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SYDNEY MEAT MARKETING MARGINS—AN ECONOMETRIC ANALYSIS*

G. R. Griffith†

Simultaneous equation techniques are used to examine the behaviour of wholesale and retail margins for beef, lamb, mutton and pork in Sydney. Hypotheses tested relate to price levelling and price averaging, and to marketing cost and turnover effects. Additionally, an attempt is made to discern the differences, if any, in the determination of retail margins between high- and low-income locations, and between traditional butcheries and supermarkets.

1 INTRODUCTION

1.1 THE PROBLEM

There has always been considerable interest in the degree of efficiency achieved by the various sectors involved in the production and exchange of Australian livestock and meat products [1, 5, 16, 24, 28]. One of the particular areas of concern has been that inefficiences in the pricing mechanism inhibit the rapid and accurate transmission of changes in supply and demand conditions from one market level to another. This sentiment has gained strength since the recent rises in retail meat prices, and a number of analyses of the relationship between auction, wholesale and retail meat prices have emerged [2, 3, 23]. Due to the lack of any up-to-date, quantitative data however, the analyses done have been necessarily qualitative and general, and empirical estimates of the forces determining these relationships have not been available.

A recent study by Griffith and Whitelaw [12] made a start towards filling this data gap by deriving a set of monthly marketing margins for Sydney beef, lamb, mutton and pork for the period January, 1971, to June, 1974[1]. Some qualitative assessments of part of this set of margins were also made [11]. The present paper complements these two studies by using the same data to quantitatively examine some hypotheses proposed about the behaviour of wholesale and retail meat margins.

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† Economist, N.S.W. Department of Agriculture, Sydney.

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[1] Marketing margins are defined as the difference in the value of the product in adjoining market levels expressed on an equivalent weight basis. Discussion of definitions, calculation procedures and results can be found in Griffith and Whitelaw [12].

1.2 AIMS OF THE STUDY

There have been four major areas of contention suggested in the literature on meat marketing margins in Australia [1, 3, 11, 13, 16, 24, 27]. In null hypothesis terms they are:

(a) there is no price levelling;[2]

(b) there is no price averaging;[3]

(c) wholesale (retail) margins are unrelated to the cost of providing wholesale (retail) market services; and

(d) wholesale (retail) margins are independent of wholesale (retail) turnover.

Additionally, two further hypotheses have been proposed by Woodward [27, p. 161] and the Joint Parliamentary Committee on Prices [24, p. 141] respectively:

(e) there is no difference in retail meat margin behaviour between supermarkets and traditional butchery outlets; and

(f) there is no difference in retail meat margin behaviour between "low-" and "high-income" suburbs of Sydney.

Testing these six hypotheses does not mean that we can give conclusive answers to questions of competition or efficiency. We are unable to consider any aspects of technical efficiency, and non-price policies are also major determinants of profit [10, p. 1365]. Given these reservations though the paper does illuminate some of the important relationships in meat marketing in Sydney.

We will examine hypotheses (a)–(d) at both wholesale and retail, and hypotheses (e) and (f) at the retail level only. The regression models and a description of the variables used are presented in section 2. Results are reported and interpreted in section 3 and the implications these results have for policy decisions occupy section 4.

2 METHODOLOGY

Two previous studies have tested in a Sydney context some of the hypotheses listed above, but both have suffered deficiencies. Woodward [27] using weekly, monthly and quarterly data tested for price levelling and price averaging by simple regression, and for price levelling only

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[2] Price levelling refers to the practice of wholesalers (retailers) holding their selling prices stable in the face of rising or falling auction (wholesale) prices.

[3] Price averaging refers to the practice of setting a low margin on one meat type and recouping any loss by setting a high margin on other meat types.

by simulation and spectral techniques. His regression equations were of the form:

$$PW = a + b\,PA, \quad \text{and} \tag{1}$$

$$MB = c + d\,ML \tag{2}$$

where PW = wholesale price
PA = auction price
MB = beef margin
ML = lamb margin

By using this specification he ignored the relationships between different meats, and the interdependent nature of market participants behaviour. He also omitted any lags in the system and the effects of marketing costs. These omissions and commissions probably resulted in substantial specification errors [26, p. 548].[4]

Marceau [16] went further in that his quarterly regression model tested for price levelling, and wage and turnover effects, but price averaging was ignored. Again, single equation methods were used to estimate the required parameters, so Marceau also disregarded the relationships between meats.[5] Neither Woodward nor Marceau analysed hypotheses (e) or (f).

To overcome the limitations of the two studies noted above we use in this article a model containing some aspects of Marceau's work but including components of margins models developed by Barr and Gale [4], Fuller and Ladd [9], and Yandle [28].

2.1 AGGREGATE MODEL SPECIFICATION

Retail and wholesale margin models are considered separately and each contains four equations for beef, lamb, mutton and pork. These models are outlined below in general terms. A description of the variables used is given in section 2.2.

Wholesale Margins

$$MW_b = f(PA_b, CW_b, LPA_b, MW_l, MW_m, MW_p, T_b) \tag{3}$$

$$MW_l = f(PA_l, CW_s, LPA_l, MW_b, MW_m, MW_p, T_l) \tag{4}$$

$$MW_m = f(PA_m, CW_s, LPA_m, MW_b, MW_l, MW_p, T_m) \tag{5}$$

$$MW_p = f(PA_p, CW_p, LPA_p, MW_b, MW_l, MW_m, T_p) \tag{6}$$

[4] These errors could have been of two types. The estimated regression coefficients would be biased estimates of the true coefficients, the extent depending on the correlations between the included and omitted variables and on the coefficients of the excluded variables. Inferences based on the estimated coefficients would also be inaccurate since the estimate of the residual variance would be biased upward.

[5] Two-stage least squares was an alternative estimator considered by Marceau, but he rejected it on the basis of autocorrelation problems in the estimated equations. We mention this problem again in section 3, but do not refer to Marceau's study further as it is not of a comparable specification.

The wholesale margins (MW) for beef (b), lamb (l), mutton (m) and pork (p) are specified to be dependent on their respective auction prices, both current (PA) and past (LPA), wholesale costs (CW) except for mutton and lamb which are both subject to the wholesale cost for all sheep (CW_s), and turnover (T), and on other wholesale margins.

Retail Margins

$$MR_b = f(PW_b, CR, LPW_b, MR_l, MR_m, MT_p, T_b) \quad (7)$$

$$MR_l = f(PW_l, CR, LPW_l, MR_b, MR_m, MR_p, T_l) \quad (8)$$

$$MR_m = f(PW_m, CR, LPW_m, MR_b, MR_l, MR_p, T_m) \quad (9)$$

$$MR_p = f(PW_p, CR, LPW_p, MR_b, MR_l, MR_m, T_p) \quad (10)$$

Thus retail margins (MR) for beef (b), lamb (l), mutton (m) and pork (p) are considered to be a function of their respective present (PW) and past (LPW) wholesale prices and turnover (T), retail costs (CR), and other retail margins. In both wholesale and retail models, total turnover (T_t) and a weighted average of other wholesale or retail margins,[6] were tried as alternate specifications to individual meat turnovers and to other wholesale or retail margins weighted equally. All prices, margins and costs are undeflated and time subscripts and error terms are omitted.

2.2 VARIABLE DEFINITIONS AND DATA SOURCES

All the basic price data came from the records of the Division of Marketing and Economics of the N.S.W. Department of Agriculture. The procedures for adjusting and weighting these prices and for calculating the wholesale and retail margins are outlined in detail by Griffith and Whitelaw [12, pp. 8–10]. Variable definitions are as follows:

PA = Monthly estimated dressed auction carcase price, in cents/kg, of composite beef, lamb, mutton and pork carcases sold at Homebush saleyards and adjusted for shrinkage.[7]

PW = Monthly wholesale price, in cents/kg, of composite beef, lamb, mutton and pork carcases sold in the Homebush meat halls and adjusted for shrinkage.

MW = Monthly wholesale margin, in cents/kg, between adjusted wholesale price and adjusted auction carcase price.

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[6] Weights used were based on the proportions contributed by each meat to total retail consumption. The retail indices (which are the same at wholesale) were as follows:

$MR_bX = 0{\cdot}45\ MR_l + 0{\cdot}36\ MR_m + 0{\cdot}19\ MP_p$; $MR_lX = 0{\cdot}60\ MR_b + 0{\cdot}27\ MR_m + 0{\cdot}13\ MR_p$;

$MR_mX = 0{\cdot}56\ MR_b + 0{\cdot}31\ MR_l + 0{\cdot}13\ MR_p$; $MR_pX = 0{\cdot}50\ MR_b + 0{\cdot}28\ MR + 0{\cdot}22\ MR_m$.

[7] An adjustment of prices is necessary to take account of the shrinkage in the meat between various market levels due to refacing, dehydration, spoilage and pilfering.

LPA = Monthly weighted average of past adjusted auction carcase prices, in cents/kg. The preferred weighting factors used were: $LPA_t = 0{\cdot}5\ PA_{t-1} + 0{\cdot}33\ PA_{t-2} + 0{\cdot}17\ PA_{t-3}$[8]

CW = An index of monthly wholesale marketing costs. Slaughtering fees comprise some 60 per cent of wholesale operating costs [1, p. 62], so slaughtering fees charged at Homebush abattoir were used as a proxy for all wholesale costs. The base period was January, 1971 = 100·00 [20].

T = Monthly throughput of local and interstate beef and veal, lamb, mutton and pork carcases at Homebush meat halls, in thousands [20]. Retail throughput (or consumption) is not available in monthly terms, so wholesale throughput was used as a proxy in preference to interpolating quarterly consumption figures.

MR = Monthly retail margin, in cents/kg, between composite retail prices of beef, lamb, mutton and pork at selected retail outlets in Sydney and adjusted wholesale prices.

LPW = Monthly weighted average of past adjusted wholesale prices, in cents/kg. The preferred weights used were again: $LPW_t = 0{\cdot}5\ PW_{t-1} + 0{\cdot}33\ PW_{t-2} + 0{\cdot}17\ PW_{t-3}$

CR = An index of monthly retail marketing costs. Since wages contribute 52 per cent of retail operating expenses [25, p. 40], the weekly wage rate for a New South Wales general butcher shopman under the Federal Meat Industry Interim Award was used as a proxy for all retailing costs. The base was January, 1971 = 100·00 [19].

2.3 INDIVIDUAL OUTLET MODEL SPECIFICATIONS

Both of the above sections refer to testing hypotheses (a)–(d) of section 1.2 in the aggregate Sydney situation. The examination of hypotheses (e) and (f) requires data on the prices of various retail cuts of beef, lamb, mutton and pork at four individual outlets—a supermarket (*s*) and a traditional butcher shop (*b*) in both a "high-income" suburb (*hi*) and a "low-income" suburb (*lo*).[9] This data came from the unpublished records of the Division of Marketing and Economics of the N.S.W. Department of Agriculture.

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[8] Several different specifications of this weighting pattern were tried. The coefficients of *LPA* and *LPW* were fairly insensitive to varying specifications but the significance achieved by the preferred weighting pattern was much higher.

[9] Ideally of course we would like individual outlet data on the prices paid to wholesalers for beef, lamb and pork carcases and on their throughput and cost structures. Comparing individual retail prices and their respective retail margins is however the only readily available way of distinguishing between the four outlets.

As not enough mutton was sold at the outlets chosen to warrant inclusion in the model, composite retail prices of only beef, lamb and pork were calculated for each of the outlets and retail margins derived using aggregate wholesale prices. Hence each outlet has three retail margin equations associated with it. The specification for the low-income supermarket is as follows—the other three models are of a similar form. Again, all prices, margins and costs are undeflated, and time subscripts and error terms are omitted.

$$MR_b^{los} = f(PW_b, CR, LPW_b, MR_l^{los}, MR_p^{los}, T_b) \quad (11)$$

$$MR_l^{los} = f(PW_l, CR, LPW_l, MR_b^{los}, MR_p^{los}, T_l) \quad (12)$$

$$MR_p^{los} = f(PW_p, CR, LPW_p, MR_b^{los}, MR_l^{los}, T_p) \quad (13)$$

2.4 METHOD OF ESTIMATION

Theory suggests that the equations would be best estimated in linear form [9, p. 802; 28, p. 130]. Therefore the coefficients express the absolute change in the margin in cents/kg for each one unit change in the independent variables.

Two-stage least squares (2*SLS*) and three-stage least squares (3*SLS*) are the estimation techniques used [26, pp. 451–459 and pp. 508–514 respectively]. Each of the aggregate equations contain four endogenous variables and four predetermined variables, and each of the individual outlet equations have three endogenous and four predetermined variables. Only the 3*SLS* estimates of the most preferred equations are presented in the next section. All equations are overidentified by the order condition, and in all models the matrix of contemporaneous covariances between the 2*SLS* error terms is non-zero, so 3*SLS* estimates are asymptotically more efficient [26, pp. 528–529].

All preferred equations were tested for autocorrelation using the simultaneous equation version of the Durbin–Watson statistic proposed by Durbin [6]. No evidence of significant autocorrelation was found in any model.

The data consisted of 42 monthly observations over the period January, 1971, to June, 1974.

3 RESULTS

This section reports estimates of the coefficients of the four aggregate wholesale margin equations (3)–(6), the four aggregate retail margin equations (7)–(10), and the twelve retail margin equations of the form (11)–(13) for the four retail outlets. The figures in parentheses are the estimated standard errors.

3.1 AGGREGATE WHOLESALE AND RETAIL MARGINS

Wholesale

$$MW_b = \underset{(5\cdot84)}{4\cdot93} - \underset{(\cdot1128)}{\cdot1802}\,PA_b + \underset{(\cdot0148)}{\cdot0305}\,CW_b + \underset{(\cdot1413)}{\cdot2411}\,LPA_b - \underset{(\cdot0662)}{\cdot1435}\,T_b - \underset{(\cdot1322)}{\cdot3509}\,MW_l + \underset{(\cdot1371)}{\cdot6181}\,MW_m \quad (14)$$

$$MW_l = \underset{(5\cdot307)}{38\cdot45} - \underset{(\cdot0660)}{\cdot3696}\,PA_l + \underset{(\cdot0643)}{\cdot2005}\,LPA_l - \underset{(\cdot0195)}{\cdot0899}\,T_l - \underset{(\cdot1197)}{1292}\,MW_m \quad (15)$$

$$MW_m = \underset{(\cdot8978)}{6\cdot402} - \underset{(\cdot0628)}{\cdot3085}\,PA_m + \underset{(\cdot0699)}{\cdot8796}\,LPA_m + \underset{(\cdot0878)}{\cdot7370}\,MW_b \quad (16)$$

$$MW_p = \underset{(6\cdot228)}{30\cdot03} - \underset{(\cdot0732)}{\cdot7237}\,PA_p + \underset{(\cdot0274)}{\cdot0427}\,CW_p + \underset{(\cdot0777)}{\cdot7155}\,LPA_p - \underset{(\cdot0084)}{\cdot0375}\,T_t - \underset{(\cdot1247)}{\cdot2994}\,MW_l \quad (17)$$

In all four equations wholesale margins are negatively related to current auction prices and positively related to past auction prices. This result suggests short-run *price levelling* with longer term adjustment of wholesale margins to trends in auction prices, and basically agrees with comparable results in Woodward [27, p. 112].

Significant instances of *price averaging* exist in the beef, lamb and pork wholesale equations, a result opposite to that of Woodward who found no price averaging behaviour at the wholesale level. The results show however that the price averaging behaviour is both incomplete and asymmetrical. i.e. none of the coefficients are minus one or less, and in none of the equations is the averaging reversible (in equation (14), the beef margin is averaged by the lamb margin but in equation (15) beef margins have no significant effect on lamb margins). Furthermore, in equation (14) lamb and mutton margin coefficients have opposite signs, indicating some type of compensation behaviour. These results suggest that price averaging is probably a much more complicated phenomena than the present model specifies it to be [22, pp. 187–188].

Wholesale costs have a small positive influence on wholesale margins of both beef and pork. No similar relationships exist in the lamb (13) and mutton (14) equations.

The expected negative relationships between *throughput* and wholesale margins occurred in the beef, lamb and pork equations. For the first two meats individual throughput was highly significant, while in equation (15) total throughput has a more significant effect than pork throughput alone.

In terms of the four hypotheses (a)–(d) dealing with the aggregate wholesale situation, we reject the absence of price levelling completely, reject the absence of at least partial price averaging for all meats but mutton, reject the absence of cost effects for all meats but mutton, and reject the absence of turnover effects for beef and pork.

Retail

$$MR_b = \underset{(8\cdot36)}{2\cdot45} - \underset{(\cdot1227)}{\cdot6844\ PW_b} + \underset{(\cdot1575)}{\cdot3608\ CR} + \underset{(\cdot1572)}{\cdot5431\ LPW_b} - \underset{(\cdot1501)}{\cdot2351\ MR_l} + \underset{(\cdot3444)}{\cdot6463\ MR_m} \quad (18)$$

$$MR_l = \underset{(16\cdot67)}{27\cdot12} - \underset{(\cdot1263)}{\cdot8213\ PW_l} + \underset{(\cdot1227)}{\cdot6044\ CR} - \underset{(\cdot0355)}{\cdot1153\ T_l} + \underset{(\cdot1385)}{\cdot6612\ LPW_l} - \underset{(\cdot2261)}{\cdot7881\ MR_p} \quad (19)$$

$$MR_m = \underset{(5\cdot93)}{-12\cdot40} - \underset{(\cdot1041)}{\cdot2817\ PW_m} + \underset{(\cdot0726)}{\cdot2320\ CR} + \underset{(\cdot1257)}{\cdot3482\ LPW_m} + \underset{(\cdot0927)}{\cdot1353\ MR_l} + \underset{(\cdot1172)}{\cdot2516\ MR_p} \quad (20)$$

$$MR_p = \underset{(8\cdot61)}{14\cdot65} - \underset{(\cdot0558)}{\cdot2825\ PW_p} + \underset{(\cdot1564)}{\cdot1727\ CR} + \underset{(\cdot3210)}{\cdot9549\ MR_m} \quad (21)$$

As with wholesale margins, all retail margins are negatively related to current wholesale prices and all except pork are positively related to past wholesale prices. This rejection of the *absence of price levelling* agrees with evidence submitted to the Brewer Committee which noted "Most butchers during the giving of evidence agreed that the practice (of price levelling) was adopted . . .". [25, p. 41]. Woodward found no substantial evidence of price levelling in the retail market. The evidence supporting price levelling infers that the recommendations of the Meat and Allied Trades Federation concerning the desirability of percentage markup policies are not being heeded in the aggregate [18, p. 16].

Some evidence of retail *price averaging* was found in the beef (16) and lamb (17) equations, a result also suggested in the Brewer Report where ". . . the Meat and Allied Trades Federation expressly stated in its submission that cross-subsidizing (price averaging) did take place in the retail trade . . ." [25, p. 41]. This averaging is again only partial in the beef equation as the coefficient of the mutton margin is significant and positive. Positive coefficients of other margins were also found in the mutton and pork equations indicating complementary relationships between the endogenous variables included in these equations. Hypothesis (b) is therefore rejected for lamb, and partially rejected for beef, at retail. Woodward isolated no consistent instances of price averaging.

The effect of the fixed costs of providing retail services was significant as all retail margins responded positively to changes in *butcher's wages*. Hypothesis (c) is thus rejected at retail.

A significant *turnover* effect was only in evidence in the lamb equation. In this case we cannot reject hypothesis (d) for beef, mutton or pork at retail. An implication is that the advice of Macartney to increase retail margins if throughput falls is being generally disregarded in the aggregate [15, p. 5]. The large measurement errors inherent in the proxy variable for retail turnover may be the cause of this perceived disregard.

In this section we have suggested that the results obtained from this study and Woodward's analysis are generally quite diverse. Two reasons can be advanced to explain these differences. The first relates to the specification of this model, and the second to the level of sophistication of the estimation technique. As noted previously, misspecifying equations results in large errors in both the estimated coefficients and residual variance.

3.2 INDIVIDUAL OUTLET RETAIL MARGINS

In this section we attempt to find any differences in margin setting behaviour by owners or managers of the four individual retail outlets described above. A secondary aim is to see if there are any differences between the individual shops and the aggregate results of section 3.1. Estimates of the relevant coefficients are presented in table 1, and they are discussed below in terms of the hypotheses listed in section 1.2.

(a) *Price Levelling*

As with the aggregate models, retail margins for beef and lamb are for all outlets negatively related to their current wholesale prices and positively related to their past wholesale prices, indicating short-run price levelling of the meat but with longer-term adjustment of margins to wholesale prices. There is no consistent pattern between outlets in the beef margins, but lamb tends to be levelled more in butcher shops than in supermarkets, particularly in the high income outlet. Further, in most cases the extent of levelling is greater in lamb than in beef.

The situation in the pork retail margin equations is diametrically opposed to that shown for the aggregate study, in that at none of the four outlets does current wholesale pork price have a significant coefficient. Past wholesale prices are negatively related to margin size suggesting that some longer-term price levelling is undertaken in setting retail pork margins.[10] This behaviour is more pronounced in the butchers shops than in the supermarkets.

Comparing the aggregate coefficients of the PW variables in section 3.2 with those in table 1 yields some interesting results. All the PW_b coefficients in table 1 are less than that estimated for the aggregate situation, three of the four being significantly so at the 5 per cent level. Similarly with pork three of the four LPW_p coefficients are significantly different from the aggregate PW_p coefficient even though they appear quite similar in magnitude. For lamb only one of the PW_l coefficients is significantly different from the aggregate PW_l coefficient at the 5 per cent level. The low income butcher appears to most consistently approach the aggregate price levelling behaviour.

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[10] This suggests that in the short-run pork has a more inelastic demand than the other meats at the four outlets chosen.

TABLE 1

Coefficient Estimates for Individual Retail Meat Outlets

Type of Outlet	Explanatory Variables													
	PW_b	PW_l	PW_p	CR	T_t	T_b	T_l	T_p	LPW_b	LPW_l	LPW_p	OWN^* MR_b	OWN^* MR_l	OWN^* MR_p
Low Income Supermarket—														
Beef	−·3576 (·0884)	.. ..	.. ..	−·1348 (·0645)	−·0263 (·0129)	.. ..	.. ..	.. ..	·3385 (·0993)	.. ..	.. ..	.. ..	.. ....	·4180 (·1219)
Lamb	.. ..	−·8815 (·1466)	.. ..	.. ..	−·1373 (·0331)	.. ..	.. ..	.. ..	.. ..	·7090 (·1451)	.. ..	.. ..	.. ..	−1·216 (·3206)
Pork	.. ..	.. ..	.. ..	·4172 (·0840)	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	−·2398 (·0731)	·8976 (·2205)	.. ..	.. ..
Low Income Butcher—														
Beef	−·6833 (·1281)	.. ..	.. ..	·1215 (·0707)	.. ..	.. ..	.. ..	.. ..	·7160 (·1440)	.. ..	.. ..	.. ..	.. ..	·4460 (·1367)
Lamb	.. ..	−·8545 (·1577)	.. ..	·4258 (·2008)	−·0959 (·0282)	.. ..	.. ..	.. ..	.. ..	·5975 (·1571)	.. ..	·7337 (·3173)	.. ..	−·9848 (·2784)
Pork	.. ..	.. ..	.. ..	·3129 (·0958)	.. ..	.. ..	.. ..	−·2693 (·1347)	.. ..	.. ..	−·3363 (·0793)	·6971 (·1873)	.. ..	.. ..
High Income Supermarket—														
Beef	−·5309 (·2165)	.. ..	.. ..	·2370 (·1234)	−·0396 (·0185)	.. ..	.. ..	.. ..	·2740 (·2655)	.. ..	.. ..	.. ..	·2654 (·1737)	·4105 (·2057)
Lamb	.. ..	−·4394 (·1626)	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	·8274 (·2227)	.. ..	1·494 (·2254)	.. ..	−1·941 (·4559)
Pork	.. ..	.. ..	.. ..	·2524 (·1091)	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	−·2079 (·0800)	·4782 (·1747)	.. ..	.. ..
High Income Butcher—														
Beef	−·2589 (·1061)	.. ..	.. ..	·2377 (·0824)	.. ..	−·3052 (·1179)	.. ..	.. ..	·3988 (·1262)	.. ..	.. ..	.. ..	.. ..	·4931 (·1653)
Lamb	.. ..	−1·053 (·6381)	.. ..	.. ..	.. ..	.. ..	−·3590 (·1810)	.. ..	.. ..	·9209 (·6633)	.. ..	1·092 (·6679)	.. ..	−1·803 (1·387)
Pork	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	.. ..	−·2830 (·1280)	·7755 (·2300)	·4712 (·2433)	.. ..

* To save space only the general names for the retail margin variables are given.

In respect of hypotheses (e) and (f) which postulate no significant differences between suburbs or between types of outlet, the four individual outlets perform substantially differently to each other and to the aggregate situation, even though the general pattern of short-run levelling and long-run adjustment to wholesale prices is similar in beef and lamb equations.

(b) *Price Averaging*

Significant price averaging of lamb by pork was revealed at all four outlets, i.e. movements in pork retail margins caused lamb retail margins to move in the opposite direction. This result corresponds to the situation in the aggregate although in the individual shops the coefficients are much larger—in the case of both the high-income outlets the response of the lamb margin was almost twice as large as the shift in the pork margin. Three of the outlets showed a positive effect of beef margins on lamb margins, which tends to partly balance the averaging of pork and lamb, and again these coefficients were larger for the high income butchery and supermarket. Significant positive relationships between beef margins and pork margins were also detected in all four shops, with the two butcheries exhibiting higher coefficients than supermarkets in the same income class. Neither of the complementary relationships found in the individual outlets is apparent in the aggregate.

Both hypotheses (e) and (f) which postulate no significant differences between suburbs or between type of outlet, must thus be rejected with respect to the existence and extent of price averaging.

(c) *Marketing Costs*

In all beef margin equations retail costs significantly effected margin size—negatively for the low-income supermarket but positively for the remaining outlets. These latter coefficients confirm the aggregate findings although they are generally smaller. The low-income outlets appeared to be more influenced by the cost variable than the high-income outlets, and generally to a greater degree. The spurious negative coefficient could be partly due to lingering multicollinearity in the model.

Retailers in aggregate regarded retail costs as a large determinant of retail lamb margins but only the low-income butcher reacted similarly individually.

The coefficients for the effect of retail costs on pork margins generally agreed with the aggregate results, and as with beef the two low-income outlets were more responsive to retail marketing costs. In contrast to beef though the individual outlet coefficients were larger than the aggregate coefficients.

In terms of the effect of retail marketing costs, both hypotheses (e) and (f) must be rejected in this instance as there were significant differences in coefficient values between suburbs and between different retail outlet types.

(d) *Turnover*

The effects of throughput on retail margins were erratic to say the least and no definite pattern could be distinguished, except that three of the four lamb margin equations were influenced by turnover—a result which agrees with that of the aggregate lamb equation. Total throughput was significant in the beef equations of both supermarkets but these influences did not emerge in the aggregate. The positive sign of the turnover coefficient in the beef equation of the high-income butcher appears on theoretical grounds to be wrong and is probably again due to some persistent multicollinearity effects, or to errors in the measurement of this variable.

We must reject therefore, hypotheses (e) and (f) when considering the effects of throughput on retail margins of beef, lamb and pork.

4 IMPLICATIONS OF RESULTS

We have shown that in the aggregate at wholesale and retail levels and for various individual retail outlets, price levelling at least in the short-run is common practice—additionally, price averaging is a feature of almost 50 per cent of the margin equations studied. By far the greatest amount of concern with the meat marketing system has been aimed at these two practices. The level of throughput and the effect of marketing costs also have significant effects in some circumstances.

In this section we firstly examine whether price levelling and price averaging do cause harmful effects, and secondly indicate some policies to modify these practices if they are adjudged deleterious.

4.1 EFFECTS OF PRICE LEVELLING AND PRICE AVERAGING

There have been two major criticisms of price levelling and price averaging. The first is that these practices distort resource allocation in the meat and livestock industries and exaggerate price fluctuations at the auction and wholesale levels. The second is that these practices restrict innovations in the storage and distribution of meat and hamper adjustments in the structure of the retailing and wholesaling sectors [14, p. 17]. These viewpoints can be questioned on a number of grounds but only a summary is given here as they have been outlined elsewhere in detail [11, pp. 16–19; 22, pp. 187–198].[11]

The usual reply is that retailers use other methods besides price in allocating various types or cuts of meat amongst consumers. Varying the display pattern or promotional pattern are two alternatives. So, even though the price elasticities of demand for individual meats are high [16, p. 60; 21, p. 167] price is not the only way of influencing consumption. Further, there is some evidence that auction prices, especially those of beef and mutton, are not entirely determined by domestic retail prices

[11] Parish [22] in particular has a good review of the reasons for, and effects of, price levelling and averaging.

[8, p. 64; 16, p. 55; 21, p. 168]. Overall then, retailing and wholesaling behaviour which tends to stabilize prices at those levels "seem unlikely to effect the allocative functions of the meat market to any significant extent" [11, p. 19].

With regard to the second point, we would expect any decisions made relating to investments in new storage or distribution facilities or to new wholesale or retail structures to be based on fairly long-run expectations of future profitability. Since the results have shown that generally wholesale and retail margins adjust to movements in auction and wholesale prices respectively after a period of 3 months, this point does not seem important in the present context.

Price levelling in particular also offers some advantages to both consumers and retailers if it is confined to the short-run. McShane [17, p. 27] has noted that a majority of consumers have a reasonably fixed and predetermined meat budget. This would influence retailers to level prices and retain custom, since consumers would search for butchers with more stable prices if the prices at their traditional butchery fluctuated wildly. Relatively stable prices also save retailers and wholesalers costs by reducing uncertainty of throughput and thereby increasing administrative and operational efficiency. Apparently there are also high costs involved in changing prices and in letting customers know of these changes, so retailers especially are reluctant to alter their prices if they consider changes in wholesale prices to be of only short-term duration.

To conclude, it appears that short-term price levelling and price averaging do not seriously interfere with the effectiveness of price signals transmitted from consumer to producer and *vice versa*, and further there are some cost savings for consumers and retailers of dealing in stable prices.

4.2 POLICIES TO ALLEVIATE PRICE LEVELLING AND AVERAGING EFFECTS

Even though we have argued that the misallocation of resources due to price levelling and averaging may not be all that large, and in any case could be balanced by the advantages accruing to consumers and retailers, some sectors still may regard these practices as undesirable.

One way of shortening the reaction time of wholesale and retail margins to auction and wholesale price changes could be to increase the accuracy, currency and accessibility of market information. At the wholesale-retail link this possibility is currently being examined as a complement to carcase measurement or classification schemes. However consumers require knowledge of different quality characteristics to those in carcase terms if they are to be more discriminating in their meat purchasing, so the introduction of a grading or classification scheme for retail cuts of meat would seem to be a necessary first step at this level. Consumers could then compare prices between outlets on the basis of fixed quality characteristics and this would give them more confidence to "shop around" for the best buys. Retailers operating under such a system would have to set competitive prices for cuts of a given quality of meat or else lose the custom of purchasers who formerly thought price was positively correlated to quality.

In summary, if it is felt that the effects of price levelling and price averaging should be diminished, formal grading or classification schemes associated with an improved system of market information may provide some dampening effects.

5 CONCLUSIONS

In this study we have provided some empirical evidence on the forces determining the relationships between prices at the auction, wholesale and retail levels of the meat market in the Sydney area. The general conclusion is that at both aggregate wholesale and retail levels, the transmission of supply and demand conditions to the auction level is distorted to some extent during the short-run (periods up to 1 month), but that over longer periods retail and wholesale prices are quite responsive to changes in auction prices. Hypothesis (a) relating to the absence of price levelling is totally rejected in the short-run at both wholesale and retail, while hypothesis (b) relating to the absence of price averaging is rejected for all meats except mutton at wholesale and for all except mutton and pork at retail. These two factors are generally the most important in causing distortions in the pricing mechanism, but we have shown that the effects of these practices are not all that large and further that consumers and retailers derive some benefits from operating under a stable price regime.

The costs of providing market services are a significant determinant of all retail margins so hypothesis (c) is rejected at the retail level. Wholesale costs are significant in only the beef (12) and pork (15) equations, so this hypothesis cannot be rejected for lamb or mutton.

All wholesale margins except mutton (14) are significantly influenced by turnover so hypothesis (d) is rejected for beef, lamb and pork. This same hypothesis can only be rejected for lamb (17) at the retail level.

When trying to illuminate any differences in retail margin behaviour between supermarkets and traditional butcheries and between high- and low-income locations, no overall consistent pattern can be discerned. In terms of hypotheses (e) and (f) the results are generally inconclusive.[12] There is some evidence though that butcher shops tend to practise price levelling more than supermarkets, that high income outlets average margins between meats more (specifically, between lamb and pork margins), and that the two outlets in low-income locations are more influenced by the costs of providing retail services.

This study set out merely to provide empirical estimates of the relationships between retail and wholesale meat margins and the various factors which influence their behaviour. As has been noted previously, this information cannot be used to provide definite policy prescriptions about market

[12] The inconclusiveness of the individual outlet results is probably due, at least in part, to the use of aggregate data in formulating their respective retail margin equations.

competition or profitability issues, but it can give a rough idea of the relative importance of the various influences in each sector and on each meat type considered. This may then help policymakers to better evaluate the effects of any decisions they make concerning those factors which were found to be a significant determinant of margin behaviour. Examples include decisions to alter Homebush slaughtering charges, Homebush throughput capacity, or butchers wages.

Further, the results of this analysis may be used in conjunction with other models of the livestock and meat sectors, e.g. spliced onto a model which predicts monthly livestock price, short-term estimates of wholesale and retail prices may be obtainable.[13]

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[13] In a similar manner perhaps to that proposed by Barr and Gale [4].

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