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Assessing the Inefficiencies in Price Determination of Rice in Sri Lanka: Econometric Inverse Demand Model Approach

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ABSTRACT

Rapidly increasing retail price of rice has become a subject of national interest in the recent past. Although Sri Lanka is claimed to be self sufficient in paddy, it was observed incessantly that the price of which at different levels of the marketing channel is highly exploited, and as a result, farmers are at a disadvantageous position. This article uses an Econometric Inverse Demand Model Approach to examine this economic problem, where two models were specified to explore the determinants of retail price of rice and farm gate (producer) price of paddy in Sri Lanka. The secondary data were collected from the Hector Kobbakaduwa Agrarian Research and Training Institute from 1980 to 2005. The variables in these models were specified to represent a Regression on Standardized Variables and coefficients of which were estimated using the OLS techniques. The results revealed that the marketing margin (MM) and few other variables including the retail price of wheat flour and per capita income had a significant impact on determining the retail price of rice, while the cost of labor and other inputs and the marketable quantity of paddy were contributed significantly in deciding the farm gate price. Irrespective of the fact that rice has been considered an inelastic good, the magnitude of MM of rice has always been greater than the farm gate price over this period and interestingly it exhibits an increasing trend. The outcome of econometric analysis proves that the gains from production of self sufficient levels of paddy in the country were not passed towards the producers appropriately as the markets were exploited enormously by middlemen. It should, therefore, be the duty of regulatory agencies to intervene effectively to keep up a constant MM overtime in order to guarantee a firm and fair price for both farmers and consumers.

Key words: Econometric inverse demand model, Marketing margin, Paddy industry in Sri Lanka, Price inefficiency, Standardized regression

INTRODUCTION

Systematic economic investigations carried out time to time on the behavior of prices in agricultural markets is vital for policy planners to maintain the economic, social and political stability of a nation. Especially, such analyses conducted for a crop like paddy and its major processed product of rice is indispensable due to a number of reasons.

Paddy sector plays a vital role in the economy of Sri Lanka with a contribution of 2.9% to the total Gross Domestic Product (GDP) and by providing livelihood to nearly 0.9 million farm families island wide (Central Bank of Sri Lanka, 2006). While there are about 32% of labor force in the country is engaged in agriculture related activities, about a half of which is involved with the paddy industry (Department of Census and Statistics, 2006). Not only these, but it is an important sector in terms of food security in the nation also, since rice is the staple food of the majority of Sri Lankans. The per capita consumption of rice in the country fluctuates around 100 kg per annum depending on the price and availability of stocks of which and of its major substitutes, for example wheat flour. In 2006, the total paddy production in Sri Lanka was nearly 3.3 million metric tons. On an average, there are about 560,000 and 310,000 hectares of lands cultivated with paddy during the Maha and Yala seasons, respectively, making the average annual extent sown with paddy to about 870,000 hectares. The total extent of arable paddy lands in the country has increased from 844,647 to 937,175 hectares from 1980 to 2005. The paddy production has, as a result, increased from 2,120 thousand metric tons to 3,246 thousand metric tons during this period (Agricultural Commodity Review, 2005) (Figure 1).

According to Jayasinghe-Mudalige (2008), many provinces and districts in Sri Lanka, excluding those with high population densities such as Western province, has a potential to feed its population with the paddy it produces or rice processes in the same geographical area given that the paddy and rice markets are not distorted (Figure 2).

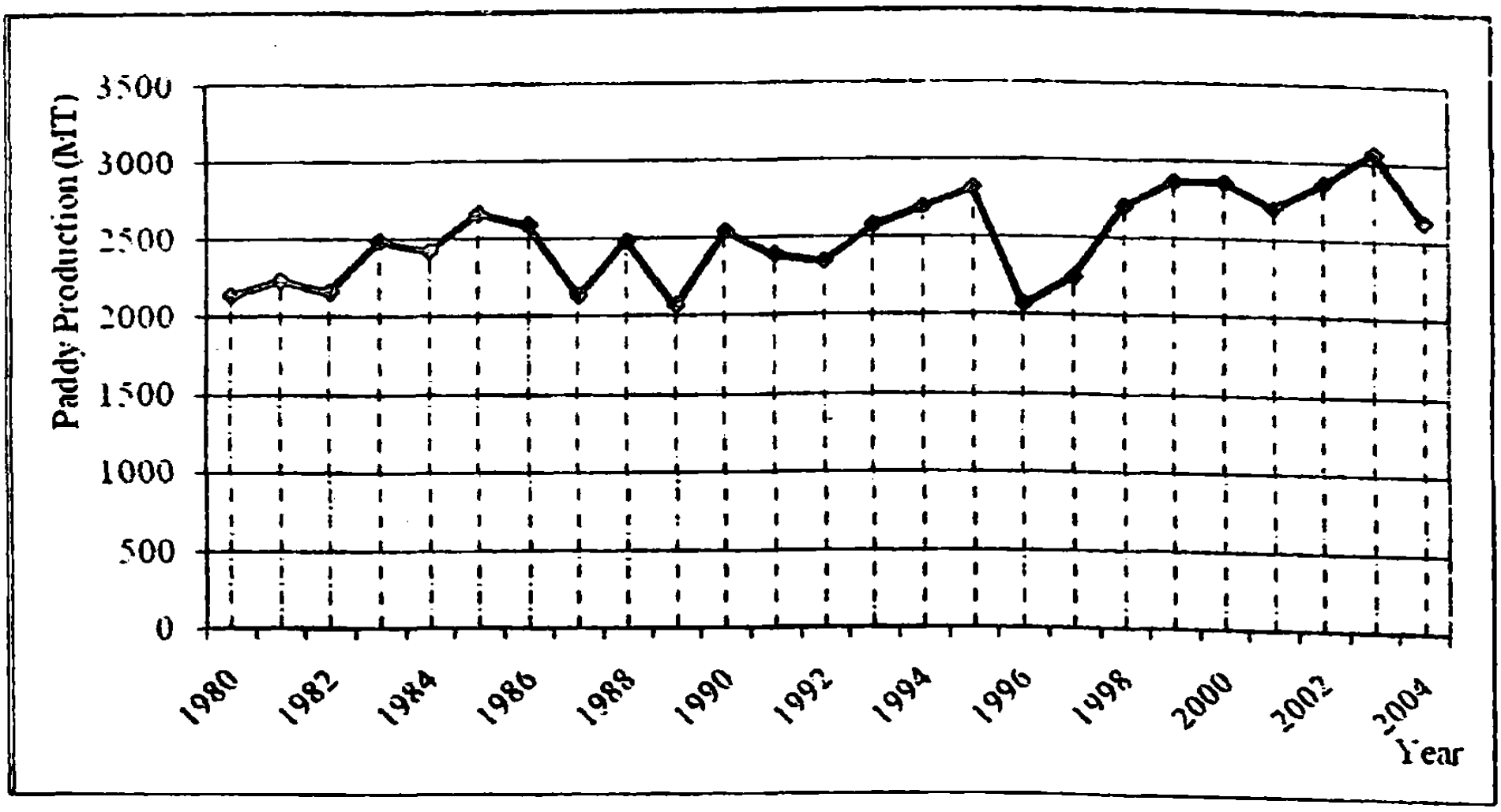
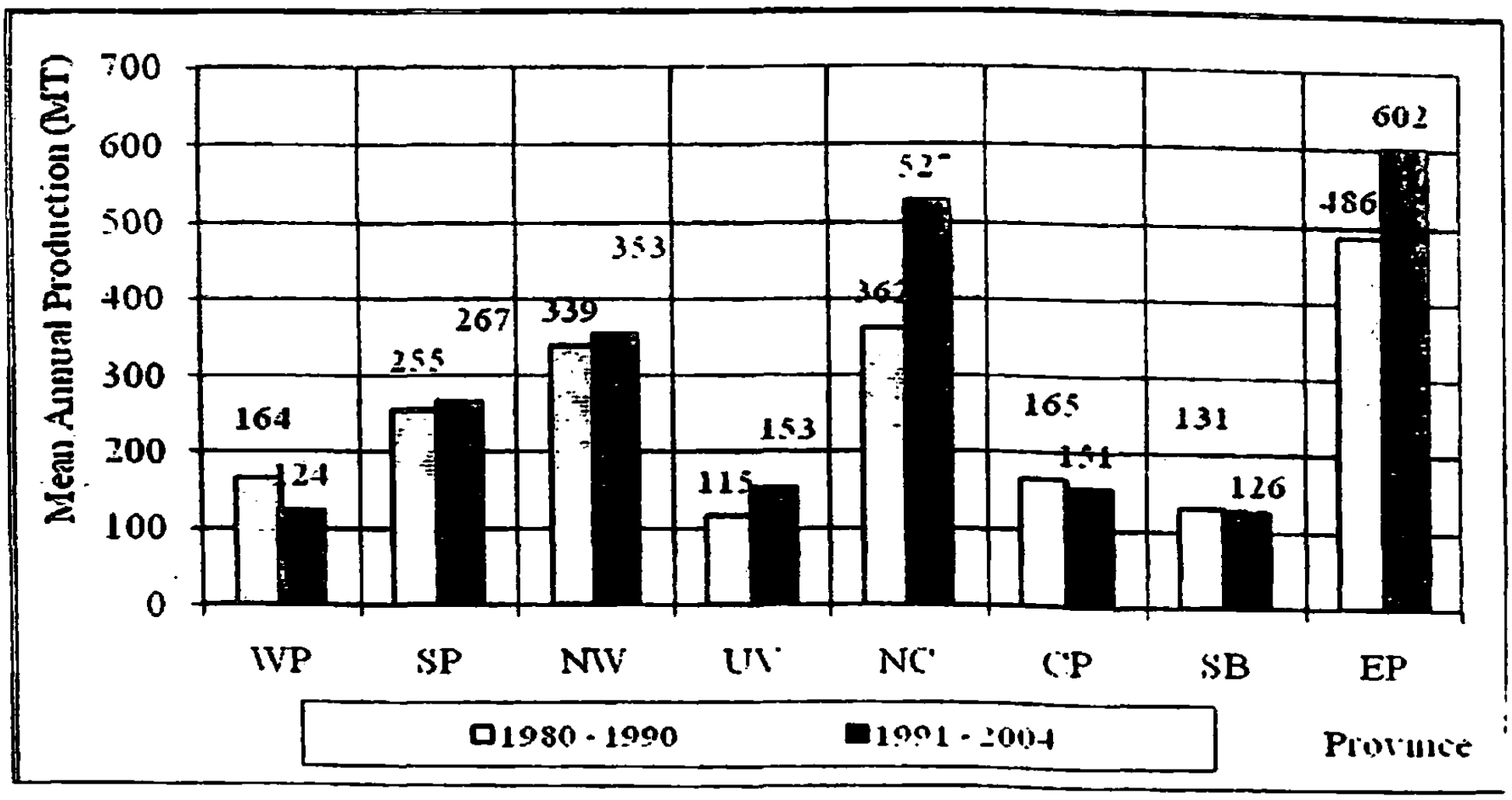


Figure 1: Paddy production in Sri Lanka (1980 – 2004)



Note: WP – Western; SP – Southern; NW – North Western; UV – Uva; NC – North Central; CP – Central; SB – Sabaragamuwa; EP - Eastern

Figure 2: Mean annual paddy production at the province level

Beside all these achievements, behavior of setting farm gate for paddy and retail price for rice has become a subject of a national issue today. It is hardly a secret that the rapidly increasing retail price of rice has become an unbearable burden for the consumers, and as a result, direct intervention of government through stringent regulations is inevitably called for. Although the farm gate price of paddy has not increased remarkably over the years, on an average, it was observed that consumers were paying high retail prices for rice; thus, making entire process of determination of price in this particular industry inefficient.

Analyzing the trends in Marketing Margin (MM), which is, in broad, defined as the difference between what consumer pays for food and what the farmer receives (Kohls and Uhl, 1990), is considered as an important aspect of agricultural product marketing and it is very useful in exploring the effects of unfair pricing practices. The economic theory suggests that widening of the MM can discourage producers to retain in the industry as the real benefits of agricultural production do not transfer adequately and rationally to those in the bottom of the supply chain. In a situation where, general public believes that returns to the farmers from agricultural production is relatively low in compared to the others in the marketing channel (i.e. processors, wholesalers, retails) as they charge exorbitant prices for their services, the specific objective of this study was to examine the determinants of farm gate price of paddy and retail price of rice using an econometric approach. We next explore the methods used to examine this economic problem and to collect and analyze data. The results are presented next followed by the discussion and conclusions.

METHODOLOGY

Theoretical Framework

The Econometric Inverse Demand Model Approach (Marsh, 1991; Kuo, 2006), where the price of a commodity is specified as a function of a number of other variables (e.g. quantity, income) was used in the analysis. In turn, the following Retail and Farm gate Demand Functions for rice and paddy, respectively, were specified to show the potential relationship between the price (regressand) and a set of other important regressors:

$$P_r = f_1 (MQR, P_w, I, QRI, MM) \quad (1)$$

$$P_f = f_2 (MQP, QRI, COL, COI) \quad (2)$$

where, in equation (1), P_r = retail price of rice; MQR = marketable quantity of rice; P_w = retail price wheat flour; I = percapita income; QRI - quantity of rice imports, and MM = marketing margin. In equation (2), P_f = farm gate price of paddy; MQP = marketable quantity of paddy; COL = cost of labor, and COI = cost of other inputs. The market clearing conditions were assumed in both the retail and farm gate levels such that: $Q_S = Q_D$, where Q_S is quantity supplied to the market and Q_D is quantity demanded in the market. Given the fact that MM explains the difference between retail price (of rice) [P_r] and farm gate price (of paddy) [P_f], we can state that: $P_f = P_r - MM$

In this type of analysis that uses time series data, over and above the effect of inflation, use of diverse units of measurements (e.g. Kg, Metric Tons) to express the regressand and regressors can make it difficult to interpret the regression coefficients (Johnston and Dinardo, 1997). The econometric literature pointed out that one may you "standardized variables", i.e. subtract the mean value of each variable from its individual values and dividing the difference by the standard deviation of that variable, to avoid the problems associated with expressing the regressand and regressors in the model. For example, the price variable can be standardized as follows:

$$P^* = \frac{Pit - \overline{Pi}}{SDPi} \qquad (3)$$

where; P_{it} = observed price at t^{th} time period; $\overline{Pi}$ = Mean of the observed prices, and SDP_i = Standard Deviation of the price. A similar notation can be used to develop the other variables. An interesting property of a standardized variable is that its Mean value is always zero and its Standard Deviation is always 1 (Gujarati, 1995).

The econometric Standardized Inverse Demand Models for the Farm gate price (P_f^*) and Retail price (P_r^*) can, in turn, be specified as follows:

$$P_F^* = \beta_1^* MQR^* + \beta_2^* P_W^* + \beta_3^* I^* + \beta_4^* QRI^* + \beta_5^* MM^* + u_i \qquad (4)$$

$$P_R^* = \beta_6^* MQP^* + \beta_7^* QRI^* + \beta_8^* COL^* + \beta_9^* COI + u_i \qquad (5)$$

where, * denote the "standardized" form of the variable; β_i = parameters ("beta coefficients") of the model, and u_i = error term. The value of intercept term of a standardized regression is always zero. By standardizing all regresors, we put them on "equal" basis, and therefore, can compare them directly. If the coefficient of a standardized regressor is larger than that of another standardized regressor appearing in the model then the former contributes more relatively to the explanation of the regressand than the latter. In other words, we can use the beta coefficients as a measure of relative strength of various regressors (Gujarati, 1995).

Data Collection and Analysis

The Secondary data on farm and retail prices of paddy and rice and several other important variables included in these models for the period of 1980 to 2005 were taken from the databases available in the Hector Kobbakaduwa Agrarian Research and Training Institute in Colombo. As the behaviors of retail prices of parboiled, samba and raw rice across the time period considered in this analysis were shown an almost similar pattern, the average of the retail prices of these three rice varieties were taken to calculate the retail price used in the analysis. Given that, the difference between the average of monthly retail price of rice and farm gate price of paddy was taken to estimate the Marketing Margin of each year using the nominal prices and the real prices derived using price deflators. Based on the historical data, it was assumed that the marketable surplus of paddy in the country was 65% of the total paddy production and the marketable surplus of rice was 65% of the marketable surplus of paddy.

The Ordinary Least Square (OLS) techniques were used to analyze the data using SPPS (version 14.0). The estimates of coefficients were obtained for four empirical models: (a) non-deflated retail price model and (b) deflated retail price model (equation 1), and (c) non-deflated farm gate price model and (d) deflated farm gate price model (equation 2).

RESULTS AND DISCUSSION

Marketing Margins

Figure 1 shows the behavior of retail price (P_r), producer price / farm gate price (P_f) and the marketing margin (MM) for the period of 1980 to 2005 using nominal prices. It is generally accepted that whatever price changes occurred in the retail market for a commodity, rice in this case, a constant marketing margin should be

n maintained overtime by allowing the farm gate price of which, paddy in this case, s also to be changed accordingly. However, the historical data show that the n magnitude of marketing margin between paddy and rice was always above the farm g gate price and it has been increased over time (Figure 3).

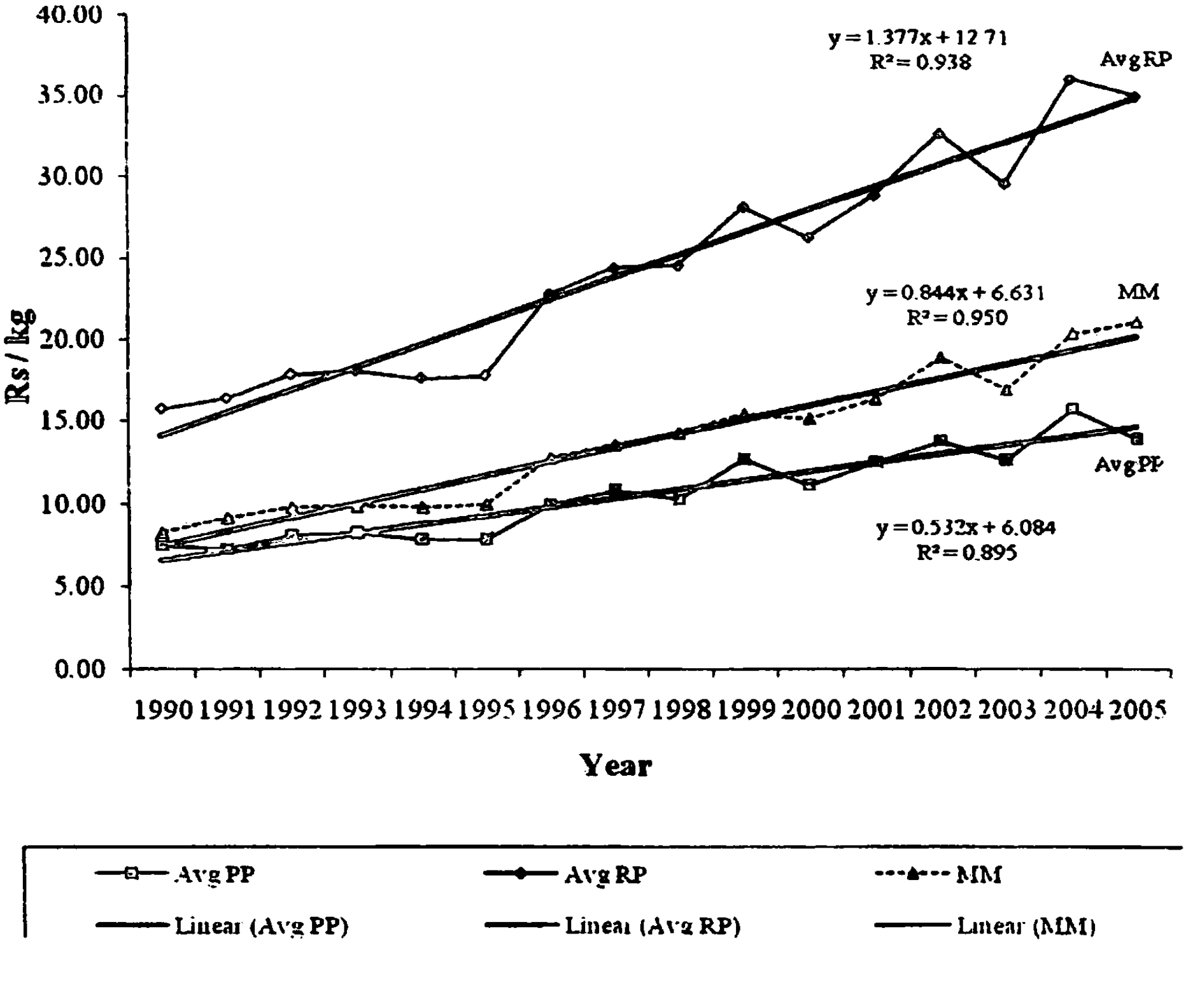


Figure 3: Trend in average nominal producer price, retail price and marketing margin

As shown in Figure 3, the retail price of rice was increasing at a much faster rate, i.e. on an average Rs. 1.377 each year, in compared to the farm gate price of paddy, which increases just Rs. 0.532 annually, on an average. The ultimate result is inefficient price determination in the paddy markets as the marketing margin

increases gradually during this period by Rs. 0.845, on an average. Figure 4 explores this phenomenon further.

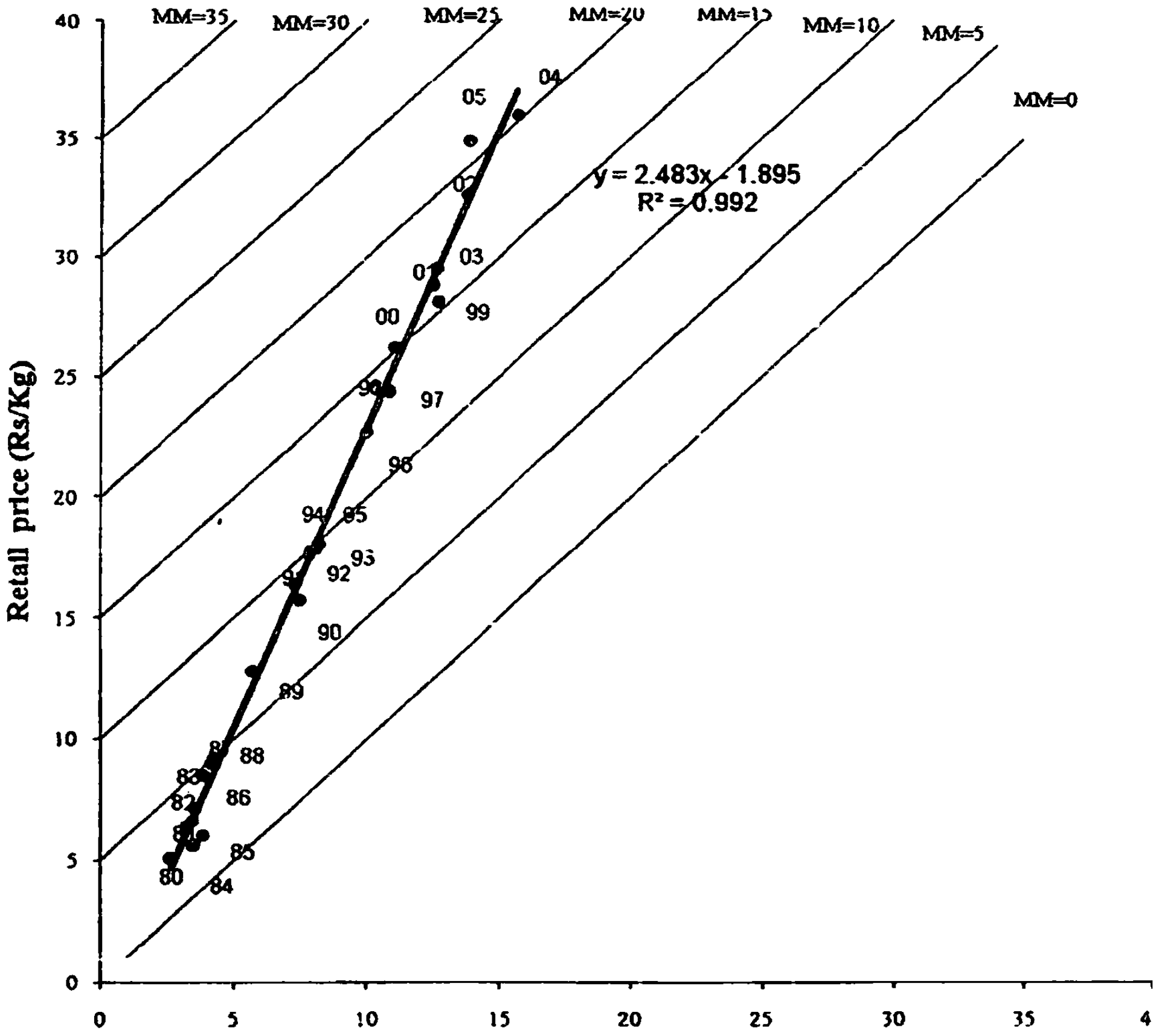


Figure 4: Trend in nominal producer price versus retail price of rice

Non-existence of a constant marketing margin suggests that paddy processors in the middle of the supply chain exploit the market for higher prices. From figure 3, it is clear that the marketing margin has increased gradually over time at the rate of 2.48, i.e. for a unit increase of a producer price, the retail price of rice increases by 2.48.

Estimates of Coefficients of the Models

The descriptive statistics for the non-standardized variables included in four empirical models are depicted in Table 1. It shows that there exists a very significant difference for CV between marketable quantity of rice (12.5%) and marketable quantity of paddy (124.5%). The CV was high in marketing margin (58.2%) in compared to retail (55.5%) and farm gate (49.9%) prices.

Table 1. Descriptive statistics of variables in the model

Variables	Mean	Standard Deviation	Coefficient of Variation (CV) (%)
P_r	17.96	9.94	55.3
P_f	8.00	3.99	49.9
MQR	1069888527	133108463	12.5
P_w	13.50	6.81	50.5
I	20126.2	19198.2	95.3
QRI	141497356	87651139	61.7
MM	9.97	5.98	58.2
MQP	1645982350	204782250	124.5
COL	4861	3187	65.6
COI	2819.9	1779.7	63.1

The regression results on estimating Inverse Demand Model for retail price of rice are shown in table 2 for both non-deflated and deflated price models.

A higher number of variables in the deflated version of both retail and farm gate models were significant than non-deflated versions of the same. The results show that marketing margin (MM) has the highest and a positive impact on deciding the retail price of rice in Sri Lanka and price of wheat (P_w) also played a positive and significant role. Interestingly, increasing per capita income of consumers (I) has forced to reduce the retail paddy prices suggesting that although rice becomes a normal good for majority of consumers but they tend to move away from purchasing it at higher prices as their per capita income rises. The other variables (i.e. MQR and QRI) did not affect significantly in deciding the retail prices of rice.

Table 2: Estimates of coefficients of the model

Variables	Farmer Gate Price Model		Retail Price Model	
	Non- deflated	Deflated	Non- deflated	Deflated
MQR	-	-	0.004 (0.020)	-0.053 (0.047)
P_w	-	-	0.011 (0.051)	0.429** (0.037)
I	-	-	0.014 (0.035)	-0.084** (0.036)
QRI	0.086 (0.047)	-0.136 (0.145)	0.018 (0.015)	0.008 (0.034)
MM	-	-	0.973** (0.042)	0.634** (0.038)
MQP	-0.049 (0.065)	-0.656** (0.153)		
COL	0.488** (0.200)	0.332** (0.134)		
COI	0.539** (0.200)	0.158 (0.131)		

The marketable quantity of paddy (MQP), as expected, has the highest and negative impact on farm gate price of paddy. The cost of labor (COL) and other inputs (COI) too had a significant positive impact on farm gate price, where the effect of labor is greater than other inputs. Interestingly, quantity of rice imported (QRI) had no any significant impact on determination of both farm gate and retail prices.

CONCLUSIONS

The outcome of analysis shows that retail price of rice have been increased at a rate faster than the farm gate price for paddy during 1980 to 2005, thus creating an ever increasing marketing margin. The magnitude of marketing margin of rice in this period was always greater than the producer price for paddy and it was further widening.

Overall, the results imply that care must be taken to maintain at least nearly constant marketing margins as ever increasing margins do not provide positive environment

for paddy farmers to retain in the business. What we can see in rice markets in Sri Lanka is that allowing the markets to work freely without state intervention does not create efficient solutions for producer and retail price that affects the balance between consumer and producer welfare. Therefore, it is inevitable for the government to set and maintain a ceiling price for rice, as it does at present, and at the same time setting a floor price for paddy. This would lead the processors in the middle of the paddy marketing chain to "work" on a fixed price premium on a competitive basis. At present, the milling and wholesaling operations are under the control of few large scale operators and the small scale operators are on the verge of extinction as they cannot compete by the economic and political stronghold of them. Hence, the government should come forward to regulate the paddy marketing channel to a greater extent not only by introducing competition laws such as rules to break excessive pricing, artificial supply shortages, collusive dealings and trading cartels created by rice traders, but by introducing systems of quota and price formulations. These regulations will provide incentives to all parties, including producers, small scale processors more specifically and retailers to retain in the business with right price premium for their work.

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