PRICES OF VEGETABLES IN INDONESIA

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INTRODUCTION

Vegetables, with increasing recognition of their value in the human diet, are rapidly gaining commercial importance in Indonesia. Significantly larger volume and market share of several important vegetables, such as potatoes, tomatoes, lettuce, squash, cabbage, bean, and leafy greens, are being handled, transported, and marketed throughout Indonesia than before.

Production and consumption of fresh vegetables are increasing. During the period 1981 - 1989 cabbage production increased from 349 to more than 923 thousand tonnes, an increase of 165 per cent, due largely to the increase in productivity from 8707 kg/ha to 18999 kg/ha and the harvest areas from 40 to 48.6 thousand hectares. Consumption of vegetables is expected to continue to rise as income grows. During the years 1981 - 1990 monthly per capita expenditure on vegetables increased from Rp 863 to Rp 1618.

As raw vegetables are transformed through distribution and related services, the evidence of direct relationship among prices at different levels of exchange becomes increasingly difficult to evaluate. Price leads and lags among farm, wholesale, and retail may arise. The extent of price changes through the vertical market chain is particularly important for producers and consumers.

Because vegetables in Indonesia are not generally contract grown or harvested, there is less of a credit link binding the farmer to the marketing agents. This provides an atmosphere conducive to greater bargaining over prices at both the farm and the wholesale level. Accordingly, vegetable prices would be expected to vary substantially in line with the short-run shifts in demand and supply at every level of the marketing chain.

According to Griffith et.al(1992), there is evidence in Sydney vegetable markets that retailers maintain at least some measure of price variability by adopting price levelling practices. Price levelling refers to the practice of retailers

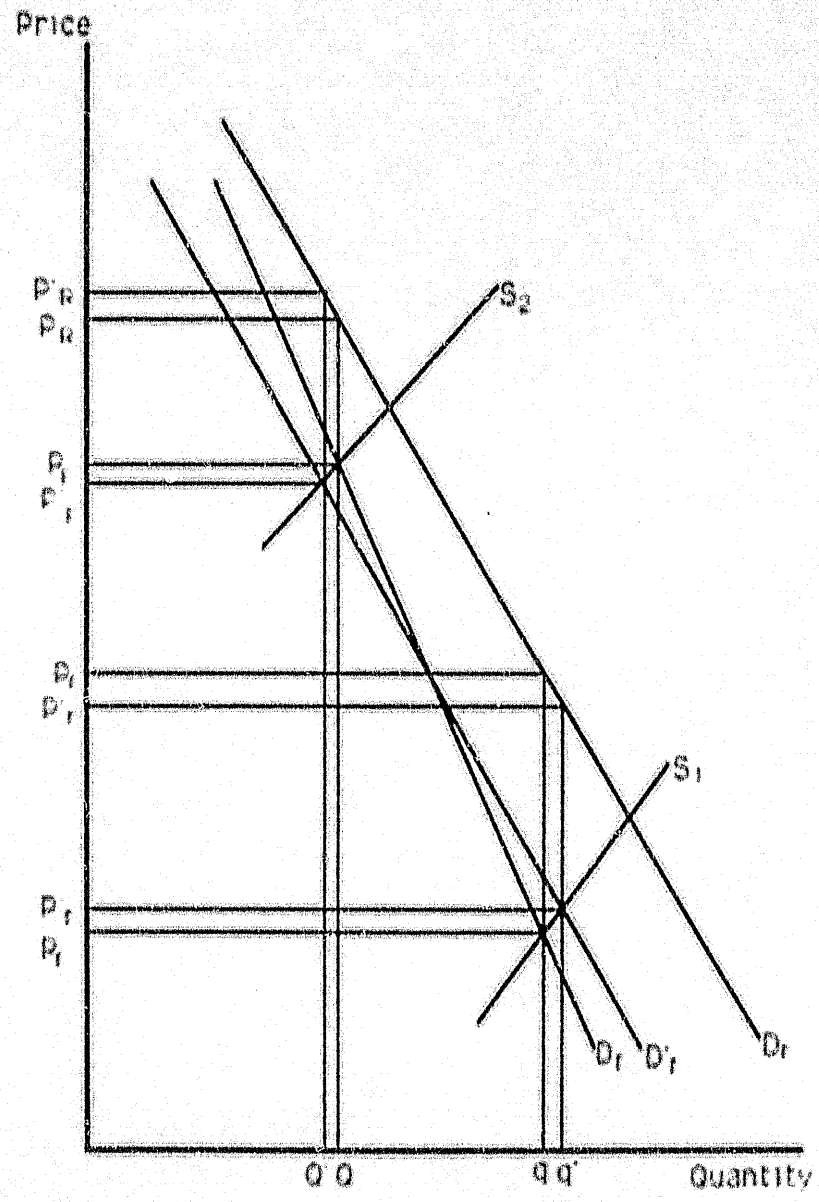
holding selling prices relatively stable while wholesale prices fluctuate. Various studies in Australia indicate that price levelling is common in retail levels of meats markets (Marceau 1968, Griffith 1974, Griffith et.al 1991, Naughtin and Quilkey 1979).

According to Parish (1967), price levelling behaviour smooths the impact of fluctuations in raw material prices on the prices charged to consumers. The effects of price levelling on quantities marketed and on consumer and producer prices are illustrated in Figure1. D_r and D_f represent the demand for Q at retail and farm levels, respectively. D_f is derived from D_r by subtraction of the marketing margins, which vary inversely with price level. D'_f is derived similarly, but on the assumption that an absolute margin is maintain irrespective of the price level. S_1 and S_2 represent the supply of Q in times of abundance and scarcity, respectively. It is seen that the effect of price levelling is to bring greater stability to quantity marketed (q to Q as supply shifts from S_1 to S_2) and to retail prices (P_r to P_R) than would otherwise be the case (P'_r to P'_R, q' to Q'). Since wholesale and farm price linkages are reasonably strong, the farmgate price becomes less stable.

Another pricing practice which wholesalers and retailers may use is price averaging. Price averaging is defined as the practice of setting higher price spreads on some types of product to off-set lower price speads on other types of related product. This may be relevant because most wholesalers and retailers in Indonesia are multiproduct firms selling a wide range of fresh vegetables.

Evidence of retail price rigidity in vegetables markets, as a result of retailer's price levelling practices are available in Australia (Griffith et.al 1992) and the United States (Ward 1982), but no examination of this issue at wholesale levels has been conducted using Indonesian data. The objective of this preliminary study is to investigate whether wholesalers of fresh vegetables in Jakarta markets

Figure 1: Price Spread Model with Price Levelling (Parish 1967)



practice price levelling and averaging. It is important to understand the factors determining the relationships between prices at different market levels, and whether wholesalers practice price levelling/averaging or not has important implication for fresh vegetable producers.

DATA and MODEL

The study is limited to a few fresh vegetables (squash, tomatoes, stringbean, and cabbage), where price information is available at each point of exchange. Accurate statistics on inter-regional or inter-provincial movements of vegetables are not available. But it is obvious that the wholesale market for vegetables in Bandung area (West Java) serves as a major supply point for terminal markets in Jakarta.

This preliminary analysis is based on monthly time-series data from wholesale markets in a producer area (Bandung) and a wholesale market in a consumer area (Jakarta) for the period January 1981 to December 1990. Data was prov ded by The Food Directorate of The Department of Agriculture. Wholesale prices in the producers' area and wholesale prices in the consumers' area are assumed to differ by a fixed transport cost and percentage mark-ups. In the consumers' area (Jakarta) wholesale mark-ups in vegetables hinge largely on buying bulk quantities from wholesalers in produ-er areas and selling to reta!'ers in Jakarta in smaller lots of volume or weight.

Following Griffith et.al (1991), a short run wholesale price spread model is as follows:

(1) $PSW_i = f(PWP_i, CW_i, T_i, LPWP_i, PSW_j, PSW_k, PSW_l, LPSW_i)$,

where i, j, k, l deno various products, squash, tomat·es, stringbean, and cabbage.

PSW_i is the wholesale price spread of the i^{th} product defined as the wholesale price of i in Jakarta minus the wholesale price of i in Bandung,

PWP_i is the wholesale price of the i^{th} product in the producers' area (Bandung),

CW_i is wholesale marketing costs of i^{th} product,

T_i is turnover of i^{th} product,

$LPWP_i$ is the wholesale price of the i^{th} product in the producer area (Bandung) lagged one period,

$LPSW_i$ is the price spread of the i^{th} product lagged one period.

However, due to two important data limitations the above proposed model (1), had to be modified. First, an index of monthly wholesale marketing costs could not be obtained. Griffith et.al (1992) use the monthly wage rate as a proxy for marketing costs, but unfortunately such data is not available in Indonesia. Second, no monthly data for even quarterly throughput of vegetables at wholesale were available. Hence the turnover (T_i) and marketing costs (CW_i) variables were dropped from the analysis.

The modified model estimated was therefore:

(2) $PSW_i = f(PWPi, LPWP_i, PSW_j, PSW_k, PSW_l, LPSW_i)$.

The wholesale price spread between the consumer area (Jakarta) and the producer area (Bandung) for the i^{th} vegetable is specified to be dependent on the respective wholesale price in the producers' area (Bandung), both current (PWR_i), and past, ($LPWP_i$), the past price spread ($LPSW_i$) and on other wholesale price spread (PSW_j, PSW_k, PSW_l).

The price levelling hypothesis suggests that the parameter on the variable PW_i is negative and statistically significant. The price spread (PSW_i) moves in the opposite direction to the wholesale price in the producers' area. As wholesale prices in Bandung rise the wholesale-wholesale price spread contract, and vice versa. The coefficients on the variable $LPWP_i$ is expected to be positive and significant, as the lagged of wholesale price in the producer area rises (falls), the price spread expands (contracts) to dampen the negative impact in the immediate period. In the longer term, wholesale prices in the consumers' area (Jakarta) follow the same pattern as wholesale prices in the producers' area (Bandung). The inclusion of the $LPSW_i$ variable is justified on the basis of a partial adjustment assumption. There is some influence from the past values of PSW_i in the decision to set the current value of PSW_i. The price averaging hyphothesis implies that the parameters on the variables PSW_j, PSW_k, and PSW_l are negative and significant, as the price spread for the j^{th}, k^{th}, or l^{th} product contracts the price spread for the i^{th} product expands, so that on average for these products, margins are made more stable.

Expectations with regard to price and seasonal conditions are likely to become an important factor in the wholesaler's marketing decision. So, in order to capture seasonal variation in price spreads quarterly dummy variables are introduced into model (2), that is:

(3) $PSW_i = f(PWP_i, LPWP_i, PSW_j, PSW_k, PSW_l, LPSW_i, D_1, D_2, D_3)$,

where D_1=dummy variable for 1st quarter, =1 in quarter 1, =0 otherwise.

D_2=dummy variable for 2nd quarter,=1 in quarter 2, =0 otherwise,

D_3=dummy variable for 3rd quarter,=1 in quarter 3, =0 otherwise.

There are four equations in the model, one for each type of vegetable. Two alternative estimation techniques were employed in the analysis; two stage least

squares (2SLS) and three stage least squares (3SLS). Since the equation for each type of vegetable contains the dependent variables (PSW's) of the other three equations, ordinary least squares (OLS) was not considered, because OLS would produce biased and inconsistent parameter estimates.

RESULT

Results from 2SLS and 3SLS estimates are represented in Table 1 and 2, respectively. The figures in parentheses are the estimated standard errors. The results are consistent across the two estimates. In all models the matrix of contemporaneous covariances between the 2SLS errors terms is non-zero, so 3SLS estimates are asymptotically more efficient. This is indicated by comparison of the relative standard errors of estimation in Table 1 (2SLS) and Table 2 (3SLS), with those of the 3SLS estimates smaller in all cases. In models in which it can be assumed that the structural disturbances are uncorrelated across equations, 3SLS estimates will be the same as the 2SLS estimates (Kmenta 1986).

The expected negative relationships between price spreads and wholesale price in the producers area occurred in the tomato and stringbean markets. For tomatoes the coefficient of the wholesale price in the producer area was highly significant, while in the stringbean market the coefficient estimate was only equal to its standard error. The results suggest that the practice of price levelling occurs in the wholesale market, at least for the tomato market. As shown in Tables 1 and 2 the wholesale spreads for tomatoes and stringbean are significantly and positively related to past wholesale price (Bandung). This result indicates that short-run price levelling occurs but in the longer term wholesale spreads adjust to wholesale prices in the producer area.

No significant evidence of price averaging exists in the wholesale spreads. The coefficients that are statistically significant have positive signs, suggesting some form of commentary relationship rather than price averaging. However the dummy variable for the 3rd quarter is negative and significant for squash and

tomatoes, and in the 1st and 2nd quarter for stringbean, suggesting some limited averaging behaviour during this period. A very strong partial adjustment effect is shown to exist in all equations.

CONCLUSION

In this preliminary analysis an attempt has been made to provide empirical evidence on forces determining the relationship between monthly vegetable prices at the wholesale level in the producer area (Bandung) and wholesale level in the consumer area (Jakarta). The general conclusion is that price levelling behaviour cannot be completely ignored at the two wholesale levels. However over longer periods wholesale prices in Jakarta are quite responsive to changes in wholesale price in the producer area (Bandung). No evidence of price averaging behaviour was found for any of vegetables examined.

Table1 : 2SLS Results

Vegetable	C	Whole-sale Price	Lagged W'sale Price	Squash Spread	Tomato Spread	S'bean Spread	Cabbage Spread	Lagged Dept Variable	D_1	D_2	D_3	R^2
Squash	-3.663	0.114	0.110	-	-0.034	0.062	0.581	0.517	-4.577	-5.356	-8.850	0.70
	(7.103)	(0.152)	(0.143)	-	(0.058)	(0.083)	(0.310)	(0.086)	(5.478)	(5.832)	(4.917)	
	-6.429	0.135	0.078	-	-0.019	0.078	0.479	0.501				0.71
	(6.631)	(0.139)	(0.135)	-	(0.056)	(0.068)	(0.264)	(0.083)				
Tomato	-15.330	-0.196	0.270	0.879	-	-0.055	0.492	0.535	-4.565	-0.478	-26.243	0.69
	(18.459)	(0.067)	(0.079)	(0.377)	-	(0.219)	(0.849)	(0.118)	(15.674)	(16.546)	(14.117)	
	-27.116	-0.170	0.234	0.929	-	-0.084	0.836	0.478				
	(18.135)	(0.068)	(0.077)	(0.391)	-	(0.198)	(0.804)	(0.118)				0.68

Vegetable	C	Whole-sale Price	Lagged W'sale Price	Squash Spread	Tomato Spread	S'bean Spread	Cabbage Spread	Lagged Dept Variable	D_1	D_2	D_3	R^2
S'bean	5.827	-0.079	0.155	0.066	0.266	-	0.822	0.289	-20.181	-22.242	-8.842	0.50
	(20.163)	(0.079)	(0.092)	(0.485)	(0.152)	-	(0.892)	(0.096)	(14.911)	(15.523)	(16.065)	
	1.428	-0.097	0.163	0.220	0.290	-	0.269	0.322				0.51
	(19.286)	(0.075)	(0.081)	(0.430)	(0.149)	-	(0.777)	(0.091				
Cabbage	6.425	0.043	0.042	-0.108	0.092	0.043	-	0.288	4.199	3.064	-0.932	0.47
	(4.383)	(0.035)	(0.037)	(0.131)	(0.041)	(0.065)	-	(0.115)	(4.316)	(4.492)	(4.235)	
	8.519	0.045	0 041	-0.096	0.110	0.010	-	0.285				0.47
	(3.517)	(0.035)	(0.037)	(0.126)	(0.6ס8)	(0.060)	-					

Table 2: 3SLS Results

Vegetable	C	Whole-sale Price	Lagged W'sale Price	Squash Spread	Tomato Spread	S'bean Spread	Cabbage Spread	Lagged Dept Variable	D_1	D_2	D_3	DW
Squash	-5.723	0.168	0.109	-	-0.046	0.062	0.623	0.498	-4.317	-5.499	-8.655	2.43
	(7.025)	(0.148)	(0.138)	-	(0.058)	(0.082)	(0.307)	(0.084)	(5.470)	(5.814)	(4.912)	
	-7.586	0.184	0.051	-	-0.027	0.105	0.499	0.453				2.32
	(6.532)	(0.134)	(0.128)	-	(0.056)	(0.067)	(0.262)	(0.081)				
Tomato	-15.549	-0.170	0.212	0.721	-	0.013	0.81(	0.498	-3.008	1.055	-23.736	1.88
	(17.722)	(0.060)	(0.071)	(0.369)	-	(0.214)	(0.823)	(0.110)	(15.47)	(16.285)	(14.004)	
	-31.969	0.124	0.150	0.681	-	0.013	1.585	0.381				1.73
	(16.724)	(0.058)	(0.066)	(0.371)	-	(0.194)	(0.738)	(0.105)				

Vegetable	C	Whole-sale Price	Lagged W'sale Price	Squash Spread	Tomato Spread	S'bean Spread	Cabbage Spread	Lagged Dept Variable	D_1	D_2	D_3	DW
S'bean	4.763	-0.065	0.145	0.124	0.261	-	0.798	0.276	-20.402	-22.382	-8.666	1.90
	(19.750)	(0.074)	(0.086)	(0.474)	(0.152)	-	(0.884)	(0.091)	(14.878)	(15.46)	(15.848)	
	3.752	-0.089	0.140	0.456	0.285	-	-0.011	0.298				1.93
	(18.994)	(0.072)	(0.078)	(0.423)	(0.148)	-	(0.773)	(0.089)				
Cabbage	7.250	0.037	0.015	-0.099	0.110	0.054	-	0.257	4.196	3.622	0.043	2.02
	(4.342)	(0.030)	(0.031)	(0.127)	(0.039)	(0.062)	-	(0.103)	(4.297)	(4.458)	(4.213)	
	10.979	0.039	0.009	-0.055	0.156	-0.016	-	0.201				1.90
	(3.439)	(0.030)	(0.031)	(0.123)	(0.036)	(0.058)	-	(0.094)				

System weighted R-square for first model (with dummy variables) = 0.77

System weighted R-square for second model (without dummy variables) =0.76

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