Variation in weights of primal pork cuts

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Market value of the carcase

The payment system used in Australia uses the weight of the carcase and fat depth at the P2 site to determine the price per kg carcase weight paid to producers. This economic incentive for a specific weight range and a higher overall lean meat content in the carcase has resulted in larger and leaner cuts available to consumers across Australia in comparison to pork cuts available in the 1980s and 1990s (Müller *et al*., 2009). The study also found only small differences in the lean meat content of pork cuts between states and areas of different socio-economic status 'due to breeding and feeding for large, lean pigs by the Australian pig industry' as the authors concluded. While the variation in the proportion of lean in each raw cut was modest, considerable variation was observed in the weight of cuts, fat thickness and slice thickness due to differing butchering practices. This aspect of variability has been addressed by Australian Pork Limited (APL, 2012) by providing the PorkStar training manual which outlines the various retail cuts in detail.

Different prices are paid for individual pork cuts. Price differences between cuts increase as the carcase is broken down. For example, the rolling annual average wholesale price varied from $ 3.55 for forequarters to $ 7.77 for bellies for broken sales and from $ 3.92 for boneless middles above 13 mm fat depth to $ 15.07 for US ribs for carton sales (APL, Eyes and Ears, Issue #502, October 2012). At the farm gate level, carcases may be broken down to the primal cuts and the return per carcase may be increased by optimising the weight in each primal cut.

Mérour and Hermesch (2008) demonstrated variation in primal cuts for carcases with similar weight and fatness levels. This variation in primal cuts resulted in an additional return per carcase of $ 7 at the farm gate level and $ 21 at the wholesale/retail level for the top 10% of pigs in comparison to the average. This evaluation was based on French data as similar data were not available in Australia at the time. Information has been collected about primal cut weights in Australian pigs and a first description of these data and evaluation of the variation in primal pork cuts is provided in this study.

Australian data

Primal cut weights were recorded for over 2,200 castrates at Rivalea (Australia) Pty Ltd from March until September 2012. The carcase data included the hot standard carcase weight, weight loss, fat depth and loin depth at the P2 site as well as the three primal cuts of forequarter, middle and leg (PorkStar manual, APL, 2012). Weight loss included evaporation loss and trim. The middle was further broken down into loin and belly weights. All primal cut weights were recorded on one side of the carcase only about 24 hours after slaughter on the cold carcase.

Pigs were evaluated with the PorkScan™ system (PorkScan Pty Ltd, Canberra, ACT) from March to May 2012 (data set A) and with the Hennessy Chong grading system from June to September 2012 (data set B). Data statistics for the carcase traits are shown for both groups of pigs in Table 1

and Table 2. The first group of pigs were slightly heavier and had a higher mean backfat depth. Loin depth was only available for the first data set. Considerable variation was observed in all four primal cut weights. Coefficients of variations were highest for belly weight with values around 17 %.

Table 1. Data statistics for pigs slaughtered from March to May 2012 (data set A)

Variable	N	Mean	SD	CV	Min	Max
Hot carcase weight (kg)	586	81.33	7.46	9.17	57.90	102.10
Weight loss (%)	573	12.6	1.56	12.44	6.80	17.9
Fat depth at P2 site (mm)	578	11.61	2.44	20.99	6.00	18.00
Loin depth at P2 site (mm)	589	51.03	5.75	11.26	34.00	66.00
Shoulder weight[1] (kg)	584	11.76	1.17	9.97	8.55	15.19
Leg weight[1] (kg)	578	11.84	1.10	9.28	8.46	14.88
Belly weight[1] (kg)	586	5.30	0.88	16.61	3.14	7.68
Loin weight[1] (kg)	589	6.55	0.83	12.73	3.40	9.55

[1]Weight based on one side of the carcase only. N: number of pigs, SD: standard deviation, CV: Coefficient of variation, Min and Max: minimum and maximum.

Table 2. Data statistics for pigs slaughtered from June to September 2012 (data set B)

Variable	N	Mean	SD	CV	Min	Max
Hot carcase weight (kg)	1606	78.28	8.16	10.42	54.40	102.80
Weight loss (%)	1585	12.0	1.45	12.12	7.20	17.8
Fat depth at P2 site (mm)	1604	10.40	2.38	22.92	4.00	18.60
Shoulder weight[1] (kg)	1574	11.24	1.26	11.25	7.65	15.13
Leg weight[1] (kg)	1579	11.57	1.19	10.28	8.16	15.08
Belly weight[1] (kg)	1542	5.03	0.87	17.40	2.54	7.70
Loin weight[1] (kg)	1560	6.35	0.91	14.39	3.62	9.64

[1]Weight based on one side of the carcase only. N: number of pigs, SD: standard deviation, CV: Coefficient of variation, Min and Max: minimum and maximum.

Factors explaining variation in primal cut weights

The proportion of variation explained by hot standard carcase weight alone was considerably higher for shoulder weight and leg weight in comparison to weight of belly and loin (Table 3). Hot standard carcase weight explained only 41 and 43 % of the variation observed in weight of the loin. Fat depth, loin depth and weight loss explained an additional three to six percent of the variation in primal cut weights observed in data set A. In comparison, the additional variation explained by these three factors varied from one to four percent in data set B. The additional variation explained by adding fat depth to the model was largest for weight of shoulder and belly, while fat depth was not significant for loin weight. Loin depth explained an additional 1.9 % of the variation for loin weight and was of less importance for the other primal cut weights. Weight loss was a significant factor for all four primal cut weights. However, the proportion of additional variation explained by this factor was variable between data sets for individual primal cut weights.

Table 3: Proportion of variation (%) for primal cut weights explained by the model

Model		Shoulder	Leg	Belly	Loin
y = HSCW	Data A	76.5	77.3	56.9	40.9
	Data B	77.8	81.2	58.8	43.4
y = HSCW+CFD	Data A	77.9	77.6	58.5	40.7
	Data B	78.1	82.0	59.6	43.0
y = HSCW+CFD+WTLOSS	Data A	81.7	80.9	61.3	42.0
	Data B	80.5	85.3	59.7	45.2
y = HSCW+CFD+CMD	Data A	78.2	77.7	58.9	42.6
Y = HSCW+CFD+CMD+WTLOSS	Data A	82.2	81.0	62.0	43.8

Abbreviations: HSCW: host standard carcase weight; CFD: carcase fat depth; WTLOSS: weight loss; CMD: carcase loin depth.

Variation in primal cut weights at a fixed carcase weight

There was considerable variation in the four primal cut weights for a fixed carcase weight as illustrated in Figures 1 and 2. Data were limited to 201 carcases with a hot standard carcase weight of 78.0 to 80.0 kg only. Shoulder weight and leg weight varied by about four kg per carcase ignoring the tails of each distribution. The variations in belly and loin weights were only slightly smaller with a range of three kilograms.

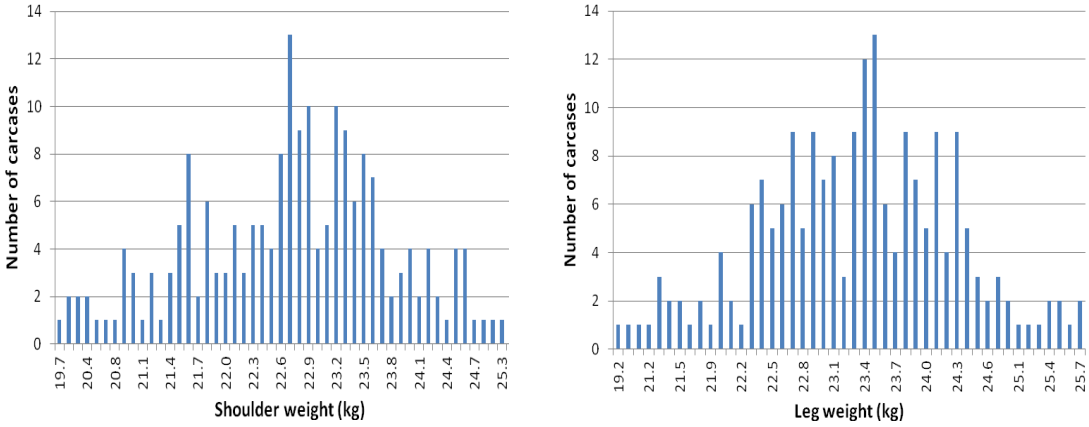

Figure 1. Distribution of shoulder and leg weight per carcase for carcases with a hot standard carcase weight of 78.0 to 80.0 kg.

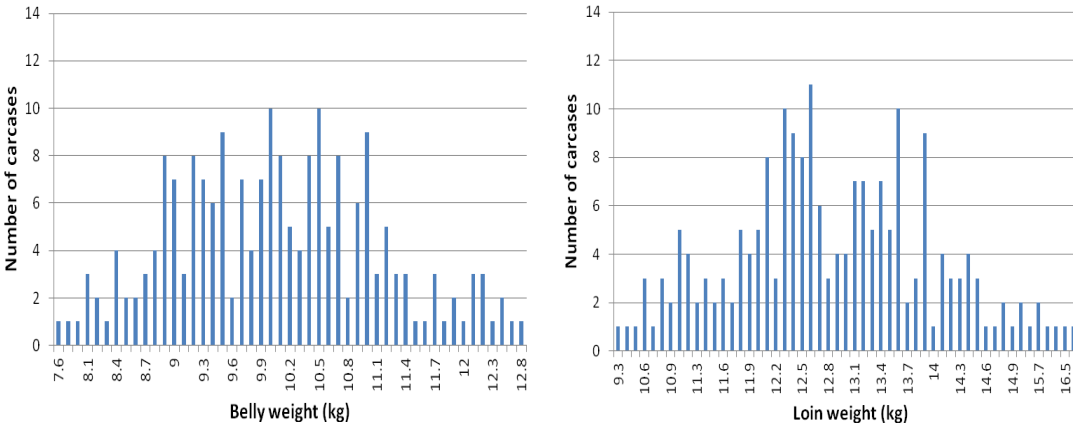

Figure 2. Distribution of belly weight per carcase for carcases with a hot standard carcase weight of 78.0 to 80.0 kg.

Summary

Considerable variation has been observed in primal pork cuts recorded in Australian pigs. Hot carcase weight explained fourty to eighty percent of the variability in individual primal cut weights. Fat depth, loin depth and weight loss explained an additional one to six percent of the variation in primal cut weights. Primal cut weights varied by four (shoulder and leg weight) and three (belly and loin weight) kilograms per carcase for carcases with a hot carcase weight of 78.0 to 80.0 kg only.

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