Subprimal Purchasing and Merchandising Decisions for Pork: Relationship to Retail Value[1]

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ABSTRACT: To assess retail value and profitability, cutting test data were obtained in a simulated retail cutting room for boxed pork subprimals, bone-in loins (n = 180), boneless loins (n = 94), Boston butts (n = 148), fresh hams (n = 28), and boneless hams (n = 23). Processing times (seconds) and retail weights (kilograms) were used to determine relative value. Cutting style affected ($P < .05$) value differential (US$/subprimal) for bone-in and boneless loins. When cutting styles within subprimals were pooled, value differential was affected ($P < .05$) by purchasing specification for bone-in loins, boneless loins, Boston butts, and inside fresh hams. Processing bone-in loins to a boneless end point produced a greater ($P < .05$) value differential and percentage of gross margin than a bone-in retail end point. Bone-in loins fabricated to a boneless retail end point produced a greater ($P < .05$) value differential and percentage of gross margin than boneless loins fabricated to the same end point. The increase in retail value can be attributed to the increased number and weight of retail cuts produced from bone-in loins. The thick, boneless loin cutting style produced a greater ($P < .05$) value differential and percentage of gross margin as a result of a lower ($P < .05$) cost of fabrication and increased value of retail cuts than the thin, boneless cutting style. In general, boneless pork cutting methods were more profitable than bone-in cutting methods regardless of subprimal.

Key Words: Pork, Retail Marketing, Computer Software

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Introduction

A recent computer program (Computer Assisted Retail Decision Support, or **CARDS**) developed by researchers at Texas A&M University and the National Live Stock and Meat Board (Garrett et al., 1991) was targeted for the beef retail market. Retailers have shown extensive interest in the CARDS program for the pork industry. Pork CARDS requires that information different from that pertaining to beef be obtained, for several reasons. First, most pork wholesale products are now sold closely trimmed (external fat less than or equal to .64 cm), so emphasis on evaluation of different fatness levels is less critical. Second, a variety of anatomical separations for pork subprimals exists in the industry (Lorenzen et al., 1996). Third, pork is generally sold at retail in a variety of bone-in and boneless forms. Cutting tests are used by retailers to better understand yields of salable products, but no large-scale effort has been conducted to serve as a standardized method to evaluate both yields and labor. The relationship of gross margin to yields of salable products along with labor requirements to produce bone-in and value-added, boneless cuts were the major focus of this effort.

Materials and Methods

Boxed pork was obtained to represent four different purchasing specifications (anatomical separation and external fat trim) common in the industry (Lorenzen et al., 1996) to evaluate yields, labor requirements, and value assessment. Bone-in loins (n = 180), boneless loins (n = 94), and Boston butts (n = 148) were shipped to Texas A&M University to perform cutting yields and time tests in a simulated retail cutting room (Garrett et al., 1991). Subprimals were allotted randomly to cutting styles. Universal Product

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Code (**U.P.C.**) descriptions (NLSMB, 1973, 1995) were used to identify the retail cuts obtained from each cutting style. Specifics for this methodology are detailed in Lorenzen et al. (1996). Briefly, bone-in loin cutting styles #1 to #4 produced bone-in and semi-boneless retail cuts and style #5 was cut to boneless retail end point. Boneless loins were fabricated into thin and thick cutting styles. Bone-in and boneless styles of cutting Boston butts were used. In addition to the fabrication methodology described in Lorenzen et al. (1996), fresh hams, inside fresh ham and outside fresh ham, and tenderloins were used in this study.

Fresh hams similar to Institutional Meat Purchase Specifications (**IMPS**) #401 (NAMP, 1992; USDA, 1993) were fabricated to produce boneless tip roasts (U.P.C. 3415), boneless top roasts (U.P.C. 3408), and boneless bottom roasts (U.P.C. 3411). Boneless top roasts (U.P.C. 3408) were further processed to produce boneless inside steaks (U.P.C. 3410) and stew meat (U.P.C. 3495). Boneless bottom roasts (U.P.C. 3411) were fabricated to produce boneless bottom steaks (U.P.C. 3412), boneless bottom roasts (U.P.C. 3411), and pork cubes (U.P.C. 3423).

Pork tenderloins (similar to IMPS #415, NAMP, 1992) were fabricated to produce tenderloin tips (U.P.C. 3364) and tenderloin roasts (U.P.C. 3363).

Value Differential Data

Value differential was determined in US$/subprimal. Value differential was derived by summing the retail value of the retail cuts, subtracting the cost of the original subprimal, and finally subtracting the cost of the labor used to process the subprimal. Retail value was calculated using prices provided by one retail chain for the week of September 27, 1994. These prices were multiplied by net weight of each retail cut. Original subprimal worth was calculated by multiplying the gross weight of the subprimal by the appropriate price provided by the National Carlot Meat Report (USDA, 1994) averaged for the week dated September 19, 1994. For subprimals not represented in the National Carlot Meat Report (inside fresh ham, outside fresh ham, and tenderloin), prices were obtained from a major packer to reflect current market value for the week of September 19, 1994. These prices were chosen because they reflected the time frame of wholesale prices used by the retail chain to determine their retail prices. Labor cost was determined by multiplying total processing time by US$15.00/h. Value differential and percentage of gross margin were determined on a US$/subprimal basis to make a relative comparison. Value differential was determined by multiplying the salable retail cut weight within each cutting style by the retail price/.4536 kg (retail value); the subprimal cost and labor cost/subprimal then were subtracted. To determine percentage of gross margin, the value differential was divided by the retail value and then multiplied by 100.

Statistical Analysis

All analyses were performed using the SAS (1991) program. Analysis of variance was used to determine the effects of purchasing specifications and cutting style on the value differential of pork subprimals. Additionally, Tukey's mean separation technique (Ott, 1988) was used to determine the effect of purchasing specification and cutting style on mean value differentials.

Results and Discussion

When comparing cutting styles within subprimals (Table 1), it was evident that the cutting style affected ($P < .05$) percentage of retail yield, cutting time, and value differential. For bone-in loins, bone-in cutting styles produced greater ($P < .05$) retail yields and had shorter ($P < .05$) cutting times than style #5 that was fabricated to a boneless retail end point. The boneless retail end point did not cause the cutting style #5 to be less profitable ($P > .05$) than bone-in retail end points. Boneless loin cutting style #2 required less ($P < .05$) cutting time and had greater ($P < .05$) value differential than cutting style #1. This reflects the importance of processing time in the value differential equation. For Boston butts, cutting style #1 produced a greater ($P < .05$) percentage of retail yield and had a shorter ($P < .05$) cutting time than style #2. Value differential was not different ($P > .05$) for the two styles of Boston butts indicating that higher retail prices for boneless retail cuts can compensate for differences in retail yield and cutting time.

Subprimals stratified by purchase specification are presented in Table 2. Anatomical separation, external fat, and weight ranges affected percentage of retail yield, cutting time, and total value differential. Purchase specification had the greatest effect on Boston butts. Purchase specification B for Boston butts was the highest-yielding and had the greatest value differential ($P < .05$). Purchase specification A was the lowest-yielding and produced the least overall value differential. This reflects the importance of percentage of retail yield in the value differential equation. Data indicate that when retail yield did not differ, cutting time affected ($P < .05$) overall value of a subprimal. Purchase specification had no significant effect ($P > .05$) on any parameters for tenderloins. This was probably because all of the tenderloins were removed, intact, from bone-in loins used in this study.

Table 3 compares a bone-in pork loin marketing method (quarter loins) with a boneless marketing method. Fabricating bone-in loins to a boneless end point produced more ($P < .05$) lean trimmings and there was a greater ($P < .05$) cost of fabrication. Cost of fabrication was a reflection of the amount of processing time required for each loin and would be

Table 1. Comparison of cutting styles for mean + SE retail yield, cutting time, and value differential[a]

Item	Retail yield, %[b]	Cutting time, s[c]	Value differential, US$/subprimal[d]
Bone-in loins			
Cutting style #1 (n = 36)	94.37^{e} ± .39	264.73^{gh} ± 8.20	18.30^{e} ± .37
Cutting style #2 (n = 36)	90.53^{f} ± .41	232.21^{h} ± 7.08	17.48^{e} ± .42
Cutting style #3 (n = 36)	93.12^{e} ± .34	312.14^{f} ± 9.58	18.02^{e} ± .39
Cutting style #4 (n = 36)	93.46^{e} ± .50	284.08^{fg} ± 14.54	8.86^{f} ± .30
Cutting style #5 (n = 36)	75.40^{g} ± .60	514.07^{e} ± 13.64	17.01^{e} ± .60
Boneless loins			
Cutting style #1 (n = 44)	96.05 ± .32	144.41^{e} ± 7.39	6.81^{f} ± .19
Cutting style #2 (n = 44)	96.87 ± .31	91.65^{f} ± 2.97	9.03^{e} ± .21
Boston butts			
Cutting style #1 (n = 78)	95.57^{e} ± .35	72.97^{f} ± 2.66	6.75 ± .19
Cutting style #2 (n = 70)	92.15^{f} ± .50	157.40^{e} ± 4.37	7.12 ± .24

[a]Description of cutting styles are detailed in Lorenzen et al. (1995).
[b]Retail yield = weight (kg) of retail cuts/initial subprimal weight (kg) × 100.
[c]Cutting time = box to table + pretrim + cutting + trim and tray times, as described in Lorenzen et al. (1996).
[d]Value differential = value of retail cuts − initial subprimal value − processing time value.
[e,f,g,h]Means within a column and column subheading lacking a common superscript letter differ ($P < .05$).

Table 2. Comparison of purchase specifications for mean ± SE retail yield, cutting time, and value differential[a]

Item	Retail yield, %[b]	Cutting time, s[c]	Value differential,[d] US$/subprimal[d]
Bone-in loins			
Purchase specification A (n = 45)	90.82^{e} ± 1.04	332.42 ± 23.46	16.88^{e} ± .67
Purchase specification B (n = 45)	90.03^{ef} ± 1.17	288.07 ± 16.57	17.20^{e} ± .64
Purchase specification C (n = 45)	86.61^{f} ± 1.25	354.82 ± 15.26	14.36^{f} ± .63
Purchase specification D (n = 45)	90.03^{ef} ± 1.00	311.16 ± 13.54	15.30^{ef} ± .60
Boneless loins			
Purchase specification A (n = 20)	97.97^{e} ± .29	104.80^{f} ± 3.28	7.79^{ef} ± .35
Purchase specification B (n = 24)	96.61^{ef} ± .19	98.90^{f} ± 2.66	8.27^{e} ± .23
Purchase specification C (n = 20)	96.27^{f} ± .41	150.96^{e} ± 14.99	7.10^{f} ± .41
Purchase specification D (n = 24)	95.54^{f} ± .54	114.93^{f} ± 8.48	8.51^{e} ± .38
Boston butts			
Purchase specification A (n = 44)	91.51^{g} ± .65	155.24 ± 10.09	4.59^{g} ± .10
Purchase specification B (n = 44)	96.85^{e} ± .37	107.54 ± 8.26	8.96^{e} ± .20
Purchase specification C (n = 30)	94.65^{f} ± .40	117.06 ± 3.11	7.70^{f} ± .24
Purchase specification D (n = 30)	92.58^{fg} ± .73	113.20 ± 8.70	6.48^{fg} ± .14
Fresh hams			
Purchase specification B (n = 12)	59.54 ± .75	307.31^{f} ± 15.64	17.71 ± .46
Purchase specification C (n = 15)	60.24 ± .67	465.74^{e} ± 40.13	17.60 ± .53
Inside fresh ham			
Purchase specification B (n = 12)	100.12 ± .05	47.53^{f} ± 2.41	5.24^{ef} ± .26
Purchase specification C (n = 16)	100.09 ± .08	51.34^{f} ± 2.48	5.77^{e} ± .15
Purchase specification D (n = 22)	99.97 ± .08	80.04^{e} ± 4.77	4.92^{f} ± .17
Outside fresh ham			
Purchase specification B (n = 12)	100.01^{e} ± .04	51.79^{e} ± 3.26	6.14 ± .25
Purchase specification C (n = 16)	99.36^{f} ± .23	32.99^{f} ± 2.67	5.44 ± .17
Purchase specification D (n = 22)	99.89^{e} ± .07	36.80^{f} ± 2.99	5.50 ± .19
Tenderloin			
Purchase specification A (n = 18)	99.68 ± .32	6.30 ± 1.46	1.31 ± .10
Purchase specification B (n = 17)	98.88 ± .29	6.50 ± .93	1.20 ± .05
Purchase specification C (n = 18)	99.30 ± .70	11.75 ± 2.55	.96 ± .06
Purchase specification D (n = 18)	100.45 ± .45	7.60 ± .99	1.12 ± .11

[a]Description of purchase specifications are detailed in Lorenzen et al. (1995).
[b]Retail yield = weight (kg) of retail cuts/initial subprimal weight (kg) × 100.
[c]Cutting time = box to table + pretrim + cutting + trim and tray times, as described in Lorenzen et al. (1996).
[d]Value differential = value of retail cuts − initial subprimal value − processing time value.
[e,f,g]Means within a column and column subheading lacking a common superscript letter differ ($P < .05$).

Table 3. Comparison of means ± SE from bone-in (style #4) and boneless (style #5) cutting methods of bone-in pork loins[a]

Item	Bone-in loin cutting style #4 (n = 36)	Bone-in loin cutting style #5 (n = 36)
Subprimal value[b]	21.31 ± .35	21.10 ± .33
Assorted chops (U.P.C.[c] 3236)	30.89 ± .58	—
Tenderloin roast (U.P.C. 3358)	—	3.60 ± .12
Sirloin roast, bnls[d] (U.P.C. 3329)	—	2.43 ± .09
Pork cubes (U.P.C. 3492)	—	1.44 ± .08
Blade roast, bnls (U.P.C. 3248)	—	3.43 ± .20
Top loin chops, bnls (U.P.C. 3374)	—	20.86 ± .77
Back ribs (U.P.C. 3243)	—	5.09 ± .23
Lean trimmings	.39[i] ± .07	3.42[h] ± .24
Cost of fabrication[e]	1.19[i] ± .06	2.16[h] ± .06
Value differential[f]	8.86[i] ± .30	17.01[h] ± .60
Percentage of gross margin[g]	28.05[i] ± .59	41.85[h] ± .66

[a]Descriptions of cutting methods are detailed in Lorenzen et al. (1996).
[b]Subprimal value = initial subprimal wt × US$ 125.65/45.36 kg.
[c]U.P.C. = Universal Product Code.
[d]bnls = boneless.
[e]Cost of fabrication = US$ for total processing time/subprimal.
[f]Value differential = [([value of retail cuts] − subprimal value) − cost of fabrication]/subprimal.
[g]Percentage of gross margin = (value differential/value of retail cuts) × 100.
[h,i]Means within a row lacking a common superscript letter differ ($P < .05$).

expected to be greater when a bone-in subprimal was fabricated to boneless retail cuts. However, processing bone-in loins to a boneless end point produced a greater ($P < .05$) value differential and percentage of gross margin, suggesting that an additional profit opportunity exists in further processing bone-in pork loins to boneless, value-added retail cuts.

Table 4 is a comparison between bone-in and boneless pork loins fabricated to the same end point. Bone-in loins had a greater ($P < .05$) subprimal value and cost of fabrication, indicating greater subprimal weight and longer processing time than boneless loins. Bone-in loins had greater ($P < .05$) retail cut values for boneless blade roast, boneless top loin chops (U.P.C. 3248 and 3374), and lean trimmings. In addition, bone-in loins produced greater ($P < .05$) value differential and percentage of gross margin. Increase in retail value was attributed to the in-

Table 4. Comparison of means ± SE from bone-in (style #5) and boneless (style #1) cutting methods of pork loins[a]

Item	Bone-in loin cutting style #5 (n = 36)	Boneless loin cutting style #1 (n = 44)
Subprimal value[b]	21.10[h] ± .33	14.60[i] ± .31
Tenderloin roast (U.P.C.[c] 3358)	3.60 ± .12	—
Sirloin roast, bnls[d] (U.P.C. 3329)	2.43 ± .09	—
Pork cubes (U.P.C. 3492)	1.44 ± .08	—
Blade roast, bnls (U.P.C. 3248)	3.43[h] ± .20	2.08[i] ± .10
Top loin chops, bnls (U.P.C. 3374)	20.86[h] ± .77	16.49[i] ± .40
Back ribs (U.P.C. 3243)	5.09 ± .23	—
Blade chops, bnls (U.P.C. 3253)	—	3.32 ± .39
Lean trimmings	3.42[h] ± .24	.13[i] ± .03
Cost of fabrication[e]	2.16[h] ± .06	.61[i] ± .03
Value differential[f]	17.01[h] ± .60	6.81[i] ± .19
Percent gross margin[g]	41.85[h] ± .66	30.82[i] ± .44

[a]Descriptions of cutting methods are detailed in Lorenzen et al. (1996).
[b]Subprimal value = initial subprimal wt × US$ 125.65/45.36 kg for bone-in loins or US$ 234.40/45.36 kg for boneless loins.
[c]U.P.C. = Universal Product Code.
[d]bnls = boneless.
[e]Cost of fabrication = US$ for total processing time/subprimal.
[f]Value differential = [([value of retail cuts] − subprimal value) − cost of fabrication]/subprimal.
[g]Percentage of gross margin = (value differential/value of retail cuts) × 100.
[h,i]Means within a row lacking a common superscript letter differ ($P < .05$).

Table 5. Comparison of means ± SE from thin (style #1) and thick (style #2) cutting methods of boneless pork loins[a]

Item	Boneless loin cutting style #1 (n = 44)	Boneless loin cutting style #2 (n = 44)
Subprimal value[b]	14.60 ± .31	15.29 ± .29
Blade roast, bnls[c] (U.P.C.[d] 3248)	2.08[h] ± .10	—
Chef's Prime™ roast (U.P.C. 3249)	—	.82[i] ± .15
Blade chops, bnls (U.P.C. 3253)	3.32[i] ± .39	—
Chef's Prime Filets™ (U.P.C. 3256)	—	6.02[h] ± .23
Top loin chops, bnls (U.P.C. 3374)	16.49[i] ± .40	—
America's Cut™ (U.P.C. 3379)	—	17.78[h] ± .36
Lean trimmings	.13 ± .03	.09 ± .03
Cost of fabrication[e]	.61[h] ± .03	.38[i] ± .01
Value differential[f]	6.81[i] ± .19	9.03[h] ± .21
Percentage of gross margin[g]	30.82[i] ± .44	36.49[h] ± .40

[a]Descriptions of cutting methods are detailed in Lorenzen et al. (1996).
[b]Subprimal value = initial subprimal wt × US$ 234.40/45.36 kg.
[c]bnls = bonelses.
[d]U.P.C. = Universal Product Code.
[e]Cost of fabrication = US$ for total processing time/subprimal.
[f]Value differential = [([value of retail cuts] − subprimal value) − cost of fabrication]/subprimal.
[g]Percentage of gross margin = (value differential/value of retail cuts) × 100.
[h,i]Means within a row lacking a common superscript letter differ ($P < .05$).

creased amount of retail cuts produced by bone-in loins. Therefore, product mix needs of the retailer must be considered when making the decision to fabricate boneless retail cuts from a bone-in subprimal.

A comparison of thin and thick cutting methods for boneless loins is provided in Table 5. The thin cutting method (style #2) produced a greater ($P < .05$) retail cut value for boneless blade chops and boneless top loin chops (U.P.C. 3253 and 3374); this reflects the greater thickness required for boneless pork chops to be classified as either "Chef's Prime™" (boneless blade chop, NPPC, 1990) or "America's Cut™" (boneless loin chop, NPPC, 1990). Cutting style #2 produced the greatest ($P < .05$) value differential and percentage of gross margin as a result of a lower ($P < .05$) cost of fabrication and increased value of thicker retail cuts.

Producing boneless retail cuts may require more time and produce smaller retail yields but the increase in retail price can result in greater value differentials and percentage of gross margin. In general, boneless cutting methods can be more profitable to the retailer than bone-in cutting methods and may result in an improved ability for the retailer to match actual consumer demand.

Implications

The information produced from this study has been used to construct the Pork CARDS (Computer Assisted Retail Decision Support) computer software. Due to the numerous combinations of factors that can affect retail yield, cutting time, and retail value of pork, a computer program will aid the retail and other interested sectors in making purchasing and marketing decisions that have been time-consuming in the past.

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