area	34%	38%	39%	37%
Pearson chi2(4) = 5.27				
Pr = 0.26				
Area of living				
Rural area	19%	19%	18%	18%
Urbanized cluster	50%	39%	42%	43%
Urban area	32%	42%	41%	38%
Pearson chi2(4) = 6.38				
Pr = 0.17				
Employment				
Student	4%	4%	5%	4%
Independent worker	7%	5%	11%	8%
Private sector worker	33%	29%	31%	31%
Public sector worker	13%	18%	15%	15%
Retired	24%	20%	23%	23%
Unemployed seeking work	9%	6%	5%	6%
Not in paid employ not seeking work	4%	11%	6%	7%
Other	5%	8%	5%	6%
Pearson chi2(14) = 21.36				
Pr = 0.09				

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Table 3 – Estimated mWTP from the MLXLM models for the three treatments: Cultured, Lab Grown, and Artificial.

VARIABLES	Cultured (*N=210*)		Lab Grown (*N=208*)		Artificial (*N=207*)	
	mWTP ($/lb) (SE)	SD	mWTP ($/lb) (SE)	SD	mWTP ($/lb) (SE)	SD
Production method	-2.60*** (0.41)	5.72*** (0.45)	-8.69*** (0.80)	8.67*** (0.70)	-7.49*** (0.61)	6.94*** (0.52)
Carbon Trust label	1.19*** (0.26)	3.36*** (0.27)	1.05*** (0.35)	4.24*** (0.40)	0.52* (0.32)	4.27*** (0.41)
Antibiotics use	2.19*** (0.34)	3.35*** (0.24)	2.52*** (0.51)	4.47*** (0.48)	1.57*** (0.38)	3.73*** (0.34)
Price	-0.75*** (0.08)	0.81*** (0.08)	-1.14*** (0.08)	0.92*** (0.08)	-0.85*** (0.08)	0.78*** (0.08)
Opt-out	-7.08*** (0.28)	/	-7.67*** (0.37)	/	-6.71*** (0.29)	/
Model fit statistics						
N. obs.	7,560		7,488		7,452	
Wald chi2	1385.13		776.93		928.09	
Prob > chi2	0.00		0.00		0.00	
logL	-1933.67		-2001.94		-1883.65	
df	9		9		9	
AIC	3885.34		4021.88		3785.30	
BIC	3947.72		4084.17		3847.54	

Note. mWTP: marginal willingness to pay.
Note. SE: standard error.
Note. SD: standard deviation.
Note: ***, **, * significance, respectively, at 1%, 5%, 10% levels.
Note. N. obs.: number of observations.
Note. Wald chi2: Wald test.
Note. logL: log likelihood function.
Note. df: degree of freedom.
Note. AIC: Akaike's information criterion.
Note. BIC: Bayesian information criterion.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Table 4 – WTP hypothesis tests.

VARIABLES	COEFFICIENT	H_{01}: ($WTP^{LABGROWN}$ – $WTP^{CULTURED}$) = 0	H_{02}: ($WTP^{ARTIFICIAL}$ – $WTP^{CULTURED}$) = 0	H_{03}: ($WTP^{ARTIFICIAL}$ – $WTP^{LABGROWN}$) = 0
Opt-out	mWTP	-7.14***	-6.85***	-6.65***
	(SE)	(0.23)	(0.20)	(0.27)
Production method	mWTP	-2.57***	-2.22***	-9.19***
	(SE)	(0.42)	(0.34)	(0.60)
	SD	6.74***	6.14***	7.30***
	(SE)	(0.42)	(0.39)	(0.44)
Carbon Trust label	mWTP	1.08***	1.53***	1.50***
	(SE)	(0.31)	(0.33)	(0.35)
	SD	3.98***	3.73***	4.05***
	(SE)	(0.28)	(0.26)	(0.27)
Antibiotics use	mWTP	2.19***	2.76***	2.34***
	(SE)	(0.34)	(0.34)	(0.33)
	SD	4.09***	3.60***	4.12***
	(SE)	(0.28)	(0.21)	(0.28)
Price	mWTP	-0.89***	-0.80***	-1.01***
	(SE)	(0.06)	(0.05)	(0.06)
	SD	0.93***	0.81***	0.92***
	(SE)	(0.06)	(0.05)	(0.07)
Interactions with treatments				
Production method × dtreatment	mWTP	-4.82***	-4.03***	2.19***
	(SE)	(0.85)	(0.64)	(0.65)
Carbon trust label × dtreatment	mWTP	-0.21	-1.13**	0.31
	(SE)	(0.44)	(0.45)	(0.37)
Antibiotics use × dtreatment	mWTP	0.03	-1.46***	-0.51
	(SE)	(0.45)	(0.44)	(0.55)
Model fit statistics				
N. obs.		15,048	15,012	14,940
Wald chi2		2672.44	2335.29	1599.61
Prob > chi2		0.00	0.00	0.00
logL		-3950.52	-3824.08	-3905.23
df		12	12	12
AIC		7925.03	7672.17	7834.46
BIC		8016.46	7763.56	7925.80

Note. mWTP: marginal willingness to pay.
Note. SE: standard error.
Note. SD: standard deviation.
Note: ***, **, * significance, respectively, at 1%, 5%, 10% levels.
Note. N. obs.: number of observations.
Note. Wald chi2: Wald test.
Note. logL: log likelihood function.
Note. df: degree of freedom.
Note. AIC: Akaike's information criterion.
Note. BIC: Bayesian information criterion.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Table 5 – Estimated mWTP from MLXLM models for IVM from the subsample analyses.

ATTRIBUTE	Cultured (*N=210*) mWTP($/lb) (SE)			Lab Grown (*N=208*) mWTP($/lb) (SE)			Artificial (*N=207*) mWTP($/lb) (SE)		
	H vs. NH								
	H (*N=65*)	NH (*N=145*)	*p-value*[1]	H (*N=84*)	NH (*N=124*)	*p-value*[1]	H (*N=101*)	NH (N=106)	*p-value*[1]
Production method	0.28 (0.40)	-3.81*** (0.27)	0.00	-8.92*** (1.28)	-8.18*** (0.76)	0.20	-8.10*** (0.85)	-6.01*** (0.59)	0.81
	LAAS vs. HAAS								
	LAAS (*N=106*)	HAAS (*N=104*)	*p-value*[1]	LAAS (*N=90*)	HAAS (*N=118*)	*p-value*[1]	LAAS (*N=108*)	HAAS (*N=99*)	*p-value*[1]
Production method	-2.80*** (0.35)	-2.32*** (0.55)	0.39	-9.25*** (1.21)	-8.25*** (0.60)	0.89	-6.03*** (0.58)	-10.76*** (1.21)	0.00
	LFTNS vs. HFTNS								
	LFTNS (*N=114*)	HFTNS (*N=96*)	*p-value*[1]	LFTNS (*N=86*)	HFTNS (*N=122*)	*p-value*[1]	LFTNS (*N=82*)	HFTNS (*N=125*)	*p-value*[1]
Production method	-0.50 (0.31)	-5.61*** (0.47)	0.00	-4.26*** (0.65)	-14.89*** (1.47)	0.00	-3.30*** (0.45)	-9.41*** (1.39)	0.00
	LNEP vs. HNEP								
	LNEP (*N=100*)	HNEP (*N=110*)	*p-value*[1]	LNEP (*N=112*)	HNEP (*N=96*)	*p-value*[1]	LNEP (*N=101*)	HNEP (*N=106*)	*p-value*[1]
Production method	-1.18** (0.44)	-3.82 (0.39)	0.06	-9.25*** (1.31)	-8.24*** (0.96)	0.75	-6.80*** (1.12)	-6.88*** (0.95)	0.29
	NREL vs. REL								
	NREL (*N=67*)	REL (*N=143*)	*p-value*[1]	NREL (*N=72*)	REL (*N=136*)	*p-value*[1]	NREL (*N=78*)	REL (*N=129*)	*p-value*[1]
Production method	-1.68*** (0.26)	-2.80*** (0.41)	0.02	-8.08*** (1.15)	-10.11*** (1.04)	0.02	-7.45*** (0.69)	-7.90*** (0.73)	0.08

	LIB vs. MOD vs. CON																
	LIB (*N=59*)	MOD (*N=63*)	CON (*N=73*)	*p-value*[1] LIB vs. MOD	*p-value*[1] LIB vs. CON	*p-value*[1] MOD vs. CON	LIB (*N=58*)	MOD (*N=67*)	CON (*N=68*)	*p-value*[1] LIB vs. MOD	*p-value*[1] LIB vs. CON	*p-value*[1] MOD vs. CON	LIB (*N=58*)	MOD (*N=67*)	CON (*N=65*)	*p-value*[1] LIB vs. MOD	*p-value*[1] LIB vs. CON	*p-value*[1] MOD vs. CON
Production method	-4.21*** (0.47)	-2.12*** (0.64)	-2.25*** (0.51)	0.74	0.90	0.97	-8.23*** (0.93)	-8.06*** (1.36)	-9.90*** (1.41)	0.93	0.13	0.07	-8.29*** (1.36)	-4.77*** (0.38)	-6.23*** (0.83)	0.01	0.04	0.00

Note. H: includes consumers who have heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab Grown, and Artificial, prior to the study.
Note. NH: includes consumers who have not heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab Grown, and Artificial, prior to the study.
Note. LAAS includes consumers who have a low pro-animal welfare attitude.
Note. HAAS includes consumers who have a high pro-animal welfare attitude.
Note. LFTNS includes consumers who have low fears toward food products produced with novel food technologies.
Note. HFTNS includes consumers who have high fears toward food products produced with novel food technologies.
Note. LNEP includes consumers who have a low pro-ecological worldview.
Note. HNEP includes consumers who have a high pro-ecological worldview.
Note. REL includes consumers who follow religion.
Note. NREL includes consumers who do not follow religion.
Note. LIB includes consumers who are extremely or slightly liberal.
Note. MOD includes consumers who are moderate.
Note. CON includes consumers who are extremely or slightly conservative.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Note[1]: *p-values* were measured using the Kruskall-Wallis test.
Note. mWTP: marginal willingness to pay.
Note. SE: standard error.
Note. For the sake of brevity, we did not report the standard deviations.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

711 **Table 6 – Subsample identification and acronyms.**

VARIABLE	SUBSAMPLE	ACRONYM
Having heard or not heard about IVM (HEARING)	Heard about IVM	H
	Not heard about IVM	NH
PRO-ANIMAL WELFARE ATTITUDE (AAS)	Consumers who have low pro-animal welfare attitude	LAAS
	Consumers who have high pro-animal welfare attitude	HAAS
FOOD TECHNOLOGY NEOPHOBIA (FTNS)	Consumers who have low fears toward food products produced with novel food technologies	LFTNS
	Consumers who have high fears toward food products produced with novel food technologies	HFTNS
PRO-ENVIRONMENTAL ATTITUDE (NEP)	Consumers who have a low pro-ecological world view	LNEP
	Consumers who have a high pro-ecological world view	HNEP
RELIGION	Consumers who follow religion	REL
	Consumers who do not follow religion	NREL
POLITICS	Consumers who are extremely or slightly liberal	LIB
	Consumers who are moderate	MOD
	Consumers who are extremely or slightly conservative	CON

712
713

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Table 7 – mWTP Hypothesis tests from MLXLM models for the subsamples analysis.

ATTRIBUTE	Cultured vs. Lab Grown mWTP ($/lb) (SE)	Cultured vs. Artificial mWTP ($/lb) (SE)	Lab Grown vs. Artificial mWTP ($/lb) (SE)	Cultured vs. Lab Grown mWTP ($/lb) (SE)	Cultured vs. Artificial mWTP ($/lb) (SE)	Lab Grown vs. Artificial mWTP ($/lb) (SE)
	NH (*N=375*)			H (*N=250*)		
Production method	-4.72*** (0.97)	-3.95*** (0.56)	-3.95 (0.96)	-7.65*** (0.89)	-6.14*** (0.97)	2.07** (0.74)
	LAAS (*N=304*)			HAAS (*N=321*)		
Production method	-3.26*** (0.48)	-3.13*** (0.66)	-0.27 (0.76)	-5.98*** (0.79)	-6.15*** (1.14)	1.12 (1.22)
	LFTNS (*N=282*)			HFTNS (*N=343*)		
Production method	-2.43*** (0.68)	-4.04*** (0.64)	-0.24 (0.54)	-7.77*** (1.25)	-3.26*** (0.76)	-1.55* (0.82)
	LNEP (*N=313*)			HNEP (*N=312*)		
Production method	-5.01*** (0.65)	-5.30*** (0.95)	0.65 (1.50)	-5.38*** (0.63)	-5.85*** (0.57)	1.23* (0.65)
	NREL (*N=217*)			REL (*N=408*)		
Production method	-3.25*** (0.56)	-3.40*** (0.48)	-0.57 (1.22)	-4.71*** (0.84)	-4.50*** (0.66)	3.68*** (0.73)

	Cultured vs. Lab Grown mWTP ($/lb) (SE)	Cultured vs. Artificial mWTP ($/lb) (SE)	LabGrown vs. Artificial mWTP ($/lb) (SE)	Cultured vs. Lab Grown mWTP ($/lb) (SE)	Cultured vs. Artificial mWTP ($/lb) (SE)	LabGrown vs. Artificial mWTP ($/lb) (SE)	Cultured vs. Lab Grown mWTP ($/lb) (SE)	Cultured vs. Artificial mWTP ($/lb) (SE)	LabGrown vs. Artificial mWTP ($/lb) (SE)
	LIB (*N=175*)			MOD (*N=197*)			CON (*N=206*)		
Production method	-2.77*** (0.63)	-4.73*** (0.54)	-1.45 (1.04)	-6.32*** (1.07)	-3.53*** (1.01)	1.50** (0.53)	-4.90*** (0.95)	-4.90*** (0.91)	-0.65 (1.13)

Note. H: includes consumers who have heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab Grown, and Artificial, prior to the study.
Note. NH: includes consumers who have not heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab Grown, and Artificial, prior to the study.
Note. LAAS includes consumers who have a low pro-animal welfare attitude.
Note. HAAS includes consumers who have a high pro-animal welfare attitude.
Note. LFTNS includes consumers who have low fears toward food products produced with novel food technologies.
Note. HFTNS includes consumers who have high fears toward food products produced with novel food technologies.
Note. LNEP includes consumers who have a low pro-ecological worldview.
Note. HNEP includes consumers who have a high pro-ecological worldview.
Note. REL includes consumers who follow religion.
Note. NREL includes consumers who do not follow religion.
Note. LIB includes consumers who are extremely or slightly liberal.
Note. MOD includes consumers who are moderate.
Note. CON includes consumers who are extremely or slightly conservative.
Note: ***, **, * significance respectively at 1%, 5%, 10% level.
Note. mWTP: marginal willingness to pay.
Note. SE: standard error.
Note. For the sake of brevity, we did not report the standard deviations.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Are Consumers Willing to Pay for In-vitro Meat?

An Investigation of Naming Effects

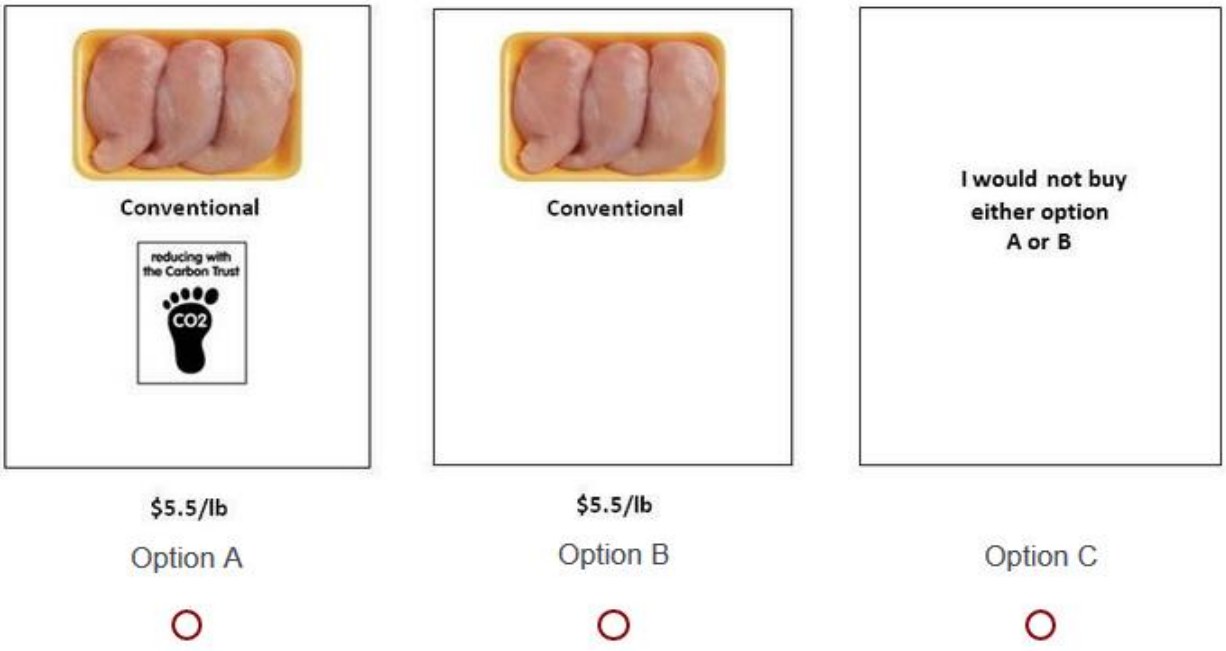
Daniele Asioli, Claudia Bazzani and Rodolfo M. Nayga, Jr

On-Line Appendices.

Appendix A

An example of a choice set.

Imagine you are in a store and you would like to purchase a package of fresh skinless boneless chicken breast product. Would you choose Option A, Option B or Option C?



Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Appendix B

Cheap Talk (CT) script.

NOW, PLEASE TAKE TIME TO CAREFULLY READ THE FOLLOWING INSTRUCTIONS BEFORE PROCEEDING.

Imagine you are in your usual store and considering the purchase of fresh boneless skinless chicken breast. In the following, you will see 12 choice questions. Each choice question includes a description of two different fresh boneless skinless chicken breast products. All features of the products in each choice question are identical except that they vary in terms of the type of production method used, carbon trust, antibiotics use, and price. In each choice question, please indicate the fresh boneless skinless chicken breast product that you would choose to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision, and select the decision that you would make based on your own preferences. Previous similar studies show that people often respond in one way on a survey, but act differently in real life. In studies where people do not actually have to pay money for a product when indicating a particular preference, people state a higher willingness to pay than what one actually is willing to pay for the good in the store. A possible reason for this is that people do not really consider how large the impact of this extra cost actually is on the available family budget. It is easy to be generous when you do not really have to pay for it. In the store, people might think in a different way: the amount of money spent on this good cannot be spent on other things. We ask you to respond to each of the following choice questions just exactly as you would if you were in a real store and had to pay for your choice. Please keep this in mind when answering the following choice questions. IMPORTANT

Choose one of the product options on each page. Or you may choose "I would not buy either option A or option B":

Assume that the options on each page are the only ones available.

Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g. a lower price, but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice question that you prefer the most, based on its characteristics.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

778

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Appendix C

Questionnaire

Consumers' preferences for chicken products

This study is being conducted by researchers from the XXX and XXX. The purpose is to investigate consumers' preferences for chicken products. You are being asked to participate in a research project by taking an online survey. The online survey should not take more than 15 minutes of your time. You can be assured that your answers will be kept confidential to the extent allowed by law and University policy and will only be released as summaries. Your name will not be collected as part of your survey response and thus can never be associated with the data. Your responses will not be individually identified or publicized. Your answers are strictly voluntary. You are free to withdraw from the survey at any time if you want. You must be 18 or older to participate in the survey. The submitted data will be used for statistical purposes only and statistical results will be reported in research papers, conferences, technical reports and academic journals. In the future, the statistical data may be used for subsequent research in the area of consumers' preferences, as a basis for comparison to future results and as an example in teaching. There are no anticipated risks to participating in this study. Benefits include a broader understanding of consumers' preferences of chicken that can contribute to the formation of public policy. If you have questions at any time about the study or the procedures, (or you experience adverse effects as a result of participating in this study) you may contact the researcher XXX at XXX, or XXX at XXX. If you have questions about your rights as a participant, you may contact the XXX IRB Compliance Officer, at XXX. Completing the survey (questionnaire) and clicking the button to continue will be considered your consent to participate. Thank you very much for your participation!

Q1 - We care about the quality of our survey data and hope to receive the most accurate measures of your opinions, so it is important to us that you thoughtfully provide your best answer to each question in the survey.

Do you commit to providing your thoughtful and honest answers to the questions in this survey?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

- I will provide my best answers
- I will not provide my best answers
- I can't promise either way

Q2.1 - How old are you?_____

Q2.2 -What is your gender?

- Female
- Male

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Q2.3 - Please indicate your approximate annual household income before taxes:

- Less than $10,000
- $10,000 - $19,999
- $20,000 - $29,999
- $30,000 - $39,999
- $40,000 - $49,999
- $50,000 - $59,999
- $60,000 - $69,999
- $70,000 - $79,999
- $80,000 - $89,999
- $90,000 - $99,999
- $100,000 - $149,999
- More than $150,000

On the following screens you will see a series of fresh skinless boneless chicken breast products. All the products adhere to US food safety regulations and have the same characteristics except for the type of production method, carbon trust, antibiotics use and price. Now, we will explain the different characteristics in details:

1. *Production method*: refers to the method of producing the chicken. The products that you will see have been produced using either of these two methods:

   - *Conventional*: the product is produced by growing the chicken in poultry farms. At maturity, the chickens are then transported to food processors that slaughter, process, and then package them into fresh boneless skinless chicken breast products.

   - (Treatment 1): *Cultured*: the product is produced by taking a number of cells from a live chicken. These cells are then transported to a food industry lab where the cells will proliferate

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

in a nutrient-rich medium until a fresh boneless skinless chicken breast product is formed and then it will be packaged. No chicken is slaughtered.

- (Treatment 2): *Lab-grown*: the product is produced by taking a number of cells from a live chicken. These cells are then transported to a food industry lab where the cells will proliferate in a nutrient-rich medium until a fresh boneless skinless chicken breast product is formed and then it will be packaged. No chicken is slaughtered.

- (Treatment 3): *Artificial*: the product is produced by taking a number of cells from a live chicken. These cells are then transported to a food industry lab where the cells will proliferate in a nutrient-rich medium until a fresh boneless skinless chicken breast product is formed and then it will be packaged. No chicken is slaughtered.

2. *Carbon Trust Label*: refers to the environmental impact of food production, transportation and use of the food products in terms of CO2 emissions. On the product, you will find information presented in two ways:

- *With Carbon Trust Label*: the Carbon Trust Label indicates that the product is produced with a commitment to reduce the carbon emissions. A food product's carbon footprint is the total sum of the greenhouse gas emissions (CO2) produced throughout the product's life-cycle, including production, distribution and use.

- *No label is reported*.

3. *Antibiotics*: use refers to the fact that antibiotics might be used during the chicken breast production. On the product you will find information presented in two ways:

- With information saying "*No antibiotics ever*" meaning that no antibiotics were ever used in any process of the chicken breast production.

- *No information is reported.*

4. *Price:* refers to the price in U.S. dollars per pound ($/lb) of the fresh boneless skinless chicken breast product. There will be four price levels.

NOW, PLEASE TAKE TIME TO CAREFULLY READ THE FOLLOWING INSTRUCTIONS

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

BEFORE PROCEEDING. Imagine you are in your usual store and considering the purchase of fresh boneless skinless chicken breast. In the following, you will see 12 choice questions. Each choice question includes a description of two different fresh boneless skinless chicken breast products. All features of the products in each choice question are identical except that they vary in terms of the type of production method used, carbon trust, antibiotics use, and price. In each choice question, please indicate the fresh boneless skinless chicken breast product that you would choose to purchase. Alternatively, you may choose NOT TO PURCHASE either product. Please carefully examine each option before you make a decision, and select the decision that you would make based on your own preferences. Previous similar studies show that people often respond in one way on a survey, but act differently in real life. In studies where people do not actually have to pay money for a product when indicating a particular preference, people state a higher willingness to pay than what one actually is willing to pay for the good in the store. A possible reason for this is that people do not really consider how large the impact of this extra cost actually is on the available family budget. It is easy to be generous when you do not really have to pay for it. In the store, people might think in a different way: the amount of money spent on this good cannot be spent on other things. We ask you to respond to each of the following choice questions just exactly as you would if you were in a real store and had to pay for your choice. Please keep this in mind when answering the following choice questions.

IMPORTANT

Choose one of the product options on each page. Or you may choose "I would not buy either option A or option B":

- Assume that the options on each page are the only ones available.
- Do not compare options on different pages.

You might see a few options that may seem counter-intuitive (e.g. a lower price, but a higher quality in your personal opinion). Be assured that this is not an error but part of the design of the survey. Simply choose the option in each choice question that you prefer the most, based on its characteristics.

Treatment 1

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

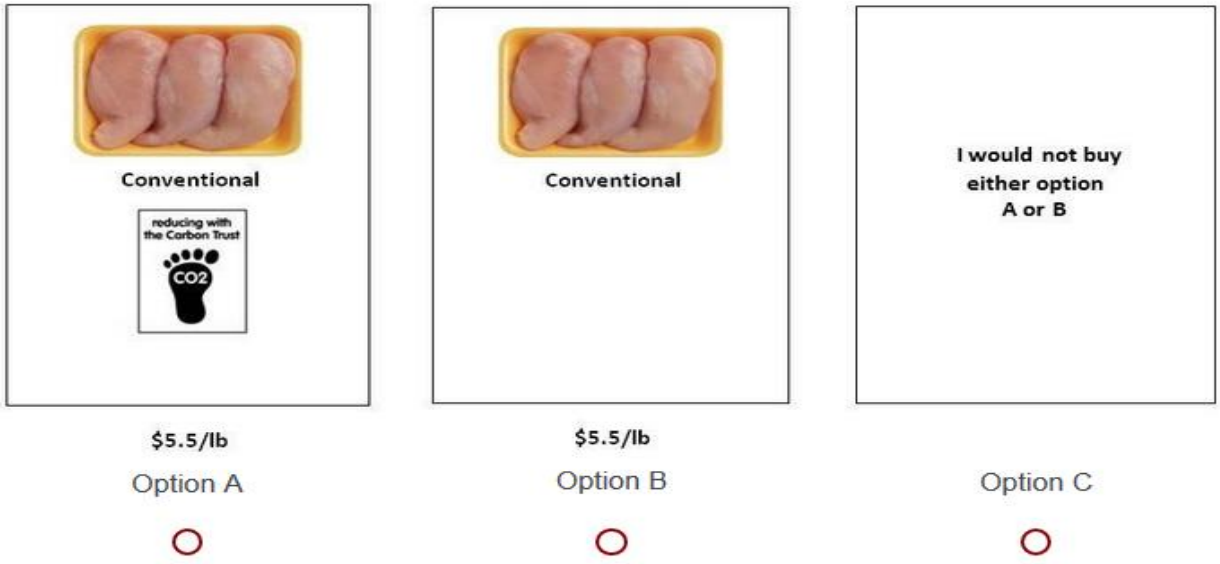
Block 1

Q3 - Choice set 1

Imagine you are in a store and you would like to purchase a package of fresh skinless boneless chicken breast product. Would you choose Option A, Option B or Option C?

- Option A
- Option B
- Option C

Example (NOTE: for simplicity we report only one example of choice set):



Q15.1 - Now, we will ask you a few questions about the attributes that you have considered when you made your choices. While responding to the choice questions, did you ignore (i.e. not consider) any of the attribute/label information (i.e. production method, carbon trust label, antibiotic use, price) reported on the products ?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

- Yes
- No

Q15.2 - Which of the following attributes did you ignore (i.e. not consider)? Please, check all that apply.

- Production process
- Carbon Trust Label
- Antibiotic use
- Price

This is the last part of the survey. We would like to ask you for some background information about yourself, as it is a critical part of our analysis. This is an anonymous survey and your name is not linked to the responses. In addition, all of this information will be treated as confidential. Results of the survey will only be used in aggregate form and only for research purposes.

Q16.1 - Are you responsible for food shopping in your household?

- Always
- Sometimes
- Never

Q16.2 - Which of the following most closely resembles the diet that you regularly adopt?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

- Full time meat eater (eating red meat, fish and chicken).
- Flexitarian (reducing meat intake, but eating meat now and then).
- Pollotarian (eating no red meat, but eat fish, chicken and other poultry).
- Pescotarian (eating no red meat or chicken, but eat fish and shellfish).
- Macrobiotic consumer (eating unprocessed, organic, and locally grown foods, with a great overlap with foods consumed in a vegetarian diet, yet also including certain kinds of meat).
- Lacto-ovo vegetarian (eating no meat or fish, but eating eggs and dairy produce).
- Lacto-vegetarian (eating no meat, fish or eggs, but eating dairy produce).
- Ovo-vegetarian (eating no meat, fish or dairy produce, but eating eggs).
- Vegan (eating no meat and using no products of animal origin).

Q17.1 - Do you buy meat products?

- Yes
- No

Q17.2 - Which kinds of meat products do you buy at the store? Please, check all the apply.

- Beef
- Pork
- Chicken/poultry
- Lamb
- Others, please specify:_____

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Q17.3 - Please indicate your purchase frequency of chicken/poultry products:

- Less than once a month
- Once a month
- 2-3 times a month
- Once a week
- Several times a week
- Everyday

Q17.4 - Where do you usually buy chicken/poultry products? Please check all that apply.

- Supermarket
- Farmers' market
- Corner/convenience shop
- Online grocery store
- Butcher
- Others, please specify:_____

Q17.5 – How important are the following criteria when buying chicken/poultry products at a

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

973 supermarket?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

	1- Not at all important	2	3	4	5	6	7- Extremely important
Appearance	○	○	○	○	○	○	○
Fat content	○	○	○	○	○	○	○
Shelf life	○	○	○	○	○	○	○
Price	○	○	○	○	○	○	○
Country of origin	○	○	○	○	○	○	○
Brand name	○	○	○	○	○	○	○
Production method (i.e. organic, free range)	○	○	○	○	○	○	○
Information on antibiotic use	○	○	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Information on environmental impact	○	○	○	○	○	○	○
Information on hormones and/or steroids use	○	○	○	○	○	○	○
Information on artificial ingredients and/or artificial additives and/or artificial preservatives use	○	○	○	○	○	○	○
Health claims	○	○	○	○	○	○	○
Package size	○	○	○	○	○	○	○
Type of packaging	○	○	○	○	○	○	○
Color	○	○	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Treatment 1

Q18.1 - Have you ever heard of the term "cultured" meat before?

- Yes
- No

Q18.2 - From 1 (Very low knowledge) to 7 (Very high knowledge), how much do you know about "cultured" meat prior to participating in this survey?

- 1 - Very low knowledge
- 2
- 3
- 4
- 5
- 6
- 7 - Very high knowledge

Q18.3 - From 1 (I will definitively not buy) to 7 (I will definitively buy), how much you feel like

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

buying "cultured" meat in the future?

- 1 - I will definitely not buy
- 2
- 3
- 4
- 5
- 6
- 7 - I will definitely buy

Treatment 2

Q18.1 - Have you ever heard of the term "lab-grown" meat before?

- Yes
- No

Q18.2 - From 1 (Very low knowledge) to 7 (Very high knowledge), how much do you know about

"lab-grown" meat prior to participating in this survey?

- 1 - Very low knowledge
- 2
- 3
- 4
- 5
- 6
- 7 - Very high knowledge

Q18.3 - From 1 (I will definitively not buy) to 7 (I will definitively buy), how much you feel like buying "lab-grown" meat in the future?

- 1 - I will definitely not buy
- 2
- 3
- 4
- 5
- 6
- 7 - I will definitely buy

Treatment 3

Q18.1 - Have you ever heard of the term "artificial" meat before?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

- Yes
- No

Q18.2 - From 1 (Very low knowledge) to 7 (Very high knowledge), how much do you know about “artificial" meat prior to participating in this survey?

- 1 - Very low knowledge
- 2
- 3
- 4
- 5
- 6
- 7 - Very high knowledge

Q18.3 - From 1 (I will definitively not buy) to 7 (I will definitively buy), how much you feel like buying "artificial" meat in the future?

- 1 - I will definitely not buy
- 2
- 3
- 4
- 5
- 6
- 7 - I will definitely buy

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Treatment 1

Q19 - From 1 (Not important at all) to 7 (Very important), what do you think about the use of the label "No antibiotics ever" in cultured chicken products? How important is this information to you when choosing a poultry or meat product?

- 1 - Not important at all
- 2
- 3
- 4
- 5
- 6

7 - Very important

Treatment 2

Q19 - From 1 (Not important at all) to 7 (Very important), what do you think about the use of the label "No antibiotics ever" in lab-grown chicken products? How important is this information to you when choosing a poultry or meat product?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

- 1 - Not important at all
- 2
- 3
- 4
- 5
- 6
- 7 - Very important

Treatment 3

Q19 - From 1 (Not important at all) to 7 (Very important), what do you think about the use of the label "No antibiotics ever" in artificial chicken products? How important is this information to you when choosing a poultry or meat product?

- 1 - Not important at all
- 2
- 3
- 4
- 5
- 6
- 7 - Very important

Q20 - The following statements deal with attitudes related to new food technologies. Please give us

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

your opinion on the following statements:

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

	Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree
New food technologies are something I am uncertain about.	○	○	○	○	○	○	○
New foods are not healthier than traditional foods.	○	○	○	○	○	○	○
The benefits of new food technologies are often grossly overstated.	○	○	○	○	○	○	○
There are plenty of tasty foods around so we do not need to use new food technologies to produce more.	○	○	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

New food technologies decreases the natural quality of food.	○	○	○	○	○	○	○
New food technologies are unlikely to have long term negative health effects.	○	○	○	○	○	○	○
New food technologies gives people more control over their food choices.	○	○	○	○	○	○	○
New products produced using new food technologies can help people have a balanced diet.	○	○	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

New food technologies may have long term negative environmental effects.	○	○	○	○	○	○	○
It can be risky to switch to new food technologies too quickly.	○	○	○	○	○	○	○
Society should not depend heavily on technologies to solve its food problems.	○	○	○	○	○	○	○
There is no sense trying out high-tech food products because the ones I eat are already good enough.	○	○	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

The media usually provides a balanced and unbiased view of new food technologies.	○	○	○	○	○	○	○

Q21 - The following statements deal with attitudes related to animal protection. Please give us your opinion on the following statements:

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
It is morally wrong to hunt wild animals just for sport.	○	○	○	○	○
I do not think that there is anything wrong with using animals in medical research.	○	○	○	○	○
I think it is perfectly acceptable for cattle and hogs to be raised for human consumption.	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

The slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work.	○	○	○	○	○
I sometimes get upset when I see wild animals in cages at zoos.	○	○	○	○	○

Q22 - The following statements deal with your environmental attitudes. Please state rate each

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

1099 statement using this scale:

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

	Strongly agree	Mildly agree	Unsure	Mildly disagree	Strongly disagree
We are approaching the limit of the number of people the Earth can support.	○	○	○	○	○
Humans have the right to modify the natural environment to suit their needs.	○	○	○	○	○
When humans interfere with nature it often produces disastrous consequences.	○	○	○	○	○
Human ingenuity will insure that we do not make the Earth unlivable.	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Humans are seriously abusing the environment.	○	○	○	○	○
The Earth has plenty of natural resources if we just learn how to develop them.	○	○	○	○	○
Plants and animals have as much right as humans to exist.	○	○	○	○	○
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Despite our special abilities, humans are still subject to the laws of nature.	○	○	○	○	○
The so-called "ecological crisis" facing humankind has been greatly exaggerated.	○	○	○	○	○
The Earth is like a spaceship with very limited room and resources.	○	○	○	○	○
Humans were meant to rule over the rest of nature.	○	○	○	○	○
The balance of nature is very delicate and easily upset.	○	○	○	○	○

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Humans will eventually learn enough about how nature works to be able to control it.	○	○	○	○	○
If things continue on their present course, we will soon experience a major ecological catastrophe.	○	○	○	○	○

Q23 - When it comes to politics, do you usually think of yourself as…

- Extremely liberal
- Slightly liberal
- Moderate or middle of the road
- Slightly conservative
- Extremely conservative
- I do not know

Q24.1- Do you follow any religion?

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

- Yes
- No

Q24.2 - How important is religion in your life?

- Not at all important
- Slightly important
- Moderately important
- Very important
- Extremely important

Q24.3 - Are you regularly attending a place of worship or religious service?

- Never
- Sometimes
- About half the time
- Most of the time
- Always

Q25.1 - What is your educational background? Please, mark the box next to the highest level of education you have completed.

- Elementary/Some High School
- High School Diploma
- Some college
- Technical School Diploma
- Associate's Degree
- Bachelor's Degree
- Master's Degree
- Doctorate
- Other, please specify:_____

Q25.2 - What is your race?

- White
- Hispanic
- Native American
- African American
- Asian/Pacific Islander
- Other, please specify: _____

Q25.3 - How many individuals live in your household where you currently reside, including

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

yourself?___

Q25.4 - Are children under the age of 18 present in the household?

- Yes
- No

Q25.5 - Did you grow up in a rural area (less than 2,500 people) or in an urbanized cluster (between 2,500 and 50,000 people) or in an urbanized area (more than 50,000 people)?

- Rural (less than 2,500 people)
- Urbanized cluster (between 2,500 - 50,000 people)
- Urban area (more than 50,000 people)

Q25.6 - Do you live today in a rural area (less than 2,500 people) or in an urbanized cluster (between 2,500 and 50,000 people) or in an urbanized area (more than 50,000 people)?

- Rural (less than 2,500 people)
- Urbanized cluster (between 2,500 - 50,000 people)
- Urban area (more than 50,000 people)

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Q25.7 - What is your employment situation?

- Student
- Independent worker (e.g. consultant)
- Private-sector worker
- Public-sector worker
- Retired
- Unemployed (seeking work)
- Not in paid employment (not seeking work, e.g. houseman, housewife)
- Other, please specify:_____

Q26 - Thank you! If you have any comments regarding this survey, please enter them in the box.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Appendix D

Definition of IVM.

"in cultured/lab-grown/artificial the product is produced by taking a number of cells from a live chicken. These cells are then transported to a food industry lab where the cells will proliferate in a nutrient-rich medium until a fresh boneless skinless chicken breast product is formed and then it will be packaged. No chicken is slaughtered". Adapted from Edelman et al. (2005), Post (2012), Roberts et al., (2015), and Yuan, (2018).

References

Edelman, P.D., McFarland, D.C., Mironov, V.A., Matheny, J.G., 2005. Commentary: In Vitro-Cultured Meat Production. Tissue Engineering 11, 659–662.

Post, M., 2012. Cultured meat from stem cells: Challenges and prospects. Meat Science 92, 297–301.

Roberts, R.M., Yuan, Y., Genovese, N., Ezashi, T., 2015. Livestock Models for Exploiting the Promise of Pluripotent Stem Cells. ILAR Journal 56, 74–82.

Yuan, Y., 2018. Capturing bovine pluripotency. Proceedings of the National Academy of Sciences 115, 1962–1963.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Appendix E

Table E1 - Consumer attitudes: descriptive statistics.

ATTITUDES	CULTURED (*N=210*)	LAB GROWN (*N=208*)	ARTIFICIAL (*N=207*)	POOLED (*N=625*)
Hearing				
Frequency				
No	145 (69.05%)	124 (40.38%)	106 (51.21%)	375 (60.00%)
Yes	65 (30.95%)	84 (59.62%)	101 (48.79%)	250 (40.00%)
Pro-animal attitude (AAS)				
Mean	3.32	3.35	3.26	3.31
Standard deviation	0.66	0.69	0.70	0.68
Median	3.20	3.40	3.20	3.40
Min	1.60	1.00	1.60	1.00
Max	5.00	5.00	4.80	5.00
Degree of neophobia towards new food technology (FTNS)				
Mean	4.33	4.55	4.55	4.48
Standard deviation	0.86	0.74	0.83	0.81
Median	4.23	4.54	4.46	4.38
Min	2.00	2.77	2.07	2.00
Max	6.67	6.62	7.00	7.00
Pro-environmental attitude (NEP)				
Mean	3.47	3.36	3.45	3.43
Standard deviation	0.60	0.56	0.61	0.59
Median	3.33	3.20	3.33	3.27
Min	1.87	1.80	1.93	1.8
Max	5.00	4.93	5.00	5.00
Religion				
Frequency				
No	67 (31.90%)	72 (34.62%)	78 (37.68%)	217 (34.72%)
Yes	143 (68.10%)	136 (65.38%)	129 (62.32%	408 (65.28%)
Politics				
Liberal (LIB)	59 (28.10%)	58 (27.88%)	58 (28.02%)	175 (28.00%)
Moderate (MOD)	63 (30.00%)	67 (32.21%)	67 (32.37%)	197 (31.52%)
Conservative (CON)	73 (34.76%)	68 (32.69%)	65 (31.40%)	206 (32.96%)

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

I do not know	15 (7.14%)	15 (7.21%)	17 (8.21%)	47 (7.52%)

1210

1211

1212 **Table E2 - Description of the consumers' attitudes used for the sub-samples analysis: variable**
1213 **used, question asked and subsample description.**

VARIABLE	QUESTION	SUBSAMPLE
HEARING	CULTURED: *"Have you ever heard of the term 'cultured' meat before?"* LAB GROWN: *"Have you ever heard of the term 'lab-grow' meat before?"* ARTIFICIAL: *"Have you ever heard of the term 'artificial' meat before?"*	H (H includes consumers who have heard the names "cultured", "lab-grown" and "artificial" meat respectively for "cultured", "lab-grown" and "artificial", prior to the study). NH (NH includes consumers who have not heard the names "cultured", "lab-grown" and "artificial" meat respectively for "cultured", "lab-grown" and "artificial", prior to the study).
PRO-ANIMAL WELFARE ATTITUDE (AAS)	Animal Attitude Scale (AAS) (Herzog, Grayson, and McCord 2015) is composed by 5-items (5–point Likert scale "agree"-"disagree"): (i) *It is morally wrong to hunt wild animals just for sport.* (ii) *I do not think that there is anything wrong with using animals in medical research*. (iii) *I think it is perfectly acceptable for cattle and hogs to be raised for human consumption*. (iv) *The slaughter of whales and dolphins should be immediately stopped even if it means some people will be put out of work*. (v) *I sometimes get upset when I see wild animals in cages at zoos*.	LAAS (LAAS includes consumers who have low pro-animal welfare attitude). We included consumers who had AAS lower or equal to the median (3.40). HAAS (HAAS includes consumers who have high pro-animal welfare attitude). We included consumers who had AAS higher to the median (3.40).
FOOD TECHNOLOGY NEOPHOBIA	Food Technology Neophobia Scale (FTNS) (Cox and Evans 2008) is composed by 13-items (7–point Likert scale "agree"-"disagree"): (i) *New food*	LFTNS (LFTNS includes consumers who have low fears towards food products

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

(FTNS)	*technologies are something I am uncertain about*. (ii) *New foods are not healthier than traditional foods*. (iii) *The benefits of new food technologies are often grossly overstated*. (iv) *There are plenty of tasty foods around so we do not need to use new food technologies to produce more*. (v) *New food technologies decreases the natural quality of food.* (vi) *New food technologies are unlikely to have long term negative health effects.* (vii) *New food technologies gives people more control over their food choices.* (viii) *New products produced using new food technologies can help people have a balanced diet.* (ix) *New food technologies may have long term negative environmental effects. (x) It can be risky to switch to new food technologies too quickly*. (xi) *Society should not depend heavily on technologies to solve its food problems.* (xii) *There is no sense trying out high-tech food products because the ones I eat are already good enough.* (xiii) *The media usually provides a balanced and unbiased view of new food technologies.*	produced with novel food technologies). We included consumers who had FTNS lower or equal to the median (4.38). HFTNS (HFTNS includes consumers who have high fears towards food products produced with novel food technologies). We included consumers who had FTNS higher to the median (4.38).
PRO-ENVIRONMENTAL ATTITUDE (NEP)	New Environmental Paradigm (NEP) (Dunlap et al. 2000) is composed by 15-items (5–point Likert scale "agree"-"disagree"): (i) *We are approaching the limit of the number of people the Earth can support.* (ii) *Humans have the right to modify the natural environment to suit their needs.* (iii) *When humans interfere with nature it often produces disastrous consequences.* (iv) *Human ingenuity will insure that we do not make the Earth unlivable*. (v) *Humans are seriously abusing the environment*. (vi) *The Earth has plenty of natural resources if we just learn how to develop them*. (vii) *Plants and animals have as much right as humans to exist*. (viii) *The balance of nature is strong enough to cope with the impacts of modern industrial nations.*	LNEP (LNEP includes consumers who have a low pro-ecological world view). We included consumers who had NEP lower or equal to the median (3.27). HNEP (HNEP includes consumers who have a high pro-ecological world view). We included consumers who had NEP higher to the median (3.27).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

	(ix) *Despite our special abilities, humans are still subject to the laws of nature*. (x) *The so-called "ecological crisis" facing humankind has been greatly exaggerated.* (xi) *The Earth is like a spaceship with very limited room and resources.* (xii) *Humans were meant to rule over the rest of nature* (xiii) *The balance of nature is very delicate and easily upset.* (xiv) *Humans will eventually learn enough about how nature works to be able to control it.* (xv) *If things continue on their present course, we will soon experience a major ecological catastrophe.*	
RELIGION	*"Do you follow any religion?"*	REL (REL includes consumers who follow religion). NREL (NREL includes consumers who do not follow religion).
POLITICS	*"When it comes to politics, do you usually think of yourself as…"* • *Extremely liberal* • *Slightly liberal* • *Moderate or middle of the road* • *Slightly conservative* • *Extremely conservative* • *I do not know*	LIB (LIB includes consumers who are extremely and slightly liberal). MOD (MOD includes consumers who are moderate). CON (CON includes consumers who are extremely and slightly conservative).

References

Cox, D.N., and G. Evans. 2008. "Construction and Validation of a Psychometric Scale to Measure Consumers' Fears of Novel Food Technologies: The Food Technology Neophobia Scale." *Food Quality and Preference* 19 (8): 704–10.

Dunlap, Riley E, Kent D Van Liere, Angela G Mertig, and Robert Emmet Jones. 2000. "New Trends

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale." *Journal of Social Issues* 56 (3). Blackwell Publishers Inc.: 425–42.

Herzog, Harold, Stephanie Grayson, and David McCord. 2015. "Brief Measures of the Animal Attitude Scale." *Anthrozoös* 28 (1).

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

APPENDIX F

Table F1 - Estimated mWTP from MLXLM models for IVM from the subsample analyses: model fit statistics.

Statistics	CULTURED (*N=210*)		LAB GROWN (*N=208*)		ARTIFICIAL (*N=207*)	
	H vs. NH					
	H *(N=65)*	**NH** *(N=145)*	**H** *(N=84)*	**NH** *(N=124)*	**H** *(N=101)*	**NH** *(N=106)*
N.obs.	2,340	5,220	3,024	4,464	3,636	3,816
Wald chi2	653.87	4123.00	609.51	2734.05	774.59	2147.26
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-622.94	-1279.34	-849.51	-1114.57	-986.36	-864.35
df	9	9	9	9	9	9
AIC	1263.88	2576.68	1717.01	2247.13	1990.73	1746.71
BIC	1315.71	2635.72	1771.14	2304.77	2046.52	1802.93
Statistics	**LAAS vs. HAAS**					
	LAAS *(N=106)*	**HAAS** *(N=104)*	**LAAS** *(N=90)*	**HAAS** *(N=118)*	**LAAS** *(N=108)*	**HAAS** *(N=99)*
N.obs.	3,816	3,744	3,240	4,248	3,888	3,564
Wald chi2	967.52	639.98	462.39	2093.57	1682.71	579.36
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-921.29	-995.27	-843.39	-1140.91	-989.85	-878.86
df	9	9	9	9	9	9
AIC	1860.59	2008.54	1704.79	2299.81	1997.71	1775.72
BIC	1916.81	2064.60	1759.54	2357.00	2054.10	1881.33
Statistics	**LFTNS vs. HFTNS**					
	LFTNS *(N=114)*	**HFTNS** *(N=96)*	**LFTNS** *(N=86)*	**HFTNS** *(N=122)*	**LFTNS** *(N=82)*	**HFTNS** *(N=125)*
N.obs.	4,104	3,456	3,096	4,392	2,952	4,500
Wald chi2	1232.88	3499.30	929.76	456.90	591.14	777.74
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-1007.54	-904.41	-828.44	-1142.10	-773.08	-1082.80
df	9	9	9	9	9	9
AIC	2033.08	1826.81	1674.88	2302.19	1564.16	2183.61
BIC	2089.96	1882.14	1729.22	2359.68	1618.07	2241.31
Statistics	**LNEP vs. HNEP**					
	LNEP *(N=100)*	**HNEP** *(N=110)*	**LNEP** *(N=112)*	**HNEP** *(N=96)*	**LNEP** *(N=101)*	**HNEP** *(N=106)*
N.obs.	3,600	3,960	4,032	3,456	3,636	3,816
Wald chi2	1155.34	1955.73	218.65	1075.56	390.53	819.58
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-956.06	-938.04	-1148.48	-833.12	-998.29	-855.92
df	9	9	9	9	9	9
AIC	1930.13	1894.08	2314.97	1684.25	2014.59	1729.85
BIC	1985.82	1950.64	2371.68	1739.58	2070.37	1786.07
Statistics	**NREL vs. REL**					
	NREL *(N=67)*	**REL** *(N=143)*	**NREL** *(N=72)*	**REL** *(N=136)*	**NREL** *(N=78)*	**REL** *(N=129)*
N.obs.	2,412	5,148	2,592	4,896	2,808	4,644

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Wald chi2	3924.73	1003.13	504.49	849.81	536.57	820.34
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-626.48	-1292.88	-673.42	-1327.02	-703.82	-1162.17
df	9	9	9	9	9	9
AIC	1270.96	2603.76	1364.85	2672.05	1425.64	2342.33
BIC	1323.06	2662.68	1417.59	2730.51	1479.10	2400.32

Statistics	**LIB vs. MOD vs. CON**								
	CULTURED (*N=210*)			**LABGROWN (*N=208*)**			**ARTIFICIAL (*N=207*)**		
	LIB *(N=59)*	**MOD (*N=63*)**	**CON *(N=73)***	**LIB *(N=58)***	**MOD (*N=67*)**	**CON *(N=68)***	**LIB *(N=58)***	**MOD (*N=67*)**	**CON *(N=65)***
N.obs.	2,124	2,268	2,628	2,088	2,412	2,448	2,088	2,412	2,340
Wald chi2	1906.60	529.74	718.68	1547.29	264.64	777.30	551.29	1465.43	681.60
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
logL	-526.71	-570.98	-646.07	-579.91	-612.55	-632.20	-551.02	-616.02	-537.64
Df	9	9	9	9	9	9	9	9	9
AIC	1071.41	1159.96	1310.14	1177.82	1243.10	1282.39	1120.03	1250.05	1093.27
BIC	1122.36	1211.50	1363.00	1228.61	1295.19	1334.62	1170.83	1302.14	1145.09

Note. H: includes consumers who have heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab-grown, and Artificial, prior to the study.
Note. NH: includes consumers who have not heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab-grown, and Artificial, prior to the study.
Note. LAAS includes consumers who have a low pro-animal welfare attitude.
Note. HAAS includes consumers who have a high pro-animal welfare attitude.
Note. LFTNS includes consumers who have low fears toward food products produced with novel food technologies.
Note. HFTNS includes consumers who have high fears toward food products produced with novel food technologies.
Note. LNEP includes consumers who have a low pro-ecological worldview.
Note. HNEP includes consumers who have a high pro-ecological worldview.
Note. REL includes consumers who follow religion.
Note. NREL includes consumers who do not follow religion.
Note. LIB includes consumers who are extremely or slightly liberal.
Note. MOD includes consumers who are moderate.
Note. CON includes consumers who are extremely or slightly conservative.
Note. N. obs: number of observations.
Note. Wald chi2: Wald test.
Note. logL: log likelihood function.
Note. df: degree of freedom.
Note. AIC: Akaike's information criterion.
Note. BIC: Bayesian information criterion.

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Table F2 – mWTP Hypothesis tests from MLXLM models for the subsamples analysis: model fit statistics.

Statistics	CULTURED vs. LAB GROWN	CULTURED vs. ARTIFICIAL	LAB GROWN vs. ARTIFICIAL	CULTURED vs. LAB GROWN	CULTURED vs. ARTIFICIAL	LAB GROWN vs. ARTIFICIAL
	NH			H		
N. obs.	9,684	9,036	8,280	5,365	5,976	6,660
Wald chi2	1762.49	2367.41	4758.45	2299.06	1120.77	1459.55
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-2412.90	-2156.67	-1996.54	-1483.32	-1607.48	-1843.41
df	12	12	12	12	12	12
AIC	4849.80	4337.34	4017.07	2990.63	3238.96	3710.81
BIC	4935.94	4422.65	4101.33	3069.68	3319.30	3792.46
Statistics	**LAAS**			**HAAS**		
N. obs.	7,056	7,704	7,128	7,992	7,308	7,812
Wald chi2	3315.05	2214.60	1503.67	947.30	1208.50	1047.58
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-1782.32	-1923.44	-1850.16	-2143.35	-1877.22	-2029.00
df	12	12	12	12	12	12
AIC	3588.65	3870.88	3724.33	4310.70	3778.44	4082.00
BIC	3670.99	3954.28	3806.79	4394.53	3861.20	4165.56
Statistics	**LFTNS**			**HFTNS**		
N. obs.	7,200	7,056	6,048	7,848	7,956	8,892
Wald chi2	1005.18	1584.75	1659.82	1191.29	1417.48	1152.98
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-1848.53	-1791.28	-1605.45	-2057.43	-1997.31	-2239.52
df	12	12	12	12	12	12
AIC	3721.06	3606.56	3234.91	4138.85	4018.61	4503.03
BIC	3803.64	3688.90	3315.40	4222.47	4102.40	4588.15
Statistics	**LNEP**			**HNEP**		
N. obs.	7,632	7,236	7,668	7,416	7,776	7,272
Wald chi2	2183.93	1559.63	1039.47	1185.99	2315.06	1282.25
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-2109.67	-1967.61	-2158.52	-1788.74	-1802.66	-1696.73
df	12	12	12	12	12	12
AIC	4243.35	3959.21	4341.05	3601.48	3629.32	3417.47
BIC	4326.63	4041.85	4424.39	3684.42	3712.83	3500.17
Statistics	**NREL**			**REL**		
N. obs.	5,004	5,220	5,400	10,044	9,792	9,540
Wald chi2	1378.51	1740.27	891.64	1483.90	2125.49	1189.22
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00
logL	-1298.40	-1337.04	-1386.91	-2639.86	-2461.50	-2490.88
df	12	12	12	12	12	12
AIC	2620.80	2698.08	2797.83	5303.73	4947.01	5005.76
BIC	2699.02	2776.81	2876.96	5390.30	5033.28	5091.72

Statistics	CULTURED vs. LAB GROWN	CULTURED vs. ARTIFICIAL	LAB GROWN vs. ARTIFICIAL	CULTURED vs. LABGROWN	CULTURED vs. ARTIFICIAL	LAB GROWN vs. ARTIFICIAL	CULTURED vs. LABGROWN	CULTURED vs. ARTIFICAL	LAB GROWN vs. ARTIFICIAL
	LIB			MOD			CON		
N. obs.	4,212	4,212	4,176	4,680	4,680	4,824	5,076	4,968	4,788
Wald chi2	1685.00	1729.29	949.80	755.10	744.38	1898.59	1561.08	1461.77	853.09
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
logL	-1122.27	-1067.78	-1137.96	-1188.87	-1206.33	-1231.74	-1289.47	-1190.65	-1174.59
df	12	12	12	12	12	12	12	12	12
AIC	2268.55	2159.56	2299.92	2401.74	2436.66	2487.47	2602.93	2405.30	2373.19
BIC	2344.69	2235.71	2375.97	2479.16	2514.07	2565.25	2681.32	2483.43	2450.87

Please cite as: Asioli, D., Bazzani, C. & Nayga, R.M. Jr (2021) Are consumers willing to pay for in-vitro meat? An investigation of naming effects. Journal of Agricultural Economics, 00, 1–20. Available from: https://doi.org/10.1111/1477-9552.12467

Note. H: includes consumers who have heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab-grown and Artificial, prior to the study.
Note. NH: includes consumers who have not heard the terms "cultured," "lab-grown," and "artificial" meat, respectively, for Cultured, Lab-grown and Artificial, prior to the study.
Note. LAAS includes consumers who have a low pro-animal welfare attitude.
Note. HAAS includes consumers who have a high pro-animal welfare attitude.
Note. LFTNS includes consumers who have low fears toward food products produced with novel food technologies.
Note. HFTNS includes consumers who have high fears toward food products produced with novel food technologies.
Note. LNEP includes consumers who have a low pro-ecological worldview.
Note. HNEP includes consumers who have a high pro-ecological worldview.
Note. REL includes consumers who follow religion.
Note. NREL includes consumers who do not follow religion.
Note. LIB includes consumers who are extremely or slightly liberal.
Note. MOD includes consumers who are moderate.
Note. CON includes consumers who are extremely or slightly conservative.
Note. N. obs: number of observations.
Note. Wald chi2: Wald test.
Note. logL: log likelihood function.
Note. df: degree of freedom.
Note. AIC: Akaike's information criterion.
Note. BIC: Bayesian information criterion.