Consumer Sensitivity to Pork Prices: A 2018-2023 Comparison of 50 U.S. Retail Markets and 6 Pork Products

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Executive Summary

This project had a main objective to determine how sensitive consumer pork purchasing behavior is to price changes across U.S. retail markets and pork products during the 2018-2023 period. As the U.S. pork industry operates in a challenging period, enhanced insights are needed to determine how consumer purchasing behavior differs both across geographically distinct markets and pork products.

This study used weekly retail scanner data from 50 U.S. retail markets and six different pork products to estimate market- and product-specific own-price elasticity estimates. The elasticity estimates quantify how sensitive consumers' purchases in each market, and for each product, are to changes in prices.

Beyond these market- and product-specific own-price elasticities for the full six years spanning 2018 to 2023, we also provide parallel estimates for each two-year period (2018-19, 2020-21, and 2022-23) showing temporal patterns in consumer price sensitivity.

The full report documents raw data utilized, procedures employed, and results. The report includes multiple tables and figures intended to be references for future refined assessments benefiting from the provided market- and product-specific information. A corresponding Appendix is also included providing supplementary details.

Main findings:

1) There is a wide range in price-sensitivity spanning from inelastic to elastic demand within product categories and across markets. Stated differently, there is notable retail demand heterogeneity in the aggregate, U.S. pork market. For example, the own-price elasticity of demand for pork loin over 2018-2023 ranges from a low of -2.383 to a high of -0.764 across the 50 markets examined.

2) Changes in prices of beef or chicken have small effects on pork purchases; pork purchases are primarily influenced by the price of pork.

Key Recommendations:

1) Wide heterogeneity in retail demand is prevalent across markets and pork products suggesting approaches treating all markets or products as equal should be made with caution. The range of price-sensitivity warrants refined assessments where feasible and supports the value of periodic updated assessments as consumer behavior is dynamic. Some markets are inelastic and others are elastic, pointing to notably different economic impacts of anything altering prices or available quantities.

2) Variation in consumer price sensitivity spanning from inelastic to elastic indicates consumer expenditures (and pork seller revenues) will move in the same direction of pork prices in some cases (where demand is inelastic) and move in opposite directions in other cases (where demand is elastic). This points to diverse consumer and producer welfare effects across product-markets for any events altering pork prices or availability. The finding also suggests the benefit of targeted, by product and/or location, advertising and price promotion.

3) Because changes in beef and chicken prices have much smaller impacts on pork purchases than does changes in pork price, the pork industry should focus on factors driving pork's pricing and competitiveness. Furthermore, across markets and products there is notable variation in substitute and complement relationships suggesting caution in broad-brush responses to adjustments in prices of other proteins.

4) Examining consumer behavior over pre-pandemic, pandemic, and post-pandemic periods reveals overall that price sensitivity was lower in 2020-21 during the pandemic. In the most recent 2022-23 period price sensitivity generally elevated from pandemic levels reflecting macroeconomic realities faced by U.S. residents.

Chapter 1. Introduction

Fundamentals of supply and demand underlie inner-workings of agricultural markets, directly influencing market outcomes of price and quantity that are perpetually of high interest to industry stakeholders, analysts, and policy makers. As such, there is value in regularly re-examining past research around supply and demand information to better understand contemporary developments in agricultural markets. Unfortunately, a common impediment to understanding impacts that market or policy phenomena have on producers and consumers is the lack of granularity in consumer demand elasticity estimates. To illustrate this, note most prior research and analysis references broad, national-aggregate elasticities when discussing the U.S. pork market. For instance, the domestic pork demand indices Dr. Tonsor maintains at Kansas State University utilize an own-price elasticity estimate of -0.31. This suggests the volume of pork consumers desire declines by 3.1% for each 10% increase in price. While the aggregate elasticity is a reasonable estimate for purposes of a broad, demand-strength tracking index, it masks important differences across geography, consumers, and pork products. The conventional approach would assume, for example, a 10% price increase will have the same effect on ribs and loin, and cannot identify differences in demand in, say, Chicago, IL vs. Houston, TX.

This aggregation distinction motivated a similar report we composed in 2021 using retail data spanning 2016 to 2020. Given the U.S. pork industry's current environment coupled with the multitude of adjustments associated with the pandemic and historically high inflation led to this latest assessment. This **2024 project's primary objective** is to determine how sensitive consumer pork purchasing is to price changes across 50 U.S. retail markets and six pork products. In meeting this objective, an enriched understanding of U.S. retail pork demand will again enable improved decision-making by many industry stakeholders.

Chapter 2. Data Overview

This project utilizes multi-outlet retail market scanner data obtained by the National Pork Board from Circana (formerly IRI). Specifically, we use data from the 50 markets listed in table 1 covering calendar years 2018-2023.[1] While we believe coverage over each of the 50 examined markets is sound and as complete as feasible, there is variation nationally as presence of excluded retail outlets varies.[2] Furthermore, there likely is adjustment in market coverage, beyond just temporal difference of being a newer dataset, in the latest retail data compared to our initial report as retail markets grow/shrink and Circana's definition of each retail market can correspondingly change. This should be noted in any comparison to past assessments.

Table 1. Retail Markets Examined

Albany, NY	
Atlanta, GA	New Orleans, LA/Mobile, AL
Baltimore, MD/Washington D.C.	New York, NY
Birmingham/Montgomery, AL	Orlando, FL
Boise, ID	Peoria/Springfield, IL
Boston, MA	Philadelphia, PA
Buffalo/Rochester, NY	Phoenix/Tucson, AZ
Charlotte, NC	Pittsburgh, PA
Chicago, IL	Portland, OR
Cincinnati/Dayton, OH	Providence, RI
Columbus, OH	Raleigh/Greensboro, NC
Dallas/Ft. Worth, TX	Richmond/Norfolk, VA
Denver, CO	Roanoke, VA
Detroit, MI	Sacramento, CA
Grand Rapids, MI	San Diego, CA
Harrisburg/Scranton, PA	San Francisco/Oakland, CA
Hartford, CT/Springfield, MA	Seattle/Tacoma, WA
Houston, TX	South Carolina
Indianapolis, IN	Spokane, WA
Jacksonville, FL	St. Louis, MO
Knoxville, TN	Syracuse, NY
Las Vegas, NV	Tampa/St. Petersburg, FL
Los Angeles, CA	Toledo, OH
Louisville, KY	West Texas/New Mexico
Miami/Ft. Lauderdale, FL	Wichita, KS
Nashville, TN	

[1] Note the sole market not included from our initial assessment in 2021 is New England as there is not complete, comparable data available for this 2018-2023 assessment.

[2] As an example, omission of HEB markets is of note in Texas. This is not something that can easily be remedied and we have no particular reason to believe it skews our analysis in any particular way but rather is noted here for transparency.

We focus on categories with sufficient volume to support a robust analysis. Accordingly, the comparatively minor categories of Leg (Fresh Ham), Offal, Ground, and Ingredients Cuts are not individually examined as they each represent less than 2% of total pork retail expenditures, on average across markets for the period examined.[3]

Table 2. Products Examined

Pork Products	*Aggregate Meat Categories*
Loin	Beef
Ribs	Chicken
Shoulder	Pork
Breakfast Sausage	
Dinner Sausage	
Bacon	

The following two tables begin to illustrate important variation across markets.[4] We use 2023 data both to summarize the most recent data available and to mitigate issues with summary statistics spanning pre-pandemic, pandemic, and "post" pandemic periods. Using average values over the 2023 period for the 10 largest resident markets, tables 3 and 4 summarize volume and expenditure shares respectively for loin, ribs, shoulder, breakfast sausage, dinner sausage, and bacon.[5]

[3] We use the sum of fixed and random weight products to capture total transactions and support improved comparisons across pork categories.

[4] The Appendix contains parallel tables providing estimates for all examined markets.

[5] Other pork categories were also considered yet each represent less than 2% expenditure shares on average and were not completely available for assessment in all cases leading us to omit them from further evaluation. Accordingly the values in tables 3 and 4 sum to 100% by market (by row) over the six examined products of focus in this report.

Table 3. Average 2023 Volume Shares of Pork Products, in Largest Population Markets

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*
New York, NY	27.8%	14.8%	8.6%	14.4%	14.4%	19.9%
Los Angeles, CA	15.0%	20.0%	10.9%	15.5%	15.5%	23.1%
Chicago, IL	20.4%	14.4%	8.9%	16.6%	16.6%	23.2%
Baltimore, MD/Washington D.C.	22.7%	12.7%	9.7%	13.2%	13.2%	28.5%
Dallas/Ft. Worth, TX	20.9%	18.8%	13.9%	10.3%	10.3%	25.8%
Houston, TX	19.3%	19.2%	17.2%	11.6%	11.6%	21.2%
Philadelphia, PA	26.0%	12.7%	7.9%	14.8%	14.8%	23.7%
San Francisco/Oakland, CA	20.5%	21.0%	13.8%	11.8%	11.8%	21.0%
Miami/Ft. Lauderdale, FL	29.3%	22.0%	12.8%	9.1%	9.1%	17.7%
Boston, MA	26.6%	15.4%	9.9%	14.9%	14.9%	18.2%

Table 4. Average 2023 Expenditure Shares of Pork Products, in Largest Population Markets

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*
New York, NY	24.2%	13.0%	4.8%	4.9%	17.0%	36.2%
Los Angeles, CA	15.7%	15.6%	6.2%	6.7%	16.8%	39.1%
Chicago, IL	18.4%	12.2%	4.1%	11.4%	17.7%	36.2%
Baltimore, MD/Washington D.C.	19.1%	9.5%	4.1%	13.3%	13.3%	40.7%
Dallas/Ft. Worth, TX	19.0%	13.3%	6.0%	12.1%	11.1%	38.5%
Houston, TX	18.5%	14.2%	7.0%	12.1%	13.6%	34.7%
Philadelphia, PA	22.2%	10.1%	4.2%	12.6%	14.9%	36.0%
San Francisco/Oakland, CA	18.0%	15.8%	7.3%	8.1%	15.0%	35.9%
Miami/Ft. Lauderdale, FL	28.9%	18.7%	7.0%	4.7%	11.1%	29.6%
Boston, MA	24.8%	12.6%	5.2%	4.8%	17.5%	35.1%

To further summarize product differences nationally, the following two figures help visually portray the average volume and expenditure shares across all 50 markets in 2023. The leading role of Loin and Bacon immediately is demonstrated. Observing expenditure share to be higher for Bacon and volume share to be higher for Loin reflects Bacon prices exceeding Loin prices.

Figure 1. 2023 Volume Shares of Pork Products, Average of 50 Markets

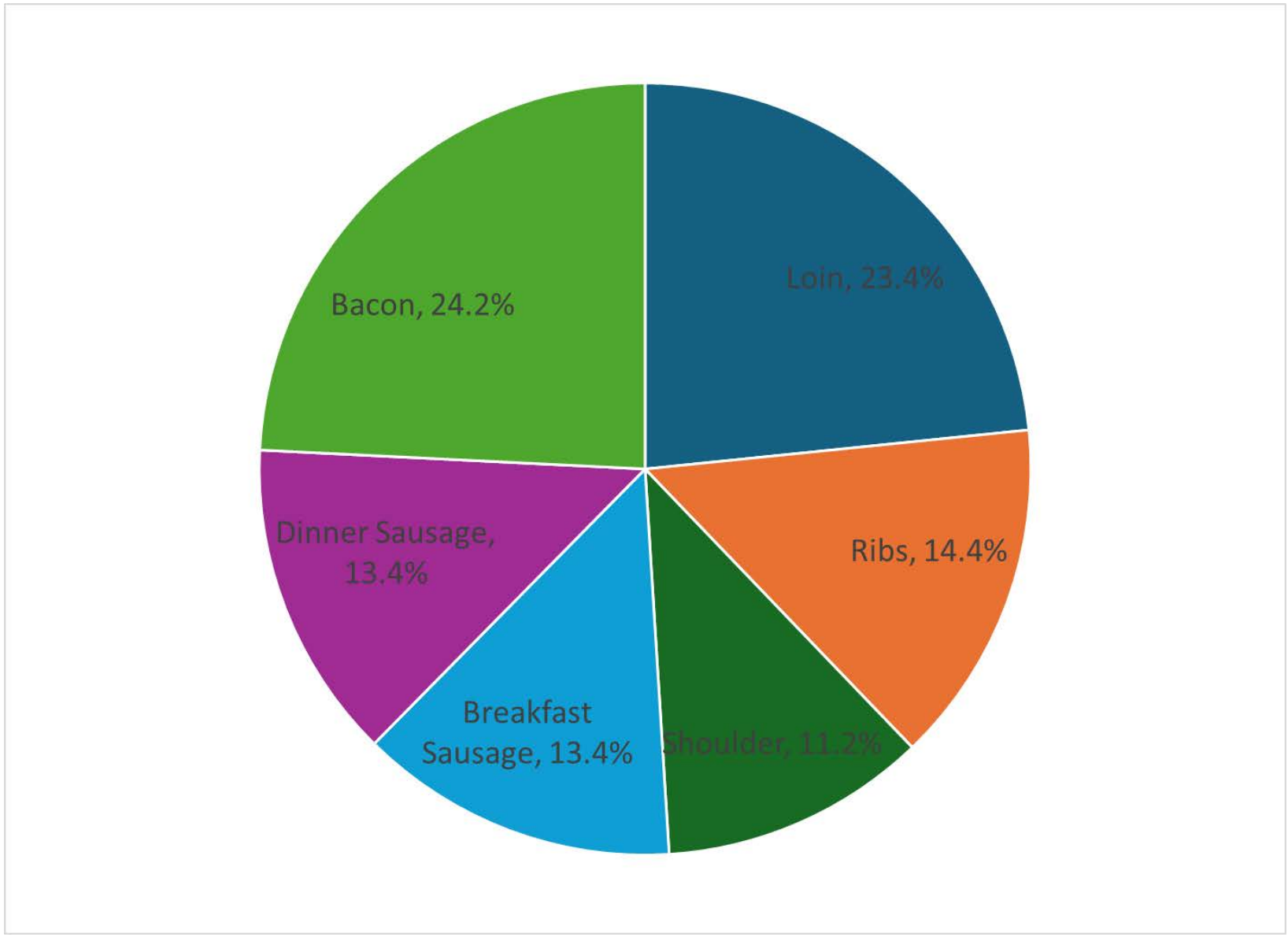
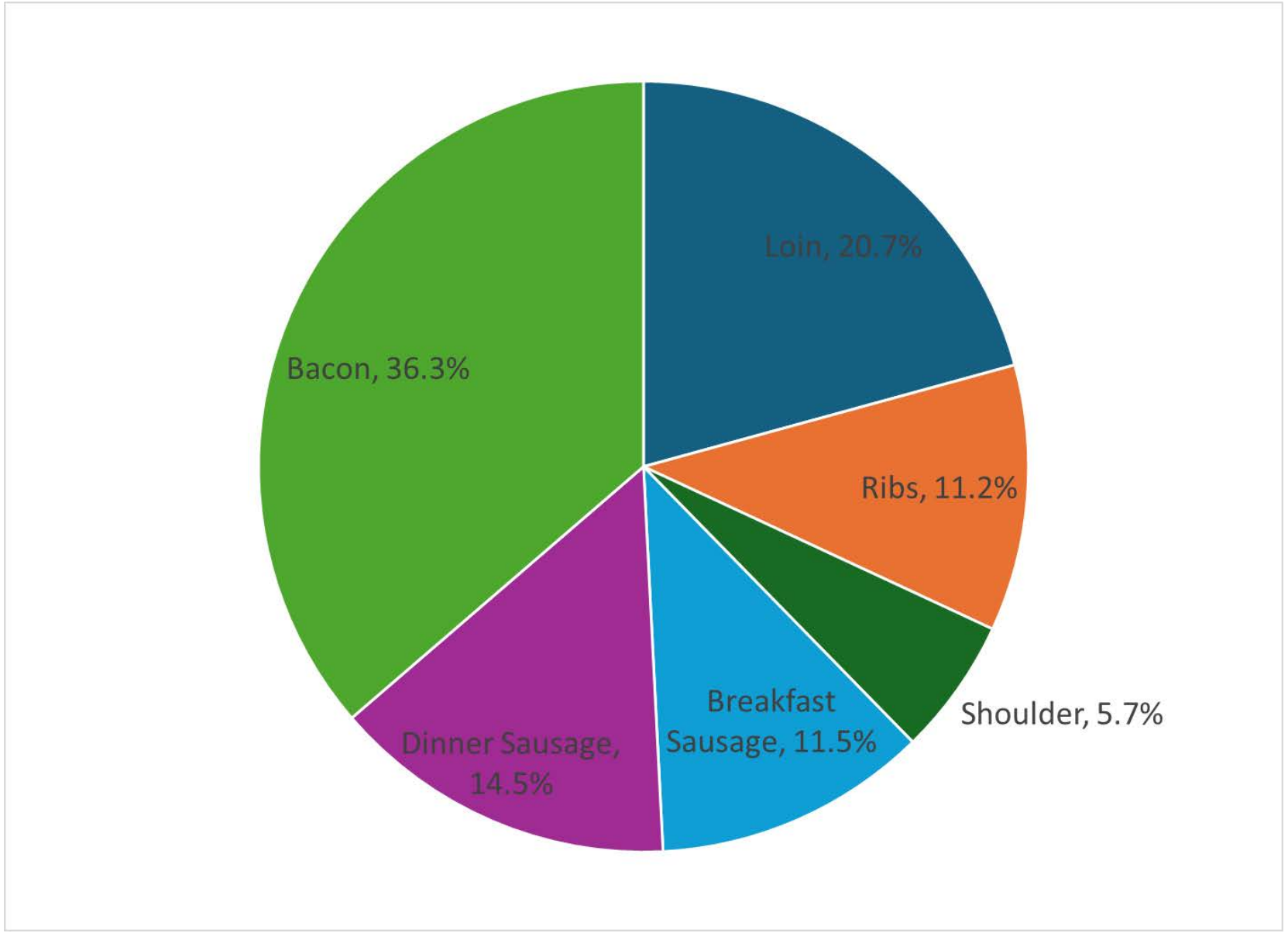


Figure 2. 2023 Expenditure Shares of Pork Products, Average of 50 Markets



To build upon the previous figures and illustrate heterogeneity masked in averages, consider the Los Angeles, CA market. Here, 15% of pork volume purchases in the form of loin; this is the lowest of the 10 markets shown in table 3. At the same time, in Los Angeles, 39% of pork expenditures were in the form of bacon (2nd highest of the 10 largest markets) and 16% of expenditures were on ribs (3rd highest of the 10 largest markets). Contrast this with the New York, NY market. New York ranks 2nd only to Miami/Ft. Lauderdale, FL in volume share from Loin purchases among the 10 markets shown in table 3. Meanwhile, New York ranks 8th among the 10 markets in table 4 in expenditure share from Breakfast Sausage purchases. These simple examples demonstrates a **central point:** the mix of pork products purchased varies notably across U.S. consumer markets.[6]

[6] The Appendix includes tables listing out the ranking of all markets, for all six pork products.

Chapter 3. Elasticity Estimation Procedure

To document heterogeneity across markets in pork purchasing behavior we proceed to examine consumer price sensitivity by product and market. Specifically, we set up economic models to use variation in prices paid and quantities purchased to derive market- and product-specific own-price elasticity of demand estimates. Our overall approach directly follows that applied by Tonsor and Lusk (2021).

In designing our model, we control for competing beef and chicken prices, monthly seasonality, annual effects, and COVID pandemic effects. The final model estimated is:

(1) $lnQ = \alpha + \beta lnOwnP + \gamma lnBeefP + \delta lnChickenP + \sum_{i=1}^{11} \mu_i Month_i + \sum_{j=2018}^{2022} \rho_j Year_j + \sigma Covid + \epsilon$

where *ln* is the natural logarithm operator, *Q* is quantity of pork product purchased, *OwnP* is price of the examined pork product in its own market, *BeefP* is beef price, *ChickenP* is chicken price, $Month_i$ is a dummy variable equal to one for month *i* and 0 otherwise, $Year_j$ is a dummy variable equal to one for year *j* and 0 otherwise, *Covid* is a dummy variable equal to one for weeks March 15, 2020 to May 31, 2020 and 0 otherwise, ϵ is the model's normally-distributed error term, and remaining terms are parameters to be estimated. This model contains 21 parameters to be estimated. We first estimate each model separately for every market-product combination yielding market-product specific insights for the 2018-2023 period. We omit time and market subscripts from equation (1) for presentation convenience.

Our final, preferred approach applies two-stage least squares methods to avoid assuming pork product prices in a market are exogenous. Instrumental variables for retail pork prices are needed that are highly correlated with the product price in the respective location but have no direct, independent effect on the outcome of interest, the quantity demanded. Often times, such instruments will be cost-side drivers of retail price changes. We utilize two types of instruments. The first type are so-called Hausman-instruments (1996) that have been widely used in the literature (e.g., Nevo, 2001), in which we use the weighted average price in the other 49 markets besides the one being examined as an instrument for the pork product price in the location in question. The assumption is that correlation among prices across two locations is due to common cost shocks, whereas it is assumed demand changes across two locations are likely to be more idiosyncratic. The other type of instruments include more direct costs to the retail sector: current and up to 8 week-lagged national cutout wholesale values as instruments.[7]

[7] The national cutout values used as instruments varies to align appropriate primals with retail products. In our loin analysis we use Loin Primal values, for ribs we use Rib Primal values, for shoulder we use Picnic Primal values, for breakfast and dinner sausage we use Butt Primal values, and for bacon we use Belly Primal values. For aggregate category analyses we use the Comprehensive Pork Cutout value.

Ultimately our primary interest is in the β parameter shown in equation 1, which quantifies how price sensitive consumers are for a given product in a particular market. Specifically, this parameter is an elasticity estimate representing how a 1% change in a product's price impacts the quantity purchased in a given market. In estimating our model for each market and product, we quickly gain new insight into multiple dimensions of heterogeneous consumer demand patterns.

Chapter 4. 2018-2023 Elasticity Results

Table 5 reports our main elasticity results for six separate pork products as well as pork when modeled as an aggregate good.[8] This table reports mean and median statistics of elasticity estimates over the 50 evaluated markets. Further, to highlight the dispersion across markets we report minimum, 1st quartile, 3rd quartile, and maximum estimates. Figure 3 presents the same information in visual format.

First consider the differences across products using median estimates over markets. The Loin category is estimated to have a -1.448 own-price elasticity, suggesting that for each 1% increase in price, Loin retail purchases will decline by 1.45%. Not surprisingly given the comments above regarding variation in volume and expenditure shares, there is notable variation across products. Bacon (-0.827 own-price elasticity) is identified to be the category less sensitive to price changes – that is bacon volumes adjust least in response to offer price movement. Conversely Breakfast (-2.069) and Dinner Sausage (-1.954) categories are found to be rather price responsive with volume changes being about double that of price movement.

While these differences across products based on median values are important to appreciate, they represent only one of two key dimensions of dispersion in demand patterns. Examining elasticity estimates across markets is also critical. Consider first loin products. The median own-price elasticity estimate is -1.448, yet across the 50 markets, this ranges from -0.764 (Miami/Ft. Lauderdale, FL) to -2.383 (Boise, ID). A convenient statistical metric used to summarize dispersion is the interquartile range (IQR), which is the difference between the 3rd quartile and 1st quartile. For loin products, the IQR is 0.40, which is 28% the magnitude of the median estimate reflecting notable variation. Stated differently, in response to a 1% increase in loin prices 25% of the loin markets decrease purchased volume by more than 1.62%, 50% of markets reduce purchased volume by 1.22% to 1.62%, and the remaining 25% of markets decrease purchased volume by less than 1.22%.

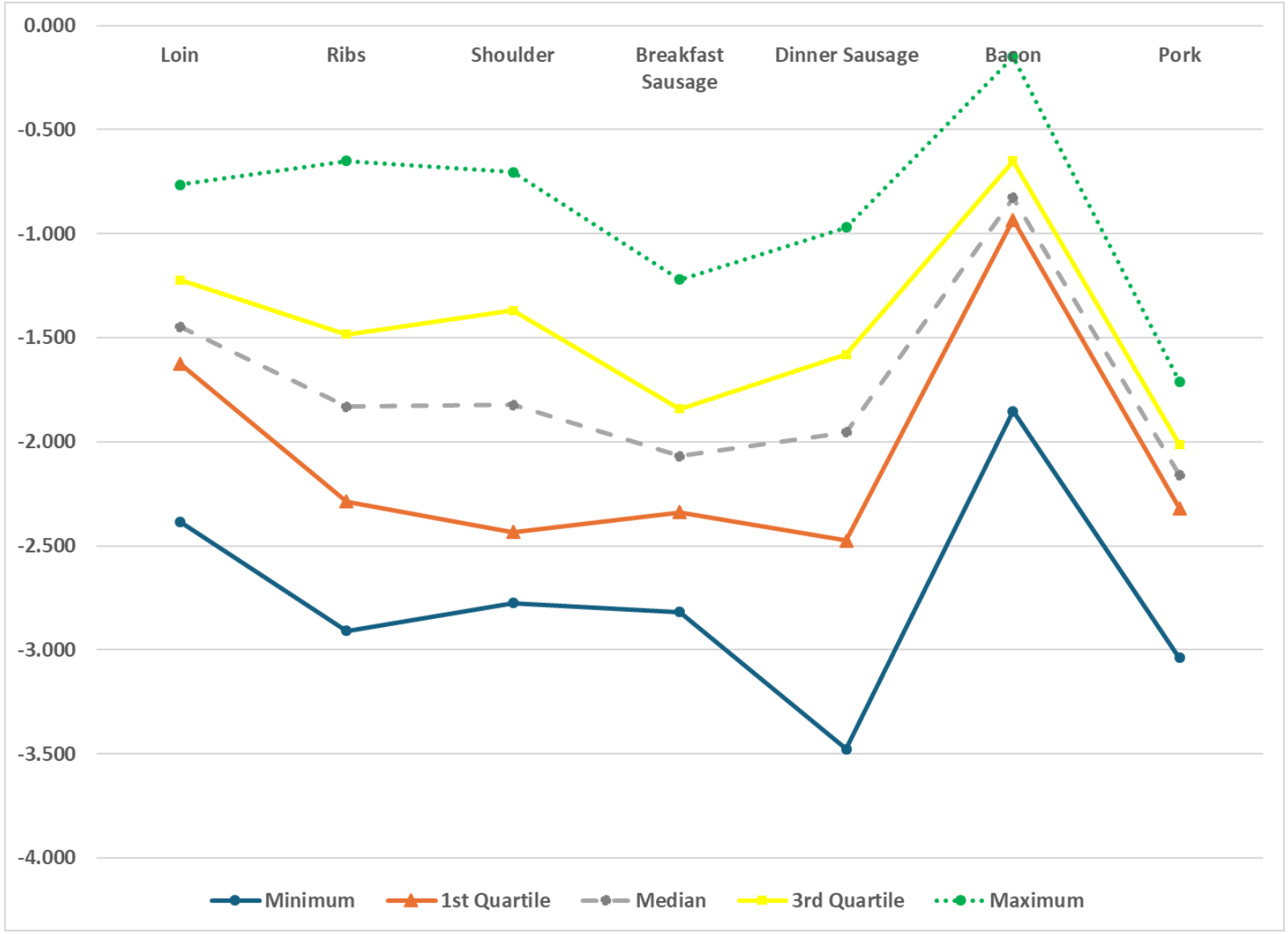
Similar results are observed for all pork products. Using the IQR as a way to compare dispersion, bacon (IQR=0.283) and loin (IQR=0.402) are product categories that are less different across markets while shoulder (IQR=1.066), dinner sausage (IQR=0.893), ribs (IQR=0.805), and breakfast sausage (IQR=0.496) are product categories that differ more across markets.

[8] Note the aggregate pork analysis reflects the aggregate pork category as provided by Circana and not just the sum of the six examined products.

Table 5. Summary Statistics on Own-Price Elasticities across 50 Markets (Jan. 2018 - Dec. 2023)

	Loin	Ribs	Shoulder	Breakfast Sausage	Dinner Sausage	Bacon	Pork
Mean	-1.436	-1.855	-1.822	-2.086	-2.038	-0.830	-2.218
Minimum	-2.383	-2.909	-2.774	-2.818	-3.476	-1.854	-3.039
1st Quartile	-1.623	-2.287	-2.434	-2.338	-2.473	-0.933	-2.318
Medan	-1.448	-1.830	-1.822	-2.069	-1.954	-0.827	-2.160
3rd Quartile	-1.221	-1.482	-1.369	-1.842	-1.581	-0.650	-2.013
Maximum	-0.764	-0.649	-0.703	-1.221	-0.970	-0.148	-1.709
Count	50	50	50	50	50	50	50
Number Positive	0	0	0	0	0	0	0

Figure 3. Dispersion of Own-Price Elasticity Estimates Across Markets (Jan. 2018 – Dec. 2023)



Complete documentation of market-product specific own-price elasticity estimates is provided in table 6. For each product (down each column), the five most elastic markets are identified in green and the five most inelastic markets are identified in orange. Some locations were consistently among the most inelastic for the 2018-2023 period. For example, Miami/Ft. Lauderdale, FL was one of the five most inelastic location for three products (loin, shoulder, and breakfast sausage) and for pork in aggregate. However, some locations are on either ends of the price sensitivity spectrum depending on product. For example, Chicago is one of the 5 most inelastic locations for shoulder but one of the 5 most elastic locations for dinner sausage.

Table 6. Own-Price Pork Elasticity of Markets (Jan. 2018 - Dec. 2023), by Product

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*	*Pork*
Albany, NY	-1.060	-1.693	-1.821	-2.606	-3.310	-0.832	-2.181
Atlanta, GA	-1.588	-1.685	-2.525	-1.975	-1.483	-0.600	-2.289
Baltimore, MD/Washington D.C.	-1.221	-1.454	-2.066	-1.777	-1.929	-0.317	-2.109
Birmingham/Montgomery, AL	-1.524	-2.572	-2.628	-1.221	-2.201	-0.652	-2.429
Boise, ID	-2.383	-2.909	-1.824	-2.302	-2.086	-0.929	-2.407
Boston, MA	-1.151	-0.850	-1.641	-2.043	-0.978	-1.207	-2.009
Buffalo/Rochester, NY	-1.118	-1.209	-1.145	-2.261	-2.782	-1.421	-2.969
Charlotte, NC	-1.963	-1.794	-2.700	-2.366	-1.504	-0.269	-2.222
Chicago, IL	-1.528	-2.074	-0.913	-2.193	-3.288	-0.811	-1.853
Cincinnati/Dayton, OH	-1.498	-1.624	-2.028	-2.579	-2.045	-0.870	-1.948
Columbus, OH	-1.725	-1.445	-2.774	-2.238	-2.253	-0.763	-1.994
Dallas/Ft. Worth, TX	-1.607	-1.822	-1.618	-2.633	-1.668	-0.347	-3.003
Denver, CO	-1.018	-1.844	-1.185	-1.915	-2.217	-0.650	-2.079
Detroit, MI	-1.222	-1.351	-2.027	-2.437	-2.187	-0.738	-2.284
Grand Rapids, MI	-1.415	-0.649	-1.597	-2.206	-2.324	-0.474	-1.869
Harrisburg/Scranton, PA	-1.374	-1.286	-1.674	-2.107	-2.656	-0.921	-1.938
Hartford, CT/Springfield, MA	-1.480	-1.579	-1.364	-2.522	-2.554	-1.296	-2.300
Houston, TX	-1.388	-2.132	-1.642	-2.429	-1.433	-0.674	-2.693
Indianapolis, IN	-1.277	-1.567	-1.599	-2.190	-2.352	-0.907	-2.025
Jacksonville, FL	-1.909	-2.590	-2.405	-1.833	-1.502	-0.877	-2.178
Knoxville, TN	-1.107	-2.447	-2.576	-1.345	-1.885	-0.770	-2.321
Las Vegas, NV	-1.609	-1.880	-1.069	-2.063	-2.275	-0.691	-2.225
Los Angeles, CA	-0.792	-2.305	-0.810	-1.819	-1.643	-0.856	-2.216
Louisville, KY	-1.569	-1.421	-2.733	-2.568	-1.834	-0.858	-2.069
Miami/Ft. Lauderdale, FL	-0.764	-1.837	-0.755	-1.590	-1.457	-0.928	-1.752
Nashville, TN	-0.911	-1.922	-2.556	-2.392	-1.995	-0.904	-2.482
New Orleans, LA/Mobile, AL	-1.781	-1.382	-2.432	-1.773	-0.970	-0.378	-2.383
New York, NY	-1.010	-1.101	-0.703	-1.806	-2.640	-1.018	-2.984
Orlando, FL	-1.276	-2.582	-1.850	-1.892	-1.563	-0.875	-2.142
Peoria/Springfield, IL	-1.184	-1.923	-1.526	-2.011	-2.849	-0.626	-2.011
Philadelphia, PA	-1.236	-1.639	-1.404	-2.031	-2.785	-1.082	-2.478
Phoenix/Tucson, AZ	-1.949	-2.357	-1.727	-2.432	-2.720	-0.877	-2.309

Pittsburgh, PA	-1.866	-1.063	-1.803	-1.836	-2.941	-0.545	-1.709
Portland, OR	-1.783	-2.376	-1.964	-1.977	-1.696	-1.695	-2.062
Providence, RI	-1.356	-1.096	-1.383	-2.307	-1.080	-1.310	-1.879
Raleigh/Greensboro, NC	-1.614	-1.691	-2.559	-2.818	-1.108	-0.148	-2.218
Richmond/Norfolk, VA	-1.327	-2.024	-2.436	-2.196	-1.633	-0.416	-2.111
Roanoke, VA	-1.626	-2.067	-2.548	-1.950	-1.913	-0.713	-1.947
Sacramento, CA	-1.587	-2.897	-1.051	-1.862	-2.464	-1.427	-2.086
San Diego, CA	-1.208	-2.522	-1.135	-1.676	-1.660	-0.935	-1.939
San Francisco/Oakland, CA	-1.497	-2.536	-1.103	-1.674	-1.670	-1.854	-1.976
Seattle/Tacoma, WA	-1.512	-2.544	-1.888	-1.857	-1.885	-0.710	-2.186
South Carolina	-1.846	-1.819	-2.436	-2.103	-1.394	-0.483	-2.061
Spokane, WA	-1.691	-2.233	-2.176	-1.628	-1.979	-0.700	-2.140
St. Louis, MO	-1.658	-1.178	-2.474	-2.348	-1.554	-0.772	-3.039
Syracuse, NY	-0.917	-1.727	-1.235	-2.205	-3.476	-1.088	-2.354
Tampa/St. Petersburg, FL	-1.346	-2.386	-1.863	-1.981	-1.373	-0.823	-2.019
Toledo, OH	-1.647	-1.920	-2.435	-2.663	-2.557	-1.031	-2.086
West Texas/New Mexico	-1.385	-2.075	-1.092	-1.579	-1.668	-0.402	-2.248
Wichita, KS	-1.284	-1.669	-2.218	-2.075	-2.477	-1.026	-2.691

To further help see relative rankings, Table 7 presents rankings of the 50 evaluated markets by own-price elasticity. These rankings are on values reported in table 6 and are derived in descending order so a rank=1 implies the largest (or least negative, most inelastic) estimate (the maximum value shown in table 5) while a rank=51 applies to the smallest (or most negative, most elastic) estimate (the minimum value in table 5).

Table 7. Own-Price Pork Elasticity Ranking of Markets (Jan. 2018 - Dec. 2023), by Product

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*	*Pork*
Albany, NY	7	21	25	47	49	26	27
Atlanta, GA	34	19	42	19	9	11	35
Baltimore, MD/Washington D.C.	13	13	33	9	25	3	22
Birmingham/Montgomery, AL	30	46	47	1	31	14	42
Boise, ID	50	50	26	36	29	37	41
Boston, MA	10	2	20	24	2	44	12
Buffalo/Rochester, NY	9	7	10	35	44	47	47
Charlotte, NC	49	23	48	39	11	2	31
Chicago, IL	31	34	4	30	48	24	3
Cincinnati/Dayton, OH	28	16	32	46	28	29	9
Columbus, OH	42	12	50	34	33	21	11
Dallas/Ft. Worth, TX	35	25	19	48	18	4	49
Denver, CO	6	27	11	17	32	13	19
Detroit, MI	14	9	31	43	30	20	34
Grand Rapids, MI	25	1	17	33	35	8	4
Harrisburg/Scranton, PA	22	8	22	28	42	35	6
Hartford, CT/Springfield, MA	26	15	13	44	39	45	36
Houston, TX	24	36	21	41	7	15	46
Indianapolis, IN	17	14	18	29	36	34	15
Jacksonville, FL	47	48	36	12	10	32	26
Knoxville, TN	8	42	46	2	22	22	38
Las Vegas, NV	36	28	6	25	34	16	32
Los Angeles, CA	2	38	3	11	15	27	29
Louisville, KY	32	11	49	45	21	28	18
Miami/Ft. Lauderdale, FL	1	26	2	4	8	36	2
Nashville, TN	3	30	44	40	27	33	44
New Orleans, LA/Mobile, AL	43	10	37	8	1	5	40
New York, NY	5	5	1	10	41	39	48
Orlando, FL	16	47	27	16	13	30	25
Peoria/Springfield, IL	11	31	16	22	46	12	13
Philadelphia, PA	15	17	15	23	45	42	43
Phoenix/Tucson, AZ	48	39	23	42	43	31	37
Pittsburgh, PA	46	3	24	13	47	10	1
Portland, OR	44	40	30	20	20	49	17
Providence, RI	21	4	14	37	3	46	5
Raleigh/Greensboro, NC	37	20	45	50	4	1	30
Richmond/Norfolk, VA	19	32	40	31	14	7	23
Roanoke, VA	38	33	43	18	24	19	8

Sacramento, CA	33	49	5	15	37	48	21
San Diego, CA	12	43	9	7	16	38	7
San Francisco/Oakland, CA	27	44	8	6	19	50	10
Seattle/Tacoma, WA	29	45	29	14	23	18	28
South Carolina	45	24	39	27	6	9	16
Spokane, WA	41	37	34	5	26	17	24
St. Louis, MO	40	6	41	38	12	23	50
Syracuse, NY	4	22	12	32	50	43	39
Tampa/St. Petersburg, FL	20	41	28	21	5	25	14
Toledo, OH	39	29	38	49	40	41	20
West Texas/New Mexico	23	35	7	3	17	6	33
Wichita, KS	18	18	35	26	38	40	45
Albany, NY	7	21	25	47	49	26	27

To help connect with earlier raw data summary statistics for the largest population markets, entries in table 7 are highlighted for these ten markets. To demonstrate key differences, consider the 2018-2023 rankings for Baltimore, Boston, and Los Angeles. Baltimore has the 3rd most inelastic bacon demand, yet the 33rd most inelastic (17th most elastic) Shoulder demand. Boston has the 2nd most inelastic Ribs demand and 2nd most inelastic Dinner Sausage demand yet the 44th most inelastic (6th most elastic) Bacon demand. Meanwhile Los Angeles has the 2nd most inelastic Loin demand and 3rd most inelastic Shoulder demand yet the 38th most inelastic Rib demand. Combined for 2018-23 we would describe the Baltimore Shoulder market, Boston Bacon market, and Los Angeles Rib markets as being rather price sensitive.

Beyond documenting variation in sensitivity to changes in pork prices, our approach yields updated insight into diversity in how beef and chicken price changes impact pork demand. Tables 8 and 9 summarize these cross-price elasticity effects. An immediate take-home point arises when comparing to results in table 5: **pork purchases are much more sensitive to pork's own-price than the price of beef or chicken**. In fact, using median estimates across markets indicates pork purchases are 4-6 times, and more in several cases, as sensitive to pork prices as beef or chicken prices.

Using median estimates reveals that overall changes in beef prices have larger impacts on pork demand than changes in chicken prices. For instance, a 1% increase in beef prices boost pork loin purchases by 0.299% while a 1% increase in chicken prices only increases pork loin purchases by 0.174%.

There is also a full range of complement and substitute relationships across markets and products. In 45 of the 50 markets, an increase in beef price increases pork ribs demand suggesting beef and pork ribs are substitutes while in the other 5 markets an increase in beef price decreases rib demand indicating a complimentary relationship. Combined this leads to the 0.552 median estimate suggesting that a 1% increase in beef price corresponds with a 0.552% increase in rib purchases, meaning in that in most locations consumers tend to not buy pork ribs and beef together.

In 31 markets an increase in chicken prices increases demand for pork loin indicating chicken and pork loin are often substitutes. This corresponds with the median cross-price estimate of 0.174 suggesting that a 1% increase in chicken price corresponds with a 0.174% increase in loin purchases.

Table 8. Summary Statistics on Beef Cross-Price Elasticities across 50 Markets (Jan. 2018 - Dec. 2023)

	Loin	Ribs	Shoulder	Breakfast Sausage	Dinner Sausage	Bacon	Pork
Mean	0.375	0.549	1.186	0.029	0.106	-0.118	0.502
Minimum	-0.508	-1.024	-0.932	-0.603	-0.438	-0.706	-0.151
1st Quartile	0.135	0.196	0.590	-0.111	-0.090	-0.311	0.363
Medan	0.299	0.552	1.098	0.044	0.072	-0.198	0.501
3rd Quartile	0.617	0.966	1.809	0.165	0.303	0.050	0.660
Maximum	1.208	2.170	3.149	0.493	0.710	0.958	1.002
Count	50	50	50	50	50	50	50
Number Positive	46	45	47	28	32	15	49

Table 9. Summary Statistics on Chicken Cross-Price Elasticities across 50 Markets (Jan. 2018 - Dec. 2023)

	Loin	Ribs	Shoulder	Breakfast Sausage	Dinner Sausage	Bacon	Pork
Mean	0.228	-0.566	0.814	0.376	-0.014	-0.438	0.391
Minimum	-0.491	-3.173	-1.439	-1.046	-1.322	-1.710	-1.311
1st Quartile	-0.092	-1.023	0.249	-0.032	-0.406	-0.730	0.154
Medan	0.174	-0.627	0.783	0.487	-0.154	-0.549	0.355
3rd Quartile	0.454	0.160	1.427	0.710	0.259	-0.320	0.643
Maximum	2.668	2.127	2.734	1.976	1.889	1.797	2.311
Count	50	50	50	50	50	50	50
Number Positive	31	15	43	36	23	9	46

Chapter 5. Price Sensitivity in Pre-Pandemic (2018-19), Pandemic (2020-21), and Post-Pandemic (2022-23) Periods

The preceding chapter documents notable heterogeneity in consumer behavior examining the 2018-2023 period collectively. We start with that full six-year assessment as it provides the most robust assessment. For instance, in each estimated model we have nearly 300 observations for the product-market combination of interest (recall from chapter 3 these models have 21 parameters to be estimated).

As the last chapter in this report we meet our project's second objective – exploring variation over time in consumer price sensitivity. Given data spanning 2018-2023 we have roughly balanced periods of pre-pandemic consumer behavior for 2018-19, market data covering the depths of the Covid19 pandemic in 2020-21, and the most recent (post-pandemic) period including 2022-23. We accordingly repeat the process above estimating models of interest for these three separate time periods and each region-product market combination.

Tables 10-12 show summary statistics on own-price elasticities for each product as estimated for the 2018-19, 2020-21, and 2022-23 periods respectively.

Table 10. Summary Statistics on Own-Price Pork Elasticity of Markets (2018 - 2019), by Product

	Loin	Ribs	Shoulder	Breakfast Sausage	Dinner Sausage	Bacon	Pork
Mean	-1.592	-2.780	-1.836	-3.152	-2.687	-1.063	-2.168
Minimum	-2.288	-5.943	-2.768	-6.980	-3.926	-1.883	-3.286
1st Quartile	-1.805	-3.567	-2.270	-3.793	-3.160	-1.307	-2.321
Medan	-1.633	-2.673	-1.897	-3.039	-2.676	-1.031	-2.106
3rd Quartile	-1.398	-1.965	-1.512	-2.452	-2.301	-0.869	-1.941
Maximum	-0.560	-0.169	-0.211	-1.682	-1.273	-0.294	-1.212
Count	50	50	50	50	50	50	50
Number Positive	0	0	0	0	0	0	0

Table 11. Summary Statistics on Own-Price Pork Elasticity of Markets (2020 - 2021), by Product

	Loin	Ribs	Shoulder	Breakfast Sausage	Dinner Sausage	Bacon	Pork
Mean	-0.987	-2.006	-1.440	-1.447	-1.120	-1.790	-2.166
Minimum	-3.150	-4.407	-2.446	-3.225	-3.329	-3.212	-3.478
1st Quartile	-1.466	-2.539	-1.961	-1.884	-1.929	-2.104	-2.230

Medan	-0.853	-2.013	-1.460	-1.475	-1.121	-1.727	-2.082
3rd Quartile	-0.581	-1.526	-1.041	-0.976	-0.441	-1.427	-1.907
Maximum	1.093	-0.218	0.125	1.306	0.519	-0.721	-1.632
Count	50	50	50	50	50	50	50
Number Positive	4	0	1	1	7	0	0

Table 12. Summary Statistics on Own-Price Pork Elasticity of Markets (2022 - 2023), by Product

	Loin	Ribs	Shoulder	Breakfast Sausage	Dinner Sausage	Bacon	Pork
Mean	-1.490	-1.619	-1.963	-3.553	-2.471	-0.733	-2.556
Minimum	-3.073	-4.457	-3.126	-7.458	-4.142	-2.214	-3.938
1st Quartile	-1.728	-1.751	-2.255	-4.149	-3.271	-1.034	-2.750
Medan	-1.438	-1.369	-1.991	-3.526	-2.636	-0.660	-2.468
3rd Quartile	-1.136	-1.035	-1.623	-2.806	-2.050	-0.395	-2.265
Maximum	-0.174	-0.075	-0.600	-0.263	2.522	0.296	-1.678
Count	50	50	50	50	50	50	50
Number Positive	0	0	0	0	2	2	0

In all cases beside Bacon, consumers were less price sensitive in 2020-21 than in 2018-19 (based on median values in tables 10 and 11). With the benefit of hindsight, this reflects elevated at-home and hence retail market channel emphasis early in the pandemic. Then for the most recent two years of 2022-23, purchase of Loin, Shoulder, Breakfast Sausage, Dinner Sausage, and Pork in aggregate were more price sensitive than during the early pandemic period (2020-21). This aligns with elevated inflation experienced during the period, many households reporting financial decline, and elevated importance of price in protein purchasing decisions signaled in other assessments including the Meat Demand Monitor project. The dissection of the most recent six years reveals the dynamic nature of consumer pork demand and illustrates the value of periodic reassessment, particularly during periods of elevated macroeconomic and general societal "abnormalities."

Chapter 6. Implications and Discussion

As a final, "so what" comment it is useful to understand what elasticities tell us about impacts of price changes on consumer expenditures and hence seller revenues. If a good's demand is elastic, then price and consumer expenditures move in opposite direction. That is, if price declines (increases) then quantities adjust by a larger percentage resulting in consumer expenditure increases (decreases). Accordingly, all-else-equal for seller revenues to increase on products with elastic demand sales prices need to decline. Conversely if a product's demand is inelastic, then price and consumer expenditures move in the same direction. Here with inelastic demand, seller revenues are expected to increase when sales prices increase.

As a simple illustration, things that reduce pork prices (e.g. reduced feed costs, gains in efficiencies, etc.) will result in lower consumer expenditures and seller revenues in markets where demand is inelastic. As shown in table 5 the median estimates for bacon (-0.827) reflect inelastic demand suggesting that consumer expenditures and seller revenues for bacon would decline if bacon prices declined. Conversely, note the other five examined pork categories have elastic median estimate of demand (table 5) over the 2018-23 period. This indicates we would expect consumer expenditures and seller revenues for loin, ribs, shoulder, breakfast sausage, and dinner sausage to increase (decrease) when sales price decline (increase).

Combined we would expect consumer expenditures for the 2018-23 period in a "typical" market would increase following a bacon price increase and decrease following a breakfast sausage price increase. Perhaps of most importance, even this example using median values masks important heterogeneity over markets and time. In the case of loin, ribs, shoulder, dinner sausage, and bacon across the 50 markets demand spans from being elastic to inelastic such that price increases result in higher consumer expenditures in some markets and lower in others. Conversely, for breakfast sausage demand is estimated to be elastic in all 50 markets indicating consumer expenditure change will be in the opposite direction of any price change. The application examples in the previous section provide specific demonstrations of this but the broader point should be kept in mind as future users reference this report.

Finally, overall price sensitivity was lower during the pandemic's early period (2020-21) than in 2018-19. Then price sensitivity generally increased in 2022-23 consistent with broader macroeconomic developments that U.S. residents faced. This demonstrates the dynamic nature of U.S. consumer pork demand and motivates periodic reassessment of consumer price sensitivity and overall domestic pork demand strength and determinants.

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Appendix

This appendix includes multiple tables and figures designed to further document project details.

Table A1. Average Volume Shares of Pork Products (2023), by Market

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*
Albany, NY	27.2%	10.7%	9.5%	16.8%	16.8%	18.9%
Atlanta, GA	22.7%	14.6%	9.8%	11.4%	11.4%	30.0%
Baltimore, MD/Washington D.C.	22.7%	12.7%	9.7%	13.2%	13.2%	28.5%
Birmingham/Montgomery, AL	21.1%	12.0%	8.8%	14.3%	14.3%	29.4%
Boise, ID	19.3%	10.7%	9.3%	15.7%	15.7%	29.3%
Boston, MA	26.6%	15.4%	9.9%	14.9%	14.9%	18.2%
Buffalo/Rochester, NY	25.3%	11.3%	9.2%	16.4%	16.4%	21.4%
Charlotte, NC	26.1%	13.3%	14.6%	10.0%	10.0%	25.9%
Chicago, IL	20.4%	14.4%	8.9%	16.6%	16.6%	23.2%
Cincinnati/Dayton, OH	25.6%	12.8%	9.8%	12.7%	12.7%	26.3%
Columbus, OH	24.2%	13.4%	10.0%	13.7%	13.7%	24.9%
Dallas/Ft. Worth, TX	20.9%	18.8%	13.9%	10.3%	10.3%	25.8%
Denver, CO	19.5%	13.4%	10.8%	16.4%	16.4%	23.5%
Detroit, MI	19.5%	14.7%	9.4%	15.6%	15.6%	25.3%
Grand Rapids, MI	19.3%	15.3%	13.8%	14.7%	14.7%	22.1%
Harrisburg/Scranton, PA	28.1%	11.7%	9.0%	15.7%	15.7%	19.8%
Hartford, CT/Springfield, MA	28.7%	12.6%	7.8%	15.5%	15.5%	19.9%
Houston, TX	19.3%	19.2%	17.2%	11.6%	11.6%	21.2%
Indianapolis, IN	25.6%	15.2%	10.8%	11.7%	11.7%	25.1%
Jacksonville, FL	25.3%	16.4%	11.9%	11.1%	11.1%	24.1%
Knoxville, TN	27.5%	12.6%	12.0%	9.1%	9.1%	29.7%
Las Vegas, NV	20.9%	17.8%	7.7%	14.4%	14.4%	24.8%
Los Angeles, CA	15.0%	20.0%	10.9%	15.5%	15.5%	23.1%
Louisville, KY	26.3%	13.0%	10.8%	10.7%	10.7%	28.4%
Miami/Ft. Lauderdale, FL	29.3%	22.0%	12.8%	9.1%	9.1%	17.7%
Nashville, TN	23.7%	13.8%	12.1%	10.5%	10.5%	29.5%
New Orleans, LA/Mobile, AL	20.9%	13.3%	8.1%	20.0%	20.0%	17.6%
New York, NY	27.8%	14.8%	8.6%	14.4%	14.4%	19.9%
Orlando, FL	27.8%	16.4%	10.2%	10.8%	10.8%	24.0%
Peoria/Springfield, IL	23.7%	12.6%	13.8%	13.6%	13.6%	22.6%
Philadelphia, PA	26.0%	12.7%	7.9%	14.8%	14.8%	23.7%
Phoenix/Tucson, AZ	21.4%	16.3%	8.7%	15.8%	15.8%	21.9%
Pittsburgh, PA	28.8%	12.6%	7.9%	12.0%	12.0%	26.7%
Portland, OR	22.2%	11.7%	9.8%	13.7%	13.7%	28.9%
Providence, RI	24.6%	14.0%	7.1%	16.8%	16.8%	20.8%
Raleigh/Greensboro, NC	26.2%	13.3%	13.8%	10.5%	10.5%	25.7%
Richmond/Norfolk, VA	24.6%	12.1%	13.8%	11.4%	11.4%	26.8%

Roanoke, VA	28.3%	10.7%	13.9%	8.2%	8.2%	30.8%
Sacramento, CA	17.0%	19.4%	13.5%	12.7%	12.7%	24.8%
San Diego, CA	14.8%	18.1%	10.3%	16.1%	16.1%	24.6%
San Francisco/Oakland, CA	20.5%	21.0%	13.8%	11.8%	11.8%	21.0%
Seattle/Tacoma, WA	20.5%	14.7%	11.9%	13.8%	13.8%	25.4%
South Carolina	25.7%	15.0%	13.6%	10.2%	10.2%	25.3%
Spokane, WA	19.1%	12.9%	10.2%	14.7%	14.7%	28.4%
St. Louis, MO	19.7%	11.4%	21.0%	13.1%	13.1%	21.7%
Syracuse, NY	24.2%	9.6%	10.7%	18.5%	18.5%	18.4%
Tampa/St. Petersburg, FL	26.5%	16.3%	11.5%	11.6%	11.6%	22.4%
Toledo, OH	22.4%	13.2%	11.3%	14.7%	14.7%	23.6%
West Texas/New Mexico	23.9%	17.6%	13.5%	10.1%	10.1%	24.8%
Wichita, KS	22.1%	14.4%	14.0%	12.2%	12.2%	25.1%
Average	23.4%	14.4%	11.2%	13.4%	13.4%	24.2%
Minimum	14.8%	9.6%	7.1%	8.2%	8.2%	17.6%
Maximum	29.3%	22.0%	21.0%	20.0%	20.0%	30.8%

Table A2. Average Expenditure Shares of Pork Products (2023), by Market

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*
Albany, NY	25.4%	9.5%	4.5%	5.9%	20.3%	34.4%
Atlanta, GA	20.2%	10.9%	4.7%	12.2%	11.8%	40.2%
Baltimore, MD/Washington D.C.	19.1%	9.5%	4.1%	13.3%	13.3%	40.7%
Birmingham/Montgomery, AL	19.0%	8.8%	4.6%	13.8%	15.6%	38.2%
Boise, ID	16.8%	8.6%	5.1%	15.2%	15.8%	38.5%
Boston, MA	24.8%	12.6%	5.2%	4.8%	17.5%	35.1%
Buffalo/Rochester, NY	24.1%	9.5%	5.3%	7.2%	19.8%	34.1%
Charlotte, NC	22.5%	9.9%	6.1%	14.1%	9.8%	37.6%
Chicago, IL	18.4%	12.2%	4.1%	11.4%	17.7%	36.2%
Cincinnati/Dayton, OH	20.7%	9.1%	5.1%	16.9%	12.8%	35.3%
Columbus, OH	21.1%	10.2%	4.9%	13.9%	14.1%	35.9%
Dallas/Ft. Worth, TX	19.0%	13.3%	6.0%	12.1%	11.1%	38.5%
Denver, CO	18.3%	10.4%	6.1%	12.0%	17.4%	35.7%
Detroit, MI	17.2%	10.9%	4.5%	14.2%	15.5%	37.7%
Grand Rapids, MI	16.9%	11.7%	7.7%	13.6%	15.7%	34.4%
Harrisburg/Scranton, PA	25.8%	10.2%	5.6%	8.5%	17.3%	32.6%
Hartford, CT/Springfield, MA	26.4%	10.7%	4.4%	4.5%	18.6%	35.5%
Houston, TX	18.5%	14.2%	7.0%	12.1%	13.6%	34.7%
Indianapolis, IN	21.4%	11.0%	5.7%	15.1%	11.4%	35.4%
Jacksonville, FL	23.1%	12.8%	6.6%	10.9%	11.9%	34.8%
Knoxville, TN	20.4%	8.7%	5.0%	17.8%	8.6%	39.4%
Las Vegas, NV	18.6%	14.4%	4.8%	9.9%	14.4%	38.0%
Los Angeles, CA	15.7%	15.6%	6.2%	6.7%	16.8%	39.1%
Louisville, KY	22.3%	9.8%	5.5%	12.8%	10.9%	38.8%
Miami/Ft. Lauderdale, FL	28.9%	18.7%	7.0%	4.7%	11.1%	29.6%
Nashville, TN	20.4%	10.2%	5.6%	13.7%	10.5%	39.5%
New Orleans, LA/Mobile, AL	20.8%	11.3%	4.8%	9.0%	26.3%	27.9%
New York, NY	24.2%	13.0%	4.8%	4.9%	17.0%	36.2%
Orlando, FL	25.6%	12.9%	5.8%	9.2%	11.2%	35.3%
Peoria/Springfield, IL	20.7%	9.6%	7.4%	14.2%	14.1%	34.0%
Philadelphia, PA	22.2%	10.1%	4.2%	12.6%	14.9%	36.0%
Phoenix/Tucson, AZ	19.5%	12.4%	5.4%	9.0%	17.3%	36.4%
Pittsburgh, PA	23.6%	9.4%	4.6%	13.8%	12.7%	35.9%
Portland, OR	18.4%	9.6%	5.4%	11.7%	15.2%	39.8%
Providence, RI	22.9%	10.9%	4.0%	5.1%	19.9%	37.3%
Raleigh/Greensboro, NC	22.0%	9.8%	5.6%	15.6%	10.3%	36.7%
Richmond/Norfolk, VA	21.1%	9.3%	5.7%	14.2%	11.5%	38.3%
Roanoke, VA	21.8%	7.5%	5.3%	17.0%	7.6%	40.8%
Sacramento, CA	15.0%	14.3%	7.3%	10.8%	14.4%	38.2%
San Diego, CA	14.8%	13.4%	5.6%	8.6%	16.8%	40.8%
San Francisco/Oakland, CA	18.0%	15.8%	7.3%	8.1%	15.0%	35.9%

Seattle/Tacoma, WA	17.6%	11.5%	6.3%	13.0%	14.7%	36.9%
South Carolina	22.7%	11.4%	6.1%	14.1%	10.3%	35.5%
Spokane, WA	16.2%	9.7%	5.6%	16.9%	14.5%	37.1%
St. Louis, MO	17.4%	8.4%	11.6%	15.0%	13.5%	34.1%
Syracuse, NY	23.2%	8.5%	5.9%	6.6%	23.9%	31.9%
Tampa/St. Petersburg, FL	24.8%	13.1%	6.6%	9.4%	12.2%	33.9%
Toledo, OH	19.8%	9.9%	5.7%	15.2%	15.5%	33.9%
West Texas/New Mexico	20.6%	13.1%	7.4%	11.3%	10.5%	37.2%
Wichita, KS	19.7%	10.4%	7.8%	14.1%	12.5%	35.5%
Average	20.7%	11.2%	5.7%	11.5%	14.5%	36.3%
Minimum	14.8%	7.5%	4.0%	4.5%	7.6%	27.9%
Maximum	28.9%	18.7%	11.6%	17.8%	26.3%	40.8%

Table A3. Own-Price Pork Elasticity of Markets (2018 - 2019), by Product

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*	*Pork*
Albany, NY	-1.297	-1.943	-1.775	-3.513	-1.949	-0.902	-1.856
Atlanta, GA	-1.154	-4.143	-2.522	-4.142	-2.834	-1.176	-2.342
Baltimore, MD/Washington D.C.	-1.794	-0.169	-1.668	-2.376	-2.616	-0.761	-2.020
Birmingham/Montgomery, AL	-1.480	-5.943	-2.400	-4.516	-3.340	-0.699	-2.389
Boise, ID	-1.639	-2.901	-1.630	-1.682	-3.652	-0.294	-1.212
Boston, MA	-1.775	-1.413	-1.707	-3.952	-2.459	-1.604	-2.137
Buffalo/Rochester, NY	-1.774	-4.609	-0.211	-3.840	-1.872	-1.727	-2.936
Charlotte, NC	-2.177	-3.583	-2.768	-5.671	-2.179	-0.796	-2.208
Chicago, IL	-1.896	-1.512	-2.046	-3.978	-2.786	-1.143	-2.145
Cincinnati/Dayton, OH	-1.961	-4.761	-1.443	-3.206	-3.323	-1.086	-1.898
Columbus, OH	-1.809	-4.182	-2.375	-3.459	-3.192	-1.485	-2.022
Dallas/Ft. Worth, TX	-0.966	-2.425	-1.710	-2.549	-2.894	-1.044	-3.176
Denver, CO	-1.683	-2.156	-2.232	-2.883	-2.610	-0.887	-1.905
Detroit, MI	-1.608	-3.725	-1.248	-3.764	-3.134	-1.040	-2.335
Grand Rapids, MI	-1.626	-1.571	-1.878	-2.553	-2.997	-0.989	-1.935
Harrisburg/Scranton, PA	-1.691	-0.249	-1.359	-2.611	-2.206	-1.077	-1.859
Hartford, CT/Springfield, MA	-2.183	-1.843	-1.474	-3.980	-2.150	-1.429	-2.665
Houston, TX	-1.737	-2.405	-2.103	-3.674	-1.728	-1.137	-2.201
Indianapolis, IN	-1.572	-3.333	-1.985	-3.803	-3.620	-1.322	-1.979
Jacksonville, FL	-0.985	-4.516	-2.245	-2.589	-2.860	-0.958	-1.782
Knoxville, TN	-1.809	-2.094	-1.086	-1.794	-2.770	-1.087	-2.094
Las Vegas, NV	-1.589	-1.761	-1.274	-2.359	-2.137	-0.604	-2.304
Los Angeles, CA	-1.302	-1.885	-2.059	-1.937	-3.053	-0.952	-2.448
Louisville, KY	-1.752	-2.596	-1.737	-3.379	-2.739	-1.459	-2.153
Miami/Ft. Lauderdale, FL	-0.560	-3.464	-0.620	-3.219	-2.297	-0.957	-1.740
Nashville, TN	-1.652	-3.519	-1.678	-4.831	-3.168	-0.937	-2.646
New Orleans, LA/Mobile, AL	-1.918	-3.687	-2.507	-3.951	-1.273	-0.300	-2.213
New York, NY	-1.533	-1.506	-1.732	-2.342	-2.436	-1.263	-3.286
Orlando, FL	-0.689	-4.464	-1.481	-2.982	-2.313	-0.986	-1.667
Peoria/Springfield, IL	-1.904	-2.274	-1.604	-3.372	-3.926	-1.070	-1.958
Philadelphia, PA	-1.782	-2.710	-1.338	-3.027	-2.467	-1.352	-2.732
Phoenix/Tucson, AZ	-1.262	-2.548	-2.462	-2.493	-3.337	-1.641	-2.123
Pittsburgh, PA	-2.288	-1.515	-2.466	-2.562	-2.027	-0.905	-2.010
Portland, OR	-1.385	-2.239	-1.985	-2.401	-2.411	-1.431	-2.057
Providence, RI	-1.880	-1.786	-2.006	-3.837	-2.407	-1.546	-1.887
Raleigh/Greensboro, NC	-2.124	-3.117	-2.411	-6.980	-2.106	-0.696	-2.549
Richmond/Norfolk, VA	-1.440	-3.390	-2.338	-3.602	-3.319	-0.901	-2.196
Roanoke, VA	-1.663	-3.299	-2.346	-1.712	-3.309	-1.023	-2.118
Sacramento, CA	-1.519	-3.032	-1.726	-2.084	-2.673	-0.603	-2.179
San Diego, CA	-1.344	-2.636	-2.000	-2.438	-2.471	-0.914	-2.327
San Francisco/Oakland, CA	-1.438	-2.413	-1.109	-2.525	-2.183	-0.807	-1.819
Seattle/Tacoma, WA	-1.537	-3.710	-2.102	-1.783	-2.335	-1.055	-2.023

South Carolina	-2.140	-3.639	-2.279	-4.021	-2.846	-0.863	-1.760
Spokane, WA	-2.057	-3.256	-2.305	-1.976	-3.633	-0.361	-2.029
St. Louis, MO	-1.335	-0.731	-2.114	-2.057	-2.584	-1.175	-2.896
Syracuse, NY	-1.508	-2.030	-0.867	-3.400	-1.603	-1.572	-2.046
Tampa/St. Petersburg, FL	-0.914	-3.784	-1.754	-3.248	-2.678	-0.767	-1.795
Toledo, OH	-1.648	-2.854	-1.916	-3.050	-2.991	-1.664	-2.073
West Texas/New Mexico	-1.479	-3.341	-1.177	-2.608	-3.199	-0.846	-2.168
Wichita, KS	-1.342	-2.335	-2.535	-2.905	-3.255	-1.883	-2.080

Table A4. Own-Price Pork Elasticity of Markets (2020 - 2021), by Product

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*	*Pork*
Albany, NY	-0.396	-2.460	-1.757	-1.948	-3.329	-1.535	-2.337
Atlanta, GA	-0.585	-1.761	-2.002	-3.225	-2.451	-1.482	-2.709
Baltimore, MD/Washington D.C.	-1.663	-2.059	-1.205	-1.010	-0.744	-1.941	-2.117
Birmingham/Montgomery, AL	-2.231	-2.516	-1.994	-1.380	-1.360	-1.409	-1.940
Boise, ID	-0.855	-2.623	-1.002	-1.342	0.094	-2.332	-2.234
Boston, MA	-0.091	-2.462	-0.748	-1.777	0.367	-2.979	-2.120
Buffalo/Rochester, NY	-3.150	-0.755	0.125	-1.162	-0.027	-2.050	-2.701
Charlotte, NC	-1.862	-1.280	-2.064	-0.428	-0.470	-1.736	-1.928
Chicago, IL	-0.209	-1.614	-1.394	-0.845	-2.587	-1.596	-1.664
Cincinnati/Dayton, OH	-0.697	-2.049	-1.547	-3.205	-1.001	-1.801	-1.946
Columbus, OH	-1.420	-0.644	-1.452	-2.385	-1.820	-1.201	-1.986
Dallas/Ft. Worth, TX	-1.040	-2.447	-1.040	-0.627	0.519	-2.224	-2.639
Denver, CO	1.093	-1.379	-1.043	-0.858	-0.366	-1.124	-1.632
Detroit, MI	-1.011	-0.218	-1.241	-0.744	-0.471	-0.823	-2.200
Grand Rapids, MI	-1.135	-1.306	-1.672	1.306	-1.973	-1.789	-1.772
Harrisburg/Scranton, PA	0.477	-1.223	-0.803	-1.218	-0.468	-2.784	-1.972
Hartford, CT/Springfield, MA	-0.453	-2.667	-1.202	-2.019	-1.165	-3.212	-2.429
Houston, TX	-0.097	-1.757	-1.467	-2.888	0.458	-1.900	-1.653
Indianapolis, IN	-0.813	-1.791	-1.152	-2.444	-1.123	-1.299	-1.900
Jacksonville, FL	-0.580	-3.090	-2.446	-1.265	-2.483	-1.311	-2.172
Knoxville, TN	-0.780	-2.685	-1.738	-1.967	-1.951	-1.262	-2.880
Las Vegas, NV	-1.269	-2.398	-0.878	-0.599	-1.119	-2.123	-2.658
Los Angeles, CA	-1.896	-1.339	-0.590	-0.097	-0.605	-2.415	-2.038
Louisville, KY	-1.752	-1.961	-2.019	-1.873	-0.635	-0.784	-2.146
Miami/Ft. Lauderdale, FL	-0.802	-2.625	-1.175	-1.656	-2.670	-2.314	-1.879
Nashville, TN	-1.393	-2.834	-1.795	-1.347	-2.124	-1.571	-2.691
New Orleans, LA/Mobile, AL	-1.476	-0.541	-2.158	-2.050	-0.787	-1.872	-1.983
New York, NY	-0.176	-2.335	-1.586	-1.669	-2.785	-0.721	-3.282
Orlando, FL	-0.775	-3.117	-2.057	-1.534	-1.979	-1.173	-2.099
Peoria/Springfield, IL	-1.155	-1.876	-1.177	-0.965	-0.708	-1.660	-1.716
Philadelphia, PA	0.326	-4.407	-0.921	-1.452	-1.477	-2.758	-2.859
Phoenix/Tucson, AZ	-1.181	-2.547	-2.001	-1.629	-2.352	-1.748	-2.200

Pittsburgh, PA	-1.821	-2.052	-1.014	-1.934	-2.225	-1.071	-1.654
Portland, OR	-0.832	-1.496	-1.331	-2.018	-1.294	-2.318	-2.208
Providence, RI	-0.713	-2.644	-1.471	-2.423	0.082	-1.718	-1.827
Raleigh/Greensboro, NC	-1.225	-1.061	-1.902	-0.717	-0.277	-1.506	-1.737
Richmond/Norfolk, VA	-0.850	-2.294	-2.004	-1.106	-1.104	-2.030	-2.218
Roanoke, VA	-1.674	-3.395	-2.148	-1.306	-1.238	-1.857	-2.056
Sacramento, CA	-1.610	-2.348	-1.194	-0.878	-0.432	-2.368	-2.077
San Diego, CA	-1.842	-1.191	-0.896	-0.500	-0.420	-1.786	-1.692
San Francisco/Oakland, CA	-1.663	-1.659	-0.968	-1.224	0.493	-1.268	-1.712
Seattle/Tacoma, WA	-0.536	-1.944	-1.320	-1.861	-1.866	-2.356	-2.192
South Carolina	0.068	-2.332	-2.097	-1.295	-0.531	-1.535	-1.871
Spokane, WA	-0.726	-1.760	-1.753	-1.595	-1.147	-1.878	-2.052
St. Louis, MO	-0.743	-1.796	-1.980	-1.843	-0.040	-1.647	-2.792
Syracuse, NY	-0.800	-0.648	-0.684	-1.498	-1.998	-3.165	-2.104
Tampa/St. Petersburg, FL	-0.517	-2.587	-2.050	-1.755	-1.844	-1.499	-2.027
Toledo, OH	-1.436	-1.647	-1.505	-1.888	-1.516	-1.658	-2.087
West Texas/New Mexico	-1.083	-1.976	-0.959	-0.413	0.358	-1.586	-2.030
Wichita, KS	-2.304	-2.696	-1.532	-1.781	-1.389	-1.315	-3.478

Table A5. Own-Price Pork Elasticity of Markets (2022 - 2023), by Product

Market	*Loin*	*Ribs*	*Shoulder*	*Breakfast Sausage*	*Dinner Sausage*	*Bacon*	*Pork*
Albany, NY	-0.998	-0.936	-2.011	-3.783	-4.142	-0.622	-3.236
Atlanta, GA	-1.614	-3.283	-2.021	-3.325	-1.820	-1.526	-3.388
Baltimore, MD/Washington D.C.	-1.321	-0.570	-1.575	-3.938	-2.948	0.296	-2.429
Birmingham/Montgomery, AL	-3.073	-4.457	-2.030	-0.263	2.522	-1.300	-2.971
Boise, ID	-1.661	-2.602	-1.486	-2.897	-3.760	-0.829	-2.578
Boston, MA	-1.882	-1.323	-1.798	-2.917	-1.737	-1.135	-2.331
Buffalo/Rochester, NY	-1.227	-2.712	-0.600	-4.238	-3.940	-0.344	-3.642
Charlotte, NC	-2.058	-1.098	-2.578	-4.895	-2.152	-0.405	-2.712
Chicago, IL	-1.585	-3.277	-2.122	-4.787	-3.319	-0.520	-1.956
Cincinnati/Dayton, OH	-1.405	-1.007	-2.817	-7.458	-3.245	-0.327	-2.475
Columbus, OH	-1.981	-1.032	-2.389	-3.310	-2.794	-0.449	-2.324
Dallas/Ft. Worth, TX	-1.580	-1.370	-1.884	-6.001	-3.427	-0.663	-2.345
Denver, CO	-1.762	-1.080	-1.397	-3.062	-3.747	-0.175	-2.702
Detroit, MI	-1.408	-0.666	-2.524	-7.279	-3.280	-0.569	-2.461
Grand Rapids, MI	-1.430	-0.786	-2.155	-3.558	-3.285	-0.440	-1.868
Harrisburg/Scranton, PA	-1.628	-1.368	-1.450	-3.493	-1.931	-0.496	-2.218
Hartford, CT/Springfield, MA	-1.411	-1.620	-2.277	-2.893	-2.137	-0.968	-2.720
Houston, TX	-1.566	-1.552	-1.972	-4.100	-0.823	-0.688	-2.091
Indianapolis, IN	-1.099	-1.046	-2.063	-2.047	-2.941	-0.619	-2.247
Jacksonville, FL	-2.982	-3.400	-2.074	-3.567	-1.685	-1.363	-2.459
Knoxville, TN	-1.372	-1.708	-2.773	-1.196	-2.690	-0.667	-3.016
Las Vegas, NV	-1.032	-1.318	-1.319	-4.620	-3.407	-0.562	-1.678

Los Angeles, CA	-0.990	-1.735	-1.455	-4.213	-2.603	-1.299	-2.459
Louisville, KY	-1.147	-1.559	-2.228	-3.630	-2.330	-0.992	-2.519
Miami/Ft. Lauderdale, FL	-1.321	-2.690	-1.806	-2.690	-1.800	-1.384	-2.259
Nashville, TN	-2.006	-1.984	-2.050	-1.341	-2.669	-1.541	-3.938
New Orleans, LA/Mobile, AL	-1.729	-1.701	-1.907	-2.910	1.557	-0.709	-2.796
New York, NY	-0.495	-1.252	-2.017	-3.329	-2.021	-0.775	-3.243
Orlando, FL	-2.550	-3.685	-1.967	-3.326	-2.512	-1.413	-2.534
Peoria/Springfield, IL	-0.174	-1.026	-1.943	-3.614	-3.295	-0.337	-2.393
Philadelphia, PA	-0.756	-1.137	-1.883	-4.557	-2.292	-0.392	-2.739
Phoenix/Tucson, AZ	-1.447	-2.024	-1.912	-3.927	-2.263	-0.657	-2.525
Pittsburgh, PA	-2.055	-0.487	-2.264	-2.015	-0.810	-0.169	-2.006
Portland, OR	-1.409	-1.670	-1.534	-1.133	-2.224	-1.048	-1.734
Providence, RI	-1.635	-1.535	-2.116	-2.384	-1.538	-0.902	-2.026
Raleigh/Greensboro, NC	-1.727	-1.228	-2.345	-5.356	-2.138	-0.111	-2.797
Richmond/Norfolk, VA	-1.132	-1.507	-2.031	-4.166	-2.873	-0.350	-2.392
Roanoke, VA	-1.118	-1.331	-2.322	-4.005	-2.543	-0.203	-2.295
Sacramento, CA	-1.480	-0.075	-1.301	-2.444	-1.677	-1.127	-2.284
San Diego, CA	-1.029	-2.555	-1.611	-2.778	-2.427	-1.282	-2.415
San Francisco/Oakland, CA	-1.485	-0.747	-1.273	-2.298	-1.379	-2.214	-2.010
Seattle/Tacoma, WA	-0.749	-1.757	-1.376	-3.290	-2.948	0.036	-2.743
South Carolina	-1.792	-1.266	-2.433	-3.712	-2.751	-0.818	-2.753
Spokane, WA	-1.034	-1.474	-1.661	-2.678	-4.104	-0.188	-2.661
St. Louis, MO	-1.764	-0.941	-2.547	-5.577	-3.112	-0.747	-3.500
Syracuse, NY	-0.697	-1.307	-1.858	-3.748	-3.729	-0.483	-3.279
Tampa/St. Petersburg, FL	-2.550	-2.938	-1.866	-3.312	-2.388	-1.399	-2.507
Toledo, OH	-1.478	-0.791	-2.573	-5.158	-2.991	-0.708	-2.228
West Texas/New Mexico	-1.275	-0.920	-1.411	-2.452	-3.161	-0.383	-1.764
Wichita, KS	-1.387	-1.421	-3.126	-3.986	-3.848	-0.658	-3.154