Assessing Price Premiums of Health and Wellness Product Attributes in Pet Food: Implications for

Product Positioning and Marketing Strategies

Lonnie Hobbs Jr., Assistant Professor, Department of Agricultural Economics, Kansas State

University, Manhattan, Kansas, USA, lhobbs@ksu.edu

Andrew Anderson, Assistant Professor, Department of Agricultural Economics and Agribusiness,

University of Arkansas, Fayetteville, Arkansas, USA, aa216@uark.edu

1. Introduction

Health and wellness products have become a leading choice in the pet food industry, playing a key role in influencing customer buying behavior. Recent academic literature highlight consumer preference for these characteristics, emphasizing their critical role in purchase decisions. The growing demand presents a great opportunity for pet food companies (Hobbs Jr. et al., 2023). By employing smart product development, differentiation, and targeted marketing strategies, these companies can notably boost their profitability. However, it is essential for pet food decision-makers to have a deep understanding of the health and wellness attributes that have the potential to generate the highest price premiums for pet food companies.

To fully capitalize on the profit potential of the growing health and wellness trend, pet food decision-makers must have a clear understanding of pet food buyers' purchasing behavior, desired product attributes, as well as the amount that owners are willing to pay for those attributes. Alongside the expanding pet food market, there has been an increase in research focusing on pet food customer preferences. Previous studies have explored preferences for sensory product characteristics such as aroma, palatability, product type (kibble vs. wet), and formulation (Koppel, 2014; Samant et al., 2021; Wagoner et al., 2022). More recently, academic researchers have explored brand, ingredient, and shopping location (online vs. in-store) preferences, while others have examined the overall value of product attributes based on post-purchase reviews (Coy et al., 2021; Hobbs Jr. et al., 2023; Schleicher et al., 2019).

Despite the growing research about pet food customer preferences, there is a limited amount of academic literature that identifies the health and wellness product attributes that generate the highest value and premium for pet food companies. Specifically, the current literature identifies

health and wellness-related attributes as highly valued and in-demand attributes for pet food customers, but it fails to identify the specific attributes within the health and wellness market subsegment that hold the highest profit potential for pet food companies. Consequently, many unanswered questions remain related to the identification of health and wellness attributes that generates the highest price premium, and the approaches of pet food decision makers to adapt their product innovation, differentiation, and marketing strategies to capitalize on the increasing demand for health and wellness pet food.

The objective of this paper is to address a gap in the existing literature by using hedonic price analysis to evaluate the associated price premium for health and wellness characteristics in pet food. Specifically, the study aims to assess the potential profit value of health and wellness dry dog food products by analyzing the implicit prices associated with each attribute. Dry dog food products were chosen for analysis due to their significant market share in the pet food industry and high demand within the dog food market segment. The empirical analysis relies on a unique dataset of retail price information obtained from Chewy.com, one of the leading pet food retailers in 2022. The dataset includes retail prices, brand information, product type and form, packaging size, primary ingredients, and health-related attributes for 1,598 dry dog food products listed on Chewy's website as of January 3, 2023. The findings from the hedonic price estimation will be synthesized to provide insights for pet food decision makers, aiding in the development, differentiation, and marketing strategies for dog food products that incorporate health and wellness attributes.

This study makes two key contributions. First, it introduces the use of hedonic pricing analysis in the pet food industry to identify the health and wellness attribute premiums based on the implicit pricing of product attributes. The current literature in this area has limitations in informing pet

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food decision makers due to its limited focus on health and wellness product attributes and limited availability of pet food pricing data. Second, the insights generated in this study can potentially assist pet food decision-makers with enhancing product positioning and differentiation strategies for health and wellness products to maximize profitability and gain a competitive edge in the market.

2. Data

To examine the variation in the prices of health-related product attribute values across various dry dog food products, pricing and product description information was collected from Chewy.com, a leading online retailer of pet food. Information for all dog food and treat product offerings on Chewy.com were extracted on January 3, 2023. To ease the computational burden, all dog treats and non-dry dog food products were excluded from the sample. Information related to the dry dog food product offerings were manually recorded and assessed. Specifically, the price ($) per pound for all product attributes and the related product features described in the product details (description) on the Chewy.com website were extracted and assessed for each product. Binary indicator variables were then generated for each product attribute, denoted as "1" if the product attribute is mentioned in the product details and "0" otherwise.

Descriptive statistics for all product attributes are presented in Table 2. It is important to note that all variables, excluding the price and package weight, are binary indicators. There is no reference category as the variables are interpreted individually as having versus not having each health claim or attribute. All product attributes are mutually inclusive, indicating that a product can include

various combinations of features in each category. Therefore, the proportion percentages presented

for each category in Table 2 will not sum to 100 percent.

Table 2. Description of variables collected from each dog food product

Variables	N	Mean/Proportion	SD	Min	Max
Price ($/lb)	1330	3.22	1.47	0.63	17.48
Health Features					
Digestive Health	1330	52.6%			
Skin Coat Health	1330	41.7%			
Immune Support	1330	36.2%			
Vitamins Minerals	1330	34.6%			
Hip Joint Support	1330	15.3%			
High Energy	1330	7.5%			
Brain Health	1330	8.6%			
Dental Breath Care	1330	9.2%			
Muscle Care	1330	7.7%			
Sensitive Skin	1330	6.2%			
Heart Care	1330	3.8%			
Weight Management	1330	4.2%			
Appetite Stimulation	1330	2.2%			
Itch Redness Remedy	1330	1.7%			
Sensitive Digestion	1330	23.7%			
Allergy Relief	1330	1.6%			
Special Diets					
With Grain	1330	56.8%			
Grain Free	1330	53.0%			
High Protein	1330	29.5%			
Natural	1330	27.9%			
Gluten Free	1330	26.8%			
Pea Free	1330	22.9%			
Premium	1330	19.7%			
Chicken Free	1330	16.5%			
Non-GMO	1330	14.9%			
Food Flavor					
Poultry	1330	56.4%			
Chicken	1330	50.0%			
Meat	1330	24.7%			
Seafood Fish	1330	20.4%			
Lamb	1330	14.2%			
Salmon	1330	11.4%			
Turkey	1330	10.8%			
Beef	1330	8.3%			
Fruits Vegetables	1330	7.4%			
Sweet Potato	1330	5.3%			

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Table 2. Description of variables collected from each dog food product (cont.)

Life Stage					
Adult	1330	79.2%			
Puppy	1330	13.5%			
Senior	1330	7.4%			
Breed Size					
Small Breeds	1330	84.3%			
Large Breeds	1330	78.9%			
Medium Breeds	1330	70.7%			
Extra Small Breeds	1330	15.9%			
Giant Breeds	1330	11.6%			
Other Variables					
Packaged Weight	1330	22.69	9.86	1.05	51.1
Made In USA	1330	47.0%			

There were nine health-related product attribute groups examined in this study: digestion, skin and coat, immune support, muscle and joint, dental, internal organ support, weight control, energy, and vitamins. Within the product attribute groups, there were a combined total of sixteen health-related product features examined for 1,330 dry dog food products. The three most common health related features include *digestive health* (56.6%), *skin coat health* (41.7%), and *immune support* (36.2%). On the other hand, *allergy relief* (1.6%), *itch redness remedy* (1.7%), and *appetite stimulation* (2.2%) were the three least common health-related attribute product offerings.

Additional product features varied by diet, food flavor, life stage (adult, puppy, or senior), breed size, package size, and product location (e.g. Made in the U.S.). The most common specialty diets included in the dog food products were with grain, grain-free, and high protein. Non-GMO, chicken free, and premium were the least frequently included specialty diet related product attributes included in the product description. Regarding food flavor, poultry, chicken, and meat were the most common food flavors; while sweet potato, fruits/vegetables, and beef were the least

common food flavor offerings. The majority of the product offerings were for dogs in the adult life stage, accounting for 79.2% of the product offerings. Puppy and senior focused products accounted from 13.5% and 7.4% respectively. Regarding the breed size, small, medium, and large breeds products accounted for 84.3%, 70.7%, and 78.9% of the product offerings respectively. The average package weight was 22.69 pounds with an average price of $3.22 per pound.

There were notable differences in the average price per pound for the health-related product attributes. A detailed table of the descriptive statistics are provided below in Table 3. The price per pound for the products that includes the health-related product attributes (indicated as "yes") and those that do not include the health-related product attribute claim (indicated as "no") as indicated. The mean price of the products with the health-related product claim and excluding the health-related product claim is also displayed in the table below.

Table 3: Summary Statistics for Price ($/lb) by Health Claim Label

Health Claim	Label	Summary of Price ($/lb)				
		Mean	Median	Std Dev	Min	Max
Allergy Relief	No	3.21	2.98	1.47	0.63	17.48
	Yes	4.01	3.86	0.98	2.18	6.30
Appetite Stimulation	No	3.21	2.99	1.45	0.63	17.48
	Yes	3.86	3.27	2.21	1.41	9.67
Brain Health	No	3.25	3.03	1.50	0.63	17.48
	Yes	2.93	2.69	1.08	1.21	7.39
Dental Breath Care	No	3.25	3.03	1.45	0.70	17.48
	Yes	2.92	2.29	1.66	0.63	8.84
Digestive Health	No	3.22	2.92	1.51	0.70	17.48
	Yes	3.22	3.02	1.43	0.63	11.21
Heart Care	No	3.21	2.99	1.46	0.63	17.48
	Yes	3.42	3.42	1.64	1.31	8.38
High Energy	No	3.25	3.01	1.49	0.63	17.48
	Yes	2.84	2.72	1.13	0.84	6.66
Hip Joint Support	No	3.25	2.99	1.48	0.63	17.48
	Yes	3.09	2.85	1.38	0.97	9.80
Immune Support	No	3.40	3.17	1.48	0.63	17.48
	Yes	2.92	2.65	1.40	0.93	11.21
Itch Redness Remedy	No	3.23	2.99	1.48	0.63	17.48
	Yes	2.92	2.72	0.83	1.55	5.22
Muscle Care	No	3.26	3.02	1.49	0.63	17.48
	Yes	2.76	2.55	1.15	1.23	6.75
Sensitive Digestion	No	3.20	2.85	1.56	0.63	17.48
	Yes	3.29	3.17	1.12	1.14	8.84
Sensitive Skin	No	3.21	2.98	1.48	0.63	17.48
	Yes	3.36	3.18	1.27	1.48	8.84
Skin Coat Health	No	3.26	3.03	1.46	0.70	17.48
	Yes	3.17	2.92	1.48	0.63	9.80
Vitamins Minerals	No	3.26	3.04	1.60	0.63	17.48
	Yes	3.15	2.91	1.18	1.21	8.17
Weight Management	No	3.20	2.97	1.47	0.63	17.48
	Yes	3.66	3.61	1.30	1.41	7.82

As indicated above, the relationship between the average price of products that included the health-related product claim and those that did not include these claims varied. Specifically, the average price per pound is higher for products that includes claims such as *allergy relief*, *appetite stimulation*, *digestive health*, *heart care*, *sensitive digestion*, *sensitive skin*, *and weight management* than for the products that do not include these claims. Products that include *brain health*, *dental breath care*, *high energy*, *hip joint support*, *immune support*, *itch redness remedy*, *muscle care*, *skin and coat health*, *and vitamins minerals* have a lower average per pound average price than the products that do not include these attributes. Products that include the *allergy relief* claim have the highest average price per pound among all health-related product claims. On the other hand, products that include the *dental breath care* attribute claim have the lowest per pound average price among all health-related product claims.

3. Model Specification

To assess the effects of the health and wellness related product attributes on dog food prices, a hedonic pricing model is adopted following Rosen (1974). According to hedonic pricing theory, a good is comprised of a set of attributes that provides consumers with utility received post-purchase (Lusk et al., 2011; Rosen, 1974). Variations in the attribute offerings allows for customization of product offerings to match the preferences of the customers, contributing to the welfare of the customer and potential opportunity to maximize the customer's utility. In a heavily competitive market, the various combinations of product attributes allow companies to differentiate their

product offerings if marketed and priced properly. Rosen (1974) indicates the observed market equilibrium price of a good is comprised of implicit prices of each product attribute. However, this approach embodies underlying assumptions that (a) all customers are aware of all available combinations of attribute offerings, (b) there is no switching cost between products, and (c) the differentiated products are bought and sold by a large number of producers and consumers with no market power (Lusk et al., 2011).

The analysis in this study consists of four hedonic models that progressively incorporate control variables in addition to the health features being studied. The models are,

$$\ln P_i = \alpha + \beta Weight_i + \sum_{j=1}^{n} \gamma_j HealthFeature_{ji} + \varepsilon_i, \tag{1}$$

$$\ln P_i = \alpha + \beta Weight_i + \sum_{j=1}^{n} \gamma_j HealthFeature_{ji} + \tau_i + \varepsilon_i, \tag{2}$$

$$\ln P_i = \alpha + \beta Weight_i + \sum_{j=1}^{n} \gamma_j HealthFeature_{ji} + \sum_{k=1}^{m} \delta_k Attribute_{ki} + \varepsilon_i, \tag{3}$$

$$\ln P_i = \alpha + \beta Weight_i + \sum_{j=1}^{n} \gamma_j HealthFeature_{ji} + \sum_{k=1}^{m} \delta_k Attribute_{ki} + \tau_i + \varepsilon_i. \tag{4}$$

Where P_i is the price (\$/lb) of dog food i, $Weight_i$ is the packaged weight, $HealthFeature_{ji}$ is a dummy variable for the jth health feature, $Attribute_{ki}$ is a dummy variable for the kth attribute, τ_i is a brand level fixed effect for dog food i, and ε_i is a normally distributed error term. Variations

of the model specifications are assessed in this study as a robustness check. Specific model specifications are provided below in Table 4.

Table 4. Description of model specifications based on control variables and fixed effects

Model Feature	(1)	(2)	(3)	(4)
Non-health related attribute Controls	NO	NO	YES	YES
Brand FE	NO	YES	NO	YES

Model one is the base hedonic model assessing the impact of the health features on the logarithm of the price, while controlling for the product weight. Model two adds brand level fixed effects for sixty-one dry dog food brands to the base model to control pricing variations due to differences in the product brand. In model three, brand level fixed effects are removed, and non-health related credence attributes included to control for potential pricing variations caused by other product attributes/features. Lastly, model four includes the brand level fixed effects and the non-health related attribute control variables.

4. Results

The estimated parameters for the health-related product attributes are reported in Table 5. Price premiums for each attribute are discussed based on the approaches of Halvorsen and Palmquist (1980) and Botta (2023). Specifically, the price premiums are computed as $(e^c-1) \times 100$, where c is the estimated parameter. The statistically significant parameter estimates are compared and

discussed across the four models. The two models (models 2 and 4) that include manufacturer fixed effects have the highest explanatory power. However, Model 4 (includes attribute controls and the manufacturer fixed effects) is the primary model of interest as the adjusted R2 indicates that 91% of the variation in the dependent variable is explained by the model. The two models that do not include manufacturer fixed effects explain only 56% (model 1) and 65% (model 3) of the variation in the dependent variable. Therefore, only the statistically significant parameter estimates in Model 4 will be discussed and compared to the other models. Parameter estimates for the control attributes and the manufacturer fixed effects are reported in Appendix B.

The statistical significance and estimated effect of the health-related product attribute groups vary when controlling for additional product features and manufacturer fixed effects. Of the health-related product attribute groups examined, credence attributes in the digestion, skin and coat, immune support, muscle and joint, dental breath care, and vitamins and minerals groups were statistically significant in model 4 (all product features and manufacturer fixed effects included). Product attributes in the internal organ, weight control, and energy groups were not statistically significant in model 4, and thus will not be discussed. The parameter estimates associated with the digestion health credence attributes are statistically significant and positive across the four models, indicating that the digestion health-related attributes create value-added for the dog food products. Specifically, there is a 2.5% - 5.9% premium for products that include the *digestive health* attribute claim, and a 3.1% - 6.1% premium for *sensitive digestion* products.

Table 5: Regression Results

		Dependent variable: log (Price ($/lb))		
Model:	(1)	(2)	(3)	(4)
Digestive Health	0.059***	0.023*	0.056***	0.025*
	(0.019)	(0.013)	(0.019)	(0.013)
Sensitive Digestion	0.061***	0.045***	0.055***	0.031***
	(0.019)	(0.012)	(0.019)	(0.012)
Skin Coat Health	-0.015	0.008	-0.014	-0.005
	(0.020)	(0.012)	(0.019)	(0.012)
Sensitive Skin	-0.071**	0.041	-0.034	0.049*
	(0.036)	(0.025)	(0.038)	(0.025)
Itch Redness Remedy	0.013	-0.056	0.029	-0.042
	(0.056)	(0.039)	(0.050)	(0.037)
Immune Support	-0.090***	-0.030**	-0.027	0.001
	(0.020)	(0.015)	(0.019)	(0.015)
Allergy Relief	0.227***	0.203***	0.086	0.145***
	(0.053)	(0.050)	(0.068)	(0.046)
Muscle Care	-0.096***	-0.042**	-0.097***	-0.045**
	(0.035)	(0.018)	(0.035)	(0.018)
Hip Joint Support	0.086***	-0.036**	0.051**	-0.027
	(0.026)	(0.016)	(0.024)	(0.017)
Dental Breath Care	-0.200***	-0.093***	-0.190***	-0.078***
	(0.039)	(0.019)	(0.034)	(0.019)
Brain Health	0.012	0.006	0.001	0.012
	(0.026)	(0.015)	(0.027)	(0.016)
Heart Care	-0.024	-0.024	-0.046	-0.015
	(0.046)	(0.029)	(0.044)	(0.029)
Weight Management	0.179***	-0.012	0.084**	-0.013
	(0.036)	(0.017)	(0.034)	(0.017)
Appetite Stimulation	0.091*	-0.030	0.075	-0.016
	(0.053)	(0.037)	(0.053)	(0.036)
Vitamins Minerals	-0.029	-0.034**	-0.019	-0.030**
	(0.018)	(0.015)	(0.018)	(0.015)
High Energy	-0.016	-0.014	-0.029	-0.011
	(0.035)	(0.020)	(0.031)	(0.019)
Observations	1,330	1,330	1,330	1,330
R^2	0.562	0.900	0.665	0.918
Adjusted R^2	0.556	0.893	0.653	0.911

Robust standard errors in parentheses. Significance: *10% level; **5% level; ***1% level.

Of the skin and coat health-related attributes, the parameter estimate associated with the *sensitive skin* attribute is the only statistically significant parameter estimate. In model 4, there is a 4.9% price premium for products that include the *sensitive skin* attribute. However, the signage and statistical significance for this attribute varies when adding additional controls in the model, as shown by the suggested discount of 7.1% when including the *sensitive skin* attribute indicated in model 1. Although the significance level is higher for the *sensitive skin* parameter estimate in model 1, there is more explanatory power provided in model 4 (all control variables and fixed effects included) and thus will be used in this study to represent the effects of the *sensitive skin* attribute on the price of dry dog food products. The parameter estimates associated with the *skin coat health* and *itch redness remedy* are statistically insignificant in each of the four models.

The parameter estimates and statistical significance associated with the credence attributes related to dog immune health varies across the four models. Specifically, the parameter estimate associated with the *allergy relief* attribute indicates in model 4 that a 14.5% - 22.7% premium is included in the price of dry dog food products that includes the *allergy relief* attribute. The parameter estimates associated with the *allergy relief* attribute are statistically significant and positive in all models except model 3 (includes attribute controls but does not include manufacturer fixed effects). However, the parameter estimates associated with the *immune support* credence attribute are statistically significant and negative in models 1 and 2, indicating a potential discount associated with this attribute. However, since the parameter estimate is not statistically significant in model 4, the impact of the *immune support* attribute in the sample data is ambiguous.

Credence attributes related to muscle and joint health varied amongst the magnitude, signage, and statistical significance of the parameter estimates. More specifically, the parameter estimate associated with the *muscle care* attribute is statistically significant and negative across the four models, indicating a potential discount associated with this attribute. Dry dog food products that include the *muscle care* product attribute have a discount of 4.2% - 9.7% as indicated in Table 3. The parameter estimates associated with *hip joint support* are statistically significant in models 1, 2, and 3, but it is statistically insignificant in model 4. Additionally, there is ambiguity in the signage of the parameter estimate associated with *hip joint support*. Therefore, the estimation results fail to provide distinct indication of the impact of the *hip joint support* product attribute on the price of the dry dog food.

The parameter estimates associated with *dental breath care* and *vitamins minerals* product attributes indicate a potential discount of the product price when this attribute is included. Specifically, the product price is discounted by a range of 7.8% - 20% when the *dental breath care* attribute is included, as shown in Table 3. The magnitude of the discount has a wider range due to the varying parameter estimates among four models. Therefore, the associated discount is expected to resemble the 7.8% effect indicated in model 4, due to the incorporation of additional control and brand fixed effects included in the estimation. Similarly, the results indicate a 3.0% – 3.4% discount in the price per pound of dry dog food products that includes the *vitamins minerals* health claim.

5. Conclusion and Implications

With the rise in the demand for health and wellness product attributes in pet food, and the available variation in product attribute offerings, there is a need to understand the associated value of said attributes. This study attempts to address this need by applying a hedonic price analysis to various health and wellness credence attributes in dry dog food to identify the implicit price premiums associated with each attribute. The results of this study can be used to assist pet food producers with identification of what product attributes can provide the most value to them and what they should place increased focus on when developing or marketing their products. Additionally, the approach in this study helps to add to the agribusiness management and applied economic academic literature related to pet food.

The results show that there are price premiums associated with credence attributes related to digestion, skin and coat, and immune support. This implies that there is a potential for pet food companies to increase their product revenue by offering products that include these product attributes at a premium. Specifically, the highest price premium of all health-related credence attributes was the *allergy relief* attribute, offering a 14.5% - 22.7% premium when included in the product offering. Current trends in pet food demand and previous academic literature suggest that pet owners place a higher focus on the healthiness of their pet and have higher preference for premium products (Hobbs Jr. et al., 2023; Pearce et al., 2023). Thus, they are more accepting of the higher priced products.

The results also show that there are price discounts associated with *muscle and joint, dental,* and *vitamins minerals* related credence attributes. Specifically, there was a 4.2% - 9.7% discount associated with the presence of the *muscle care* attribute, 7.8% discount associated with the *dental breath care* attribute, and 3.0 – 3.4% discount associated with the *vitamins minerals* attribute. The discounts associated with these attributes potentially indicate the presence of said attributes in lower quality and/or priced products. However, the approach in this study fails to identify if the variation in price premiums is motivated by supply chain cost to produce the attributes, and/or customer demand for said product attributes. Therefore, further research is needed to isolate these effects and provide further clarification on the "why" driving the differences in prices.

This study provides insight into the current health-related credence attributes offered in dry dog food products and provides a starting point for further researchers to expand on the approaches and findings in this study. Specifically, future research should expand the scope of the study to identify the variations in health-related price premiums in other types of dog food offerings (e.g. wet dog food, semi-moist, freeze-dried, etc.), and different types of pet food (i.e. cat food, exotics, etc.). Additional research should also take a deeper exploration into the other non-health-related attributes used as controls in this study to identify the associated impact on product pricing and demand. This has a potential to assist pet food companies in identifying the right combination of health-related and non-health related attribute offerings that can potentially bring the highest level of value to pet food customers, and lead to higher revenue for pet food companies.

References

Botta, R., Garlock, T., Asche, F., Camp, E. V., & Ropicki, A. (2023). The value of product attributes for farmed oysters: A hedonic price analysis of US restaurant menus. *Journal of the Agricultural and Applied Economics Association*, *2*(2), 295–305. https://doi.org/10.1002/jaa2.58

Coy, A. E., Green, J. D., & Behler, A. M. C. (2021). Why Can't I Resist Those "Puppy Dog" (or "Kitty Cat") Eyes? A Study of Owner Attachment and Factors Associated with Pet Obesity. *Animals*, *11*(2), Article 2. https://doi.org/10.3390/ani11020539

Halvorsen, R., & Palmquist, R. (1980). The Interpretation of Dummy Variables in Semilogarithmic Equations. *American Economic Review*, *70*(3), 474–475.

Hobbs Jr., L., Shanoyan, A., Wiley, Z. Z., & Aldrich, G. (2023). Analysis of pet-food customer postpurchase experience using online customer reviews: Implications for product and marketing strategies. *Agribusiness*, *n/a*, 1–23. https://doi.org/10.1002/agr.21866

Koppel, K. (2014). Sensory analysis of pet foods. *Journal of the Science of Food and Agriculture*, *94*(11), 2148–2153. https://doi.org/10.1002/jsfa.6597

Lusk, J. L., Roosen, J., & Shogren, J. (2011). *The Oxford Handbook of the Economics of Food Consumption and Policy*. Oxford University Press.

Pearce, H., Neill, C. L., Royal, K., & Pairis-Garcia, M. (2023). Can dogs help chickens? Pet owners' willingness to pay for animal welfare-friendly pet food in the United States. *Animal Welfare*, *32*, e11. https://doi.org/10.1017/awf.2022.3

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure

    Competition. *Journal of Political Economy*, *82*(1), 34–55. https://doi.org/10.1086/260169

Samant, S. S., Crandall, P. G., Jarma Arroyo, S. E., & Seo, H.-S. (2021). Dry Pet Food Flavor

    Enhancers and Their Impact on Palatability: A Review. *Foods*, *10*(11), Article 11.

    https://doi.org/10.3390/foods10112599

Schleicher, M., Cash, S. B., & Freeman, L. M. (2019). Determinants of pet food purchasing

    decisions. *The Canadian Veterinary Journal*, *60*(6), 644–650.

Wagoner, M. P., Presume, M. R., Chilenje, M. E., Abascal-Ponciano, G. A., Sandoval, J. L.,

    Smith, H. R., Reyes, T. M., Wilborn, B. S., Dunavant, J. A., Mason, R. P., Altom, E. K.,

    Starkey, C. W., & Sawyer, J. T. (2022). Shelf-Life Evaluation of Ingredient

    Combinations and Technologies for Use in Pet Food Formulations. *Animals*, *12*(2),

    Article 2. https://doi.org/10.3390/ani12020152

Appendix A

Table A.1: Other attribute coefficients

	Model:	*Dependent variable:* log(Price ($/lb))			
		(1)	(2)	(3)	(4)
Packaged Weight		-0.031***	-0.023***	-0.029***	-0.023***
		(0.001)	(0.001)	(0.001)	(0.001)
With Grain				-0.030*	-0.085***
				(0.018)	(0.011)
Grain Free				-0.116***	-0.021
				(0.017)	(0.016)
High Protein				0.005	0.003
				(0.018)	(0.013)
Natural				-0.0004	-0.030
				(0.017)	(0.029)
Gluten Free				-0.001	-0.001
				(0.018)	(0.013)
Pea Free				0.075***	-0.001
				(0.020)	(0.017)
Premium				0.209***	0.134***
				(0.021)	(0.026)
Chicken Free				0.107***	0.030**
				(0.022)	(0.014)
Non-GMO				0.038*	0.048**
				(0.021)	(0.020)
Poultry				0.033	0.032**
				(0.027)	(0.016)
Chicken				-0.039	-0.063***
				(0.026)	(0.015)
Meat				0.038	0.047**
				(0.034)	(0.019)
Seafood Fish				0.038	0.021
				(0.025)	(0.015)
Lamb				-0.065**	-0.022
				(0.033)	(0.020)
Salmon				-0.047*	0.003
				(0.027)	(0.016)
Turkey				-0.017	-0.009
				(0.024)	(0.016)
Beef				-0.100**	-0.032

	(1)	(2)	(3)	(4)
			(0.041)	(0.020)
Fruits Vegetables			-0.212***	0.017
			(0.069)	(0.029)
Sweet Potato			0.188***	0.016
			(0.070)	(0.032)
Adult			0.193	-0.019
			(0.180)	(0.060)
Puppy			0.215	-0.011
			(0.180)	(0.060)
Senior			0.204	-0.038
			(0.180)	(0.060)
Small Breeds			-0.150***	0.013
			(0.034)	(0.024)
Large Breeds			-0.054*	0.040*
			(0.032)	(0.021)
Medium Breeds			0.172***	0.012
			(0.030)	(0.022)
Extra Small Breeds			0.156***	0.018
			(0.035)	(0.024)
Giant Breeds			0.102***	0.023
			(0.033)	(0.019)
Made In USA			-0.016	0.029
			(0.017)	(0.018)
Constant	1.791***	1.660***	1.555***	1.526***
	(0.025)	(0.037)	(0.187)	(0.087)
Observations	1,330	1,330	1,330	1,330
R^2	0.562	0.900	0.665	0.918
Adjusted R^2	0.556	0.893	0.653	0.911

Robust standard errors in parentheses. Significance: *10% level; **5% level; ***1% level.