The Broiler Chicken Industry in Malaysia: Some Evidences on the Structure, Conduct and Performance

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Abstract

The broiler chicken industry in Peninsular Malaysia has undergone major structural changes in recent years, notably the increasing vertical integration in the industry, which has led to concerns over market power by wholesalers at the expense of producers and consumers. This paper investigates the performance of the broiler market by applying the Structure, Conduct and Performance approach. Using primary data collected from a survey on the wholesale market for broilers, it was found that there was a high degree of concentration in most of the wholesale markets as evident by the high concentration ratio and Herfindahl-Hirshman Index. There are also several conditions that restrict the entry of new players. However, in spite of structural rigidities, the study found evidence of spatial market integration using cointegration analysis. This finding suggests that the government could reconsider price control policy measures in the market.

Keywords: Structure-conduct-performance, industry concentration, market integration, cointegration, livestock, Malaysia.

Introduction

The broiler chicken industry in Peninsular Malaysia has undergone major structural changes, particularly increasing vertical integration and growing market concentration at the wholesale level. There has also been a gradual shift towards contract farming with an increasing number of broiler farmers working under contract arrangements for wholesale firms and integrators. These structural developments are likely to affect the performance of the industry, particularly in pricing efficiency and market integration. Evidence of inefficiencies may manifest in inefficient operations of markets and higher prices paid both by input purchasers and consumers.

The broiler industry is frequently embroiled in crises as a result of severe price fluctuations and these have often been blamed on the boom-and-bust cycle in

production. In order to reduce price volatilities, the government introduced a market support scheme via a committee pricing system in 1986. Under this scheme, a weekly ceiling price is negotiated and fixed and this acts as a reference price beyond which the market price should not exceed. However, broiler prices continue to experience dramatic fluctuations in spite of the government's initiatives. It is thus important for producers to continually manage supply to match demand so that price fluctuations are minimised. This requirement underlines the importance of adequate information flows, particularly to the producers.

The wholesale sector in the Malaysian broiler chicken industry appears to be highly concentrated as evident by their relatively small numbers but large market shares. The farm level suppliers, on the other hand, are fragmented, physically distant from the retail markets, and some of them are dependent on the wholesalers for inputs and credit which reduces their bargaining power somewhat. Lack of ready access to market information and marketing facilities has also pushed many of the farmers to rely almost totally on intermediaries (wholesalers) to carry out the marketing decisions and functions. In fact, the close relationship between farmers and wholesalers is sometimes described as a symbiotic relationship where each needs the other. While they may need each other to function, the bargaining power scale is skewed towards the wholesalers in view of their economic strength and most importantly, access to market information, both from the supply and demand sectors.

This paper draws on the widely accepted framework of Structure-Conduct-Performance (SCP) paradigm to study the impact of increased concentration in the broiler chicken industry in Peninsular Malaysia. The following section presents the theoretical framework and methodology used in this study. This is followed by a discussion on the findings and conclusions.

Literature Review

The marketing system for agricultural produce in Malaysia has been found to be seriously flawed with inefficient price discovery mechanism, for instance, the market for fish (Mohd Ariff et al., 1985), rice (Fatimah, 1992), floriculture (Chiew et al., 1996) and vegetables (Sharifah, 1994). The traditional method of selling through consignment is still being practised by farmers at large, despite the growing transparency in market prices and information. Under such an arrangement, the wholesalers have the total say on the price to be paid to the farmers as well as the timing of payment to the farmers. In the Malaysian fish market, price discovery through the "whispering system" is still being practised despite various attempts to introduce an auction price system. The prevalence of these "indirect market malpractices" is attributed to the lack of competitive pressure at the wholesale level and market imperfections at the farm level.

Market concentration is often of concern to economists since it indicates the extent to which activities take place in a competitive environment. Empirical evidence indicates that concentration is more likely to erode competition and result in a monopolistic industry. This has led to concerns over the implications of concentration on market integration, control of supplies, price discovery mechanism and the overall degree of competitiveness in an industry (Folwell et al., 1996).

Although there is much concern over the impact of increased concentration in the food industry, empirical analysis on food markets in Malaysia has been scarce. Previous studies include Fatimah (1980) on paddy, Fatimah and Gibbons (1987) on fish and Rohizad (2002) on vegetables. The broiler industry has not been investigated previously for the effects of concentration, in spite of structural concerns relating to increased vertical integration.

Studies on the impact of increased market concentration in the food industry usually draw explicitly on the Structure-Conduct-Performance (SCP) paradigm from the theory of industrial organisation. The SCP paradigm traces the pathway for identifying the factors that determine the competitiveness of markets, analysing the behaviour of firms and assessing the impact of an industry. First developed by Mason (1939) and later improved by Bain (1956, 1959), the traditional SCP approach postulates a one-way causal relationship from the structure of the market to its conduct and then performance. Many studies have tried to link market structure to performance. Bain (1956) showed that higher profits accrued to firms in industries with high concentration and barriers to entry. However, the traditional SCP paradigm was criticised by the New Industrial Economists who argued that conduct is the key element connecting structure and performance (Cowling and Waterson, 1976).

The general SCP approach (Scherer and Ross, 1990; Neuberger, 2001), proposes that there are interdependencies and feedback effects between market structure, conduct and performance. Market imperfections such as uncertainty, asymmetric information and transaction costs are integrated into the approach as a determinant of structure and conduct. Performance is postulated to result from structure and conduct but intervention by public or private order institutions may be necessary to improve performance (Greenwood and Carter, 1997).

According to Scherer and Ross (1990), good performance embodies several fundamental goals of society, including production efficiency, full employment of resources and equitable distribution of income, which implies that producers should not earn returns in excess of the service supplied. Although these goals may not be consistent with each other, good performance means that firms should attempt to satisfy all the goals as far as possible. The degree to which the goals have been satisfied may be measured by several means, including the

magnitude of price-cost margins. The SCP approach emphasises that market power is a source of poor market performance.

Methodology

Theoretical Framework
This study utilises the general SCP approach that has been revised to take into account characteristics of agricultural markets, particularly the broiler industry in Malaysia. The modified SCP paradigm is depicted in Figure 1.
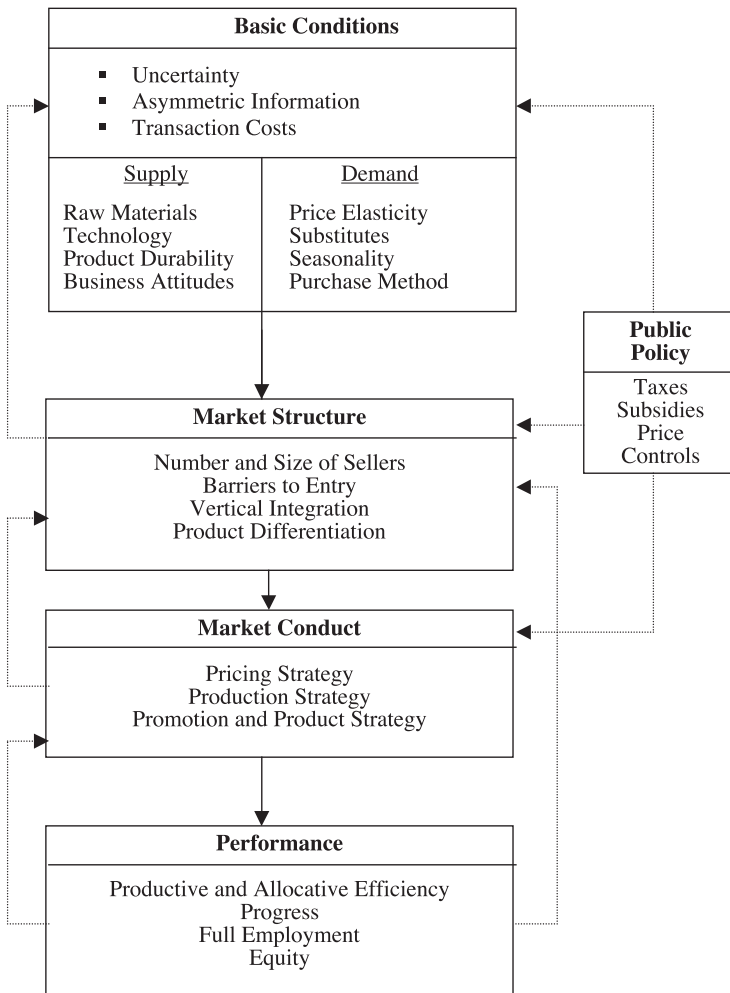
Source: Adapted from Scherer and Ross (1990) and Neuberger (2001).
Figure 1: Structure Conduct and Performance Framework

All variables are considered endogenous in the general SCP approach because of interdependencies and feedback effects between market structure, conduct and performance. Institutional infrastructure is included as a determinant of structure and conduct. In order to use this paradigm in analysing agricultural markets, it is necessary to integrate market imperfections such as uncertainty, asymmetric information, and transaction costs into the basic conditions.

A total application of the SCP framework on the assessment of an industry requires a comprehensive and massive data collection to verify each dimension of the SCP. This study focuses on the salient market indicators to provide some evidences on selected aspects of the SCP which are considered adequate to provide some understanding on the relationship between structure and conduct and their overall effect on the performance of the industry. The following sections provide a brief description of the statistical analyses utilised to measure selected dimensions of the SCP.

Market Structure

The major dimensions of a market structure are market competition, barriers to entry and product differentiation. This study utilises both descriptive and inferential statistics to illustrate and measure these dimensions. Two measures are normally used to indicate the degree of competitiveness of a market, i.e. the concentration ratio (CR) and the Herfindahl-Hirschman Indices (HHI). The method of calculation for these indices is given below.

Market Concentration Ratios: Market Concentration Ratios measure the percentage of market share owned by the n largest firms in the industry (Church and Ware, 2000). The concentration ratio (CR) can be expressed as:

$$CR_n = X_1 + X_2 + \ldots X_n \tag{1}$$

where X_i is the market share of the ith firm. Usually the ratio is related to the 4, 8, 20, or 50 largest companies.

Although the concentration ratio is useful as a measure of competitiveness, it provides an incomplete picture of the concentration of firms in an industry since it does not use the market shares of all the firms in the industry. Furthermore, it does not provide information about the distribution of firm size.

Herfindahl-Hirshman Index: Another measure of market concentration is the Herfindahl-Hirshman Index (HHI) (Hirschman, 1964) which can be expressed as:

$$HHI = \sum_{1}^{n} X_1^2 \tag{2}$$

where X_i is the market share of the ith firm and n is the number of firms in the industry.

The HHI provides a more complete picture of industry concentration since it considers the market shares of all the firms in the industry and the market shares are squared so that more weight is placed on the larger firms. The HHI changes when there are changes in market shares among the larger firms. The maximum value of the HHI is 10,000. If there is only one firm with 100% market share in the industry, the HHI would assume the maximum value. The HHI will decrease as the number of firms increase (U.S. Department of Justice, 1992).

According to the guidelines of The U.S. Department of Justice (1992), an HHI of less than 1000 represents a relatively unconcentrated market, an HHI between 1000 and 1800 represents a moderately concentrated market, and markets having an HHI greater than 1800 are considered to be highly concentrated.

Market Conduct

Market conduct refers to the actual behaviour of buyers and sellers in a market. This study focuses on several features of the broiler marketing system, including buying and selling practices, integration among wholesalers and the price discovery mechanism. Primary data collected from a survey on wholesalers are used to provide some evidence on the market conduct of the traders.

Market Performance

Market performance looks at the end result of the marketing system. In this study, the performance of the broiler chicken market in Peninsular Malaysia is empirically evaluated using the criterion of spatial market integration. Cointegration analysis as developed by Engle and Granger (1987) is used to test for the existence of price linkages across inter-state regional broiler markets. Generally, if regional markets are linked in the long-run, i.e., if the price series are cointegrated, there is a long-run equilibrium relationship between them indicating that the markets are integrated (Silvapulle and Jayasuriya, 1994).

Following the Engle and Granger (1987) approach, the cointegrating regression is specified as follows:

$$P_{i,t} = \alpha_0 + \alpha_1 P_{j,t} + u_t \qquad\qquad (3)$$

where Pi,t is regional market price, Pj,t is central market price, α_0 is a constant, and μt is the residual series which has to be tested for stationarity in order

to establish long-run relationships between regional market and central market price.

The residuals from Equation 3 are used to test for stationarity using the following equation:

$$\Delta \hat{u}_t = \rho_I \hat{u}_{t-1} + \gamma_1 \Delta \hat{u}_{t-1} + \varepsilon_t$$

Prior to testing for cointegration, the presence of stationarity in the time series data is tested by using the Augmented Dickey-Fuller (ADF) test (Engle and Granger, 1987).

Spatial market integration refers to a situation where price movements of a commodity in geographically separated markets are linked. Generally, when two markets are integrated, price changes in one market should be followed by changes in the other market (Takayama and Judge, 1971). Since market integration generally means the free flow of information and products over space, form and time, it is closely related to the concept of efficiency (Barrett, 1996). Market integration signifies that price signals and market information are transmitted accurately across markets. Therefore, markets that are integrated facilitate the dissemination of accurate price information which assists in making correct producer decisions and ensuresefficient product movements. Hence, the performance of the market may be evaluated by examining linkages in prices across spatially separated markets.

The theoretical basis for analysis of spatial market integration is the Spatial Price Equilibrium (SPE) model (Takayama and Judge, 1964, 1971), where competitive commodity arbitrage is assumed to lead to equilibrium so that price differences between markets will just equal transfer costs. Under conditions of perfect competition, prices across markets will be inter-related if their price differential equals transfer costs.

Data

The structure and conduct of the broiler market was evaluated in this study through the analysis of primary data obtained through a field survey by the Federal Agricultural Marketing Authority (FAMA) in 2003. The objectives of this survey were to determine the actual number of wholesalers operating in the market, to assess the characteristics of the broiler marketing system and to obtain information on the price determination process. The information that was collected includes marketing practices, the existing institutional structures, the degree of market power of intermediaries, and other factors affecting the competitiveness of the sector. A total of 260 primary level wholesalers throughout

Peninsular Malaysia who purchased broilers at the farm level, either directly or through collectors, were interviewed for this survey using questionnaires.

A field survey covering fourteen centres, which included all the eleven states in Peninsular Malaysia, the Federal Territory of Kuala Lumpur, and the East Malaysian states of Sabah and Sarawak, was carried out by FAMA. Prior to the actual field study, a preliminary exercise was conducted to list all wholesalers involved in trading broilers in April, 2003. This step was necessary to ascertain the actual number of wholesalers who were involved in the marketing chain for broilers since there were no recent surveys on the wholesale sector. This initial survey was made possible by enlisting the assistance of local authorities and by using FAMA's existing contacts with farmers and wholesalers through the organisation's various programmes, for instance, trading, market information collection and enforcement.

From the outset, it was decided to limit the collection of data to primary level wholesalers. The term primary level wholesalers was defined in this survey to cover only wholesalers who purchased live broilers either directly from farmers or indirectly through agents/collectors who in turn were first level buyers at farm level. This definition was important to exclude second and third level buyers, which might lead to the problem of multiple counting when trying to ascertain the volume of transactions. It was also necessary to exclude the wholesale buyers operating in the urban wholesale markets who buy either live or slaughtered broilers in bulk to supply to retailers. The primary study on broiler marketing was carried out in May 2003. The interview method using pre-designed questionnaires was used and FAMA research assistants carried out interviews on all the wholesalers listed earlier for this study.

The performance of the market was analysed through studying linkages in prices between the central market of Kuala Lumpur and wholesale price levels for each of the eleven regional markets in Peninsular Malaysia. Monthly broiler prices from 1982 to 2001 obtained from various price bulletins of FAMA were used, giving a total of 240 observations for each centre.

Findings and Conclusions

Structure of the Broiler Marketing System
Market Size and Distribution
The total number of primary level wholesalers in Peninsular Malaysia was found to be 260. Of this, almost 85% or 223 wholesalers were direct buyers from farm level. Only 37 wholesalers were found to be purchasing broilers indirectly from agents or collectors. The distribution of wholesalers by regional markets is given in Table 1.

**Table 1: The Number of Primary Level Broiler Wholesalers
by States in Peninsular Malaysia, 2003**

Regional Centre	Number of Direct Wholesalers	Number of Indirect Wholesalers	Total Number of Wholesalers	Percentage Distribution by State
Johor	30	6	36	13.8
Kedah	12	-	12	4.6
Kelantan	41	5	46	17.7
K. Lumpur	27	-	27	10.4
Malacca	7	-	7	2.7
N. Sembilan	7	2	9	3.5
Pahang	34	8	42	16.2
Perak	16	1	17	6.5
Perlis	-	2	2	0.8
Penang	9	1	10	3.8
Selangor	11	3	14	5.4
Terengganu	29	9	38	14.6
Total	223	37	260	100.0

Most of the wholesalers are concentrated in the states of Kelantan, Pahang, Terengganu, and Johor. Together, these four states account for 62% of the total number of wholesalers.

Weekly purchase of live broilers was used as a criterion for comparing the size of operations of the wholesalers. The total weekly purchases for the twelve regional markets were found to be 4,151,479 kg while the average weekly purchase per wholesaler was about 15,967 kg (Table 2). There were wide variations in terms of scale of operations with wholesalers in Kuala Lumpur and Selangor operating on a much bigger scale than other regional markets. In Perak, for instance, each wholesaler handled an average weekly volume of only 4,341.18 kg whereas in Kuala Lumpur, each wholesaler handled about 39,632.19 kg.

Kuala Lumpur has the largest share of the broiler market accounting for about 25.78% of the total volume transacted. This was followed by Kelantan with 20.63% market share, Selangor with 12.52%, and Kedah with 9.91%. These four regional centres had a total market share of 68.84 % in terms of volume.

Table 2: Weekly Purchases of Live Broilers by Wholesalers in Peninsular Malaysia, 2003 (kg)

Regional Centre	Direct Purchases from Farmers	Indirect Purchases through Collectors/ Agents	Total Weekly Purchases	% of Total Volume by Centre	Average Weekly Purchases Per Wholesaler
Johor	159,950	37,400	197,350	4.75	5,481.94
Kedah	411,400	-	411,400	9.91	34,283.33
Kelantan	856,540	-	856,540	20.63	18,620.43
K. Lumpur	1,070,069	-	1,070,069	25.78	39,632.19
Malacca	53,000	-	53,000	1.28	7,571.43
N. Sembilan	108,050	1,400	109,450	2.64	12,161.11
Pahang	304,050	1,750	305,800	7.37	7,280.95
Perak	73,800	-	73,800	1.78	4,341.18
Perlis	-	31,200	31,200	0.75	15,600.00
Penang	210,000	2,000	212,000	5.10	21,200.00
Selangor	519,820	-	519,820	12.52	37,130.00
Terengganu	307,050	4,000	311,050	7.49	8,185.53
Total	4,073,729	77,750	4,151,479	100.00	15,967.23

Market Competitiveness

The results indicate that the CR for the four largest wholesalers is very high for three states, i.e. Penang, Negeri Sembilan, and Malacca where there are few wholesalers (Table 3 and Figure 2). When the CR for the eight largest wholesalers is calculated, it is found that the level exceeds 80% for all centres, except Terengganu and Perak. In the case of the CR for the twenty largest wholesalers, the figure is close to 100 for all the centres that are measurable.

**Table 3: Competitive Index of Wholesale Broiler Markets in
Peninsular Malaysia, 2003**

Regional Centres	Total Number of Wholesalers	Concentration Ratio			Herfindahl-Hirshman Indices
		Four Largest	**Eight Largest**	**Twenty Largest**	
Johor	36	61.31	80.21	99.54	1218.28
Kedah	12	84.59	96.11	n.a	1365.73
Kelantan	46	72.29	84.57	98.97	3273.22
K. Lumpur	27	70.71	88.52	99.96	6035.30
Malacca	7	86.79	n.a	n.a	2814.30
N.Sembilan	9	96.12	n.a	n.a	1030.54
Pahang	42	58.86	85.68	99.80	2675.44
Perak	17	43.53	73.35	n.a	3047.30
Perlis	2	n.a	n.a	n.a	9260.36
Penang	10	100.0	n.a	n.a	4117.12
Selangor	14	85.41	98.67	n.a	912.22
Terengganu	38	52.31	73.96	97.27	2395.87
Total	260				

Note: n.a=not available

Figure 2: Concentration Rations of Top Four Wholesalers in Peninsular Malaysia, 2003
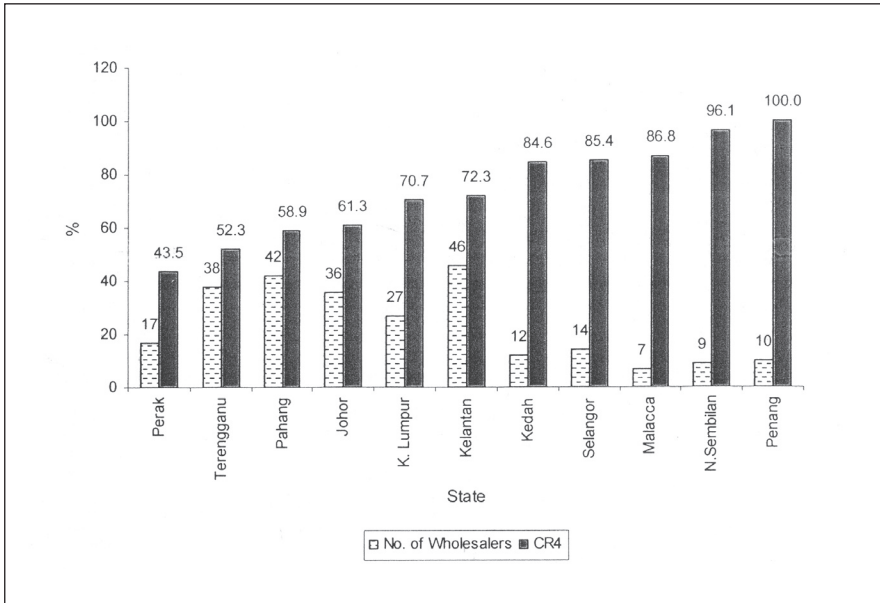
In general, if the CR of the 4 largest firms (CR4) is below 40, the industry is considered to be competitive, with a number of firms competing, but none owning a substantial proportion of the market. However, if the CR4 measure is more than 90, then the firms that control more than 90% of the market are effectively oligopolistic. In the present study, none of the states have a CR4 below 40 but two states, i.e., Penang and Negeri Sembilan have a CR4 exceeding 90.

Using the benchmark of anti-trust practices of 1800 in the USA, the results indicate that eight of the twelve regional centres exceed the benchmark, indicating that the majority of broiler markets in Peninsular Malaysia are highly concentrated. The state of Perlis, which has only two wholesalers serving the whole state, has the highest HHI. Kuala Lumpur, the main terminal market, has the second highest concentration.

Barriers to Entry

Although free competition appears to exist in the broiler market in theory, there are several conditions that make the entry of new players very difficult. Among the barriers are long-standing relationships between farmers and certain wholesalers, resulting in confidence and trust in conducting business dealings. About 55% of the wholesalers have below 10 years' experience in the business while 45% have more than ten years' involvement. In the Kuala Lumpur market for instance, 50% of the wholesalers have more than ten years' experience trading in broilers.

In actual practice, licensing requirements are an effective barrier to entry. Under the Supply Control Act (Chicken) 1996, all wholesalers and retailers of broilers are required to be licensed by local authorities before they can trade. This effectively limits the number of intermediaries who are allowed to trade in the market.

Product Differentiation

Generally there is no clear product differentiation in the case of broiler meat sold in wet markets or those supplied to institutional buyers. The price obtained is uniform regardless of the origin.

However, broiler meat sold in supermarkets is normally branded to cater to the needs of the more discerning consumers. Several brands are available, the most popular being Ayamas, followed by Ayam Dindings, Farm's Best, and Ayam A1. These brands are owned by the large integrators in the country.

The general perception among those in the trade is that there is as yet no marked preference for branded chicken among consumers. This may be attributed to the fact that most consumers tend to purchase freshly slaughtered chicken which is easily obtainable in wet markets. Branded chicken as found in supermarkets is generally perceived as not fresh and the quality may have deteriorated after a period of storage.

Market Conduct

Buying Practices

The direct payment system is the most common mode of purchase for broilers. Only 14.9% of wholesalers purchase on a consignment basis which usually means that the price is determined after the products have been sold (Table 4).

This implies that the farm price is usually set at the time of purchase by the wholesalers for a majority of transactions in broilers.

Table 4: Modes of Broiler Purchases at Farm Level in Peninsular Malaysia, 2003

State	Outright Purchases	Consignment Basis
Pahang	37	4
Johor	24	11
Kelantan	40	6
Negeri Sembilan	6	2
Selangor	12	2
Terengganu	37	1
Kuala Lumpur	24	4
Kedah	10	1
Perlis	2	0
Penang	10	3
Perak	15	5
Malacca	6	0
Total	223	39

Selling Practices

Most of the wholesalers dispose of their products in the wet markets that are located around the country. Based on the percentages given by individual traders in terms of distribution of their products to market outlets, it is possible to ascertain the distribution patterns among the various states. On the whole, almost 73% of broilers are distributed to wet markets, although there is great variability in the state-wise distribution (Table 5).

The percentage of broilers distributed to wet markets exceeds 90% in Kelantan and Negeri Sembilan, while it is below 15% in Terengganu and Penang. Other market outlets such as supermarkets, sundry shops, supermarkets and institutional buyers take up only a small proportion of the broiler supply, except in the latter two states where the dominant channel appears to be institutional buyers other than restaurants and hotels.

In addition, almost 85% of the wholesalers sell broilers to retailers using the outright sales method which means that the price is fixed at the time of delivery (Table 6). Credit terms of between three to thirty days are offered to buyers.

Table 5: Distribution of Broilers by Type of Market Outlets in Peninsular Malaysia, 2003 (Percentage)

Outlets/States	Pahang	Johor	Kelantan	N.Sembilan	Selangor	Terengganu	KL	Kedah	Perlis	Penang	Perak	Malacca	Total
Wet Markets	60.19	76.3	93.87	96.71	84.86	12.11	80.26	84.16	76.92	14.62	82.77	60.75	72.79
Supermarkets	20.65	8.71	0.17				15.07				5.35		5.76
Sundry Shops	7.43	1.84	0.15		2.42				11.92		5.08		1.14
Hotel/Restaurant	9.63	5.55	0.05				4.67		9.61	9.91			2.69
Other Institutions	2.1	7.6	5.76	3.29	12.72	84.51		15.84	1.55	75.47	6.8	39.25	15.46
Export						3.38							2.13
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Notes: KL=Kuala Lumpur
          N. Sembilan=Negeri Sembilan

Table 6: Modes of Broiler Sales to Retailers in Peninsular Malaysia, 2003

Regional Centre	Outright Sales	Consignment Basis
Pahang	36	5
Johor	25	10
Kelantan	40	6
Negeri Sembilan	7	0
Selangor	13	1
Terengganu	36	1
Kuala Lumpur	26	7
Kedah	10	1
Perlis	2	0
Penang	10	5
Perak	12	7
Malacca	6	0
Total	223	43

Sources of Supply

Most of the wholesalers reported that they obtained their supplies of broilers
from independent farmers (Table 7). Only 25% of wholesalers had made
arrangements with contract farmers to ensure a steady supply of broilers. On
average, these wholesalers had had experience of about seven years in contract
farming.

Table 7: Sources of Broiler Supply in Peninsular Malaysia, 2003

Sources of Supply	Number of Wholesalers Involved	Percentage of Wholesalers
Contract Farmers	65	25.0
Independent Farmers	163	62.69
Collectors	4	1.54
Other Wholesalers	56	21.54
Importers	4	1.54
Own Farms	17	6.54

The biggest number of contract trading arrangements was in the state of Kelantan where 19 out of the total number of wholesalers had made contract arrangements with farmers (Table 8).

Table 8: Number of Wholesalers Involved in Contract Farming in Peninsular Malaysia, 2003

Regional centre	Number	Percentage of Total
Johor	6	16.67
Kedah	2	16.67
Kelantan	19	41.30
Kuala Lumpur	3	11.11
Malacca	5	71.42
Negeri Sembilan	5	55.56
Pahang	2	4.76
Perak	2	11.76
Perlis	1	50.00
Penang	4	40.00
Selangor	3	21.43
Terengganu	13	34.21
Total	65	25.00

Figures on the actual number of farmers involved in contract farming are unavailable although about a quarter of all broiler supplies originate from contract farms. Contract farming is likely to increase in importance in the future as farmers and wholesalers alike appreciate the importance of obtaining adequate supplies without severe price gyrations.

Integration among Wholesalers

Membership in associations was used as a criterion to determine the level of integration among wholesalers. Only 36.5% of the respondents were found to be members of poultry associations. This could indicate that most of the wholesalers operated individually and there was lack of cooperation among them to improve their conditions through collaborative efforts. The distribution by state shows that Perak has the highest percentage of association membership, followed by Kuala Lumpur and Malacca (Table 9).

Table 9: Membership of Associations by Broiler Wholesalers in Peninsular Malaysia, 2003

Regional Centre	Number of Members of Poultry Associations	Percentage of Members by State
Johor	3	8.33
Kedah	4	33.33
Kelantan	17	36.96
Kuala Lumpur	13	48.15
Malacca	3	42.86
Negeri Sembilan	2	22.22
Pahang	6	14.29
Perak	11	64.71
Perlis	0	0.00
Penang	3	30.00
Selangor	4	28.57
Terengganu	21	55.26
Total	87	33.46

Transportation

Wholesalers provide the essential service of transporting broilers from the farm to the market centres. This is usually carried out early in the morning since the broilers are transported by open trucks that leave them vulnerable to heat dehydration and the mortality rate is believed to be quite high due to this factor.

Transportation costs tend to vary widely among the regional centres and even within each region (Table 10). The general trend seems to be towards rising transportation costs in line with rising fuel prices and the inflation rate.

Table 10: Transportation Costs for Broilers by State in Peninsular Malaysia, 2003 (RM/kg)

Regional Centre	Costs
Pahang	0.24
Johor	0.16
Kelantan	0.22
N.Sembilan	n.a.
Selangor	0.56
Terengganu	0.17
Kuala Lumpur	0.13
Kedah	0.32
Perlis	0.10
Penang	0.14
Perak	0.13
Malacca	0.10

Note: n.a=not available.

Price Discovery

The price discovery process at the farm level appears to be influenced predominantly by wholesalers who seem to wield considerable power over the price offered to farmers. The selling price to retailers, in turn, reflects the purchase price since wholesalers use the mark-up pricing method. According to the study, about 74% of wholesalers use the farm price as the reference price and add marketing costs in order to arrive at the wholesale selling price. Another 9% use the retail price as the reference price and mark down to account for marketing costs.

At the retail level, the wholesale price is predominantly used as the reference price in order to arrive at the retail sales price. Supply and demand conditions have a bearing on the actual market price and the big wholesalers normally are able to influence price movements by their sheer volume of transactions. Although the committee pricing system has been in existence since 1986, only 32% of retailers reported that they used the prices set by the committee as a guideline in determining their selling prices.

A simple grading system seems to be in existence with the breeds and weight at marketing point being the most important criteria. This is because broilers are deemed to be of optimal quality for marketing only within the 40-day period. Broilers that are kept longer tend to depreciate in quality.

Market Performance

Marketing Flow

An important pre-condition for the existence of market integration is for trade flows to take place between centres that are separated geographically. Centres that have trade relations with each other are likely to be integrated into a single market. In order to ascertain whether there are trade flows among the regional centres, analysis was carried out on the destination and supply sources of products in each centre.

It was found that all the centres studied had trade links with other regions, either as supplier or purchaser of broilers. However, the northern state of Kelantan has the unique position of not receiving supplies from other states, but it supplies broilers to the neighbouring state of Terengganu. In addition, two regional centres were found to be not supplying broilers to other centres, i.e., Perlis and Terengganu. However, they are linked in trade to other regions since they receive supplies from several other centres.

An interesting feature of broiler marketing in Peninsular Malaysia is the occurrence of cross-flows in the marketing flow of products in several states. For instance, while Johor receives supplies from Malacca, it in turn supplies to Malacca (Appendix I). This phenomenon may take place because some wholesalers from the respective states may have business arrangements to buy from other states rather than directly from suppliers in their own states. The same is true in the case of Perak where there is a two-way flow with Penang.

Kuala Lumpur's position as the main terminal market is apparent since it receives supplies from four states and supplies broilers to seven states, including the northern state of Penang and the southern state of Johor. Kuala Lumpur as the largest urban market is not a producing region but receives supplies mainly from neighbouring Selangor and the southern state of Johor.. The largest producing areas are in Johor, Perak and Negeri Sembilan.

Market Integration

Prior to testing for market integration, unit root tests were carried out to check for stationarity of the data series. The estimated test statistics for the prices in levels and first differences are reported in Table 11. These results indicate that all the time series are stationary after first differencing and the original series is said to be integrated of order zero or I(0).

Table 11: Results of the DF tests on Wholesale Prices, 1982-2001

Centre	Levels		First Differences	
	Constant Without Trend	Constant With Trend	Constant Without Trend	Constant With Trend
Perak	-1.2012	-2.0745	-5.8561*	-5.8434*
Johor	-1.0749	-1.9781	-3.7825*	-3.7746*
K. Lumpur	-1.1708	-1.9645	-3.7944*	-3.7845*
Malacca	-2.2200	-3.0099	-4.8889*	-4.8888*
Penang	-1.0511	-1.8437	-4.0074*	-4.7181*
N. Sembilan	-1.0402	-2.3132	-3.7987*	-3.7906*
Kedah	-0.9808	-1.7540	-3.5583*	-3.5465*
Kelantan	-1.0345	-2.1709	-4.2120*	-4.2026*
Pahang	-1.3877	-2.4033	-3.1638*	-3.1514*
Terengganu	-1.0616	-1.9698	-3.9815*	-3.9696*

Significant at 5% level

Cointegration analysis (Engle and Granger, 1987) was then carried out to test for market integration. Two models were estimated: the first model had the wholesale level in each of the centres as the regressand while the Kuala Lumpur central market price was the independent variable; the second model had the central market price as the regressand.

Results for the analysis of market integration are given in Table 12. When the regional price is the regressand, the estimated EMBED Equation.3   statistics in absolute terms exceed the 1% level; it can therefore be concluded that the estimated residuals are stationary, i.e., there are no unit roots. The reverse regression where the central market price is the dependent variable while the regional market prices are independent variables shows that the residuals for both the models without trend and with trend are stationary since the estimated EMBED Equation.3   statistics in absolute terms exceed the 1% level.

Therefore, it can be concluded that the regional and central market prices are cointegrated. This is confirmed by the high R2 and low Durbin-Watson statistics which are also an indication of cointegration. Since the price series are cointegrated in pairs using the Engle-Granger method, the broiler chicken market in Peninsular Malaysia can be said to be a highly integrated market. As price linkage is the central feature in integrated markets, this means that central market and regional market prices tend to move together over time.

Table 12: Results of Engle-Granger Cointegration Tests for Market Integration

Centres	Constant Without Trend[1]			Constant With Trend[2]		
	t-value	R2	d	t-value	R2	d
Model 1 Dependent : Regional Wholesale Prices						
Independent : Kuala Lumpur Wholesale Price						
Kedah	-11.007*	0.9620	1.314	11.408*	0.9624	1.380
Kelantan	-9.7673*	0.9423	1.109	-9.344*	0.9462	1.030
Terengganu	-11.736*	0.9539	1.438	-11.456*	0.9571	1.387
Pahang	-12.116*	0.9721	1.515	-12.008*	0.9722	1.498
N. Sembilan	-12.808*	0.9676	1.480	-12.681*	0.9677	1.459
Perak	-11.114*	0.9707	1.358	-11.102*	0.9747	1.351
Johor	-11.907*	0.9696	1.467	-11.733*	0.9697	1.439
Penang	-13.390*	0.9726	1.693	-13.113*	0.9728	1.650
Malacca	-11.519*	0.9451	1.381	-11.660*	0.9452	1.404
Model 2 Dependent : Kuala Lumpur Wholesale Price						
Independent : Regional Wholesale Prices						
Kedah	-11.187*	0.9620	1.332	-11.900*	0.9670	1.456
Kelantan	-10.072*	0.9423	1.146	-10.009*	0.9429	1.140
Terengganu	-11.949*	0.9539	1.460	-11.848*	0.9541	1.447
Pahang	-12.326*	0.9721	1.542	-12.599*	0.9733	1.587
N. Sembilan	-13.133*	0.9676	1.510	-13.330*	0.9692	1.559
Perak	-11.324*	0.9707	1.386	-11.561*	0.9711	1.421
Johor	-12.158*	0.9696	1.498	-12.387*	0.9708	1.539
Penang	-13.619*	0.9726	1.718	-13.676*	0.9732	1.730
Malacca	-11.693*	0.9451	1.394	-12.054*	0.9520	1.466

Notes:
1. The Engle-Granger critical values of the τ statistic at the 1%, 5%, and 10% levels for the model without trend are –3.90, -3.34, and –3.04 respectively.
2. For the model with trend variable, the critical levels for the model with trend are –4.32, -3.78, and –3.50
* Significant at 1% level.

Conclusions

An assessment of the broiler marketing system using elements of the structure-conduct- performance paradigm was carried out in this paper.

In terms of structure, generally the broiler market is found to be oligopolistic in nature with a few large buyers exercising considerable power over the broiler marketing process. This can be related to the high concentration ratio for most of the regional centres and effective barriers to entry, such as licensing requirements.

Policy-makers are often concerned about market concentration because of the belief that market power can hinder the efficient operation of markets. However, increasing concentration in the industry can both enhance and dampen market competition. In some cases, concentration can help to realize economies of scale, thus driving down production costs and thereby improving market efficiency. At the same time, high concentration can erode competition, leading to inefficient markets and higher prices both for downstream purchasers of inputs and for consumers. It is, therefore, necessary to weigh the economic benefits of concentration against the effects of the potential decrease in competition.

The present study found that the broiler chicken industry in Peninsular Malaysia is a highly integrated market. This indicates that the linkage between central market and regional market prices is continuously maintained by arbitrage behaviour since there is an equilibrium price relationship between them. Contrary to prior expectations that high concentration could erode competitiveness, this finding provides evidence that concentration can in fact help to realise economies of scale, thus driving down production costs and improving market efficiency.

As for market conduct, the main aspect covered is the pricing behaviour of the wholesalers. Since wholesalers have advantage in terms of access to market information, they are able to perform the price discovery process. As the majority of wholesalers purchase broilers directly from farmers, they are able to ascertain the current supply situation and likely changes in the future. Their close relationship with retailers also enables them to estimate the trends in consumer demand. With this knowledge on the demand and supply situation, they are able to set the purchase price at the farm level and mark up to set the selling price to retailers.

Farmers, however, are at a considerable disadvantage since they usually lack market information on current and future market conditions. Their scattered nature of production and considerable distance from the urban markets means that dissemination of market information has limited reach, in spite of the best efforts of FAMA's market information services.

In spite of the structural rigidities that are present, the existence of market integration at the wholesale level points to the fact that there is pricing efficiency in the broiler market. Therefore, there is efficiency in product movements among markets and this provides evidence of efficient information transmission at the wholesale level. The fulfilment of spatial equilibrium condition between the central market and all regional wholesale markets implies that there is market level efficiency. However, the same may not be true at the farm level.

The finding of spatial market integration has important policy implications. Since the markets are spatially integrated, the government could consider policy measures such as reducing or even withdrawing its efforts at price control in the market. Efficient product movements indicate that shortages in one market will be transmitted to the other markets; therefore, it may be unnecessary to impose price controls.

This study is able to provide some understanding on the relationship between the structural characteristics and market conduct on the extent of market integration of the broiler industry. Further research, however, is required to examine the impact of the broiler market structure on the welfare of farmers and consumers, particularly on incomes and prices, respectively. Besides, there is a need to establish the relationship between the structure and conduct of the market on selected performance measures such as technical efficiency, product development, growth and equity.

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Appendix I

Marketing Flow of Broilers in Peninsular Malaysia
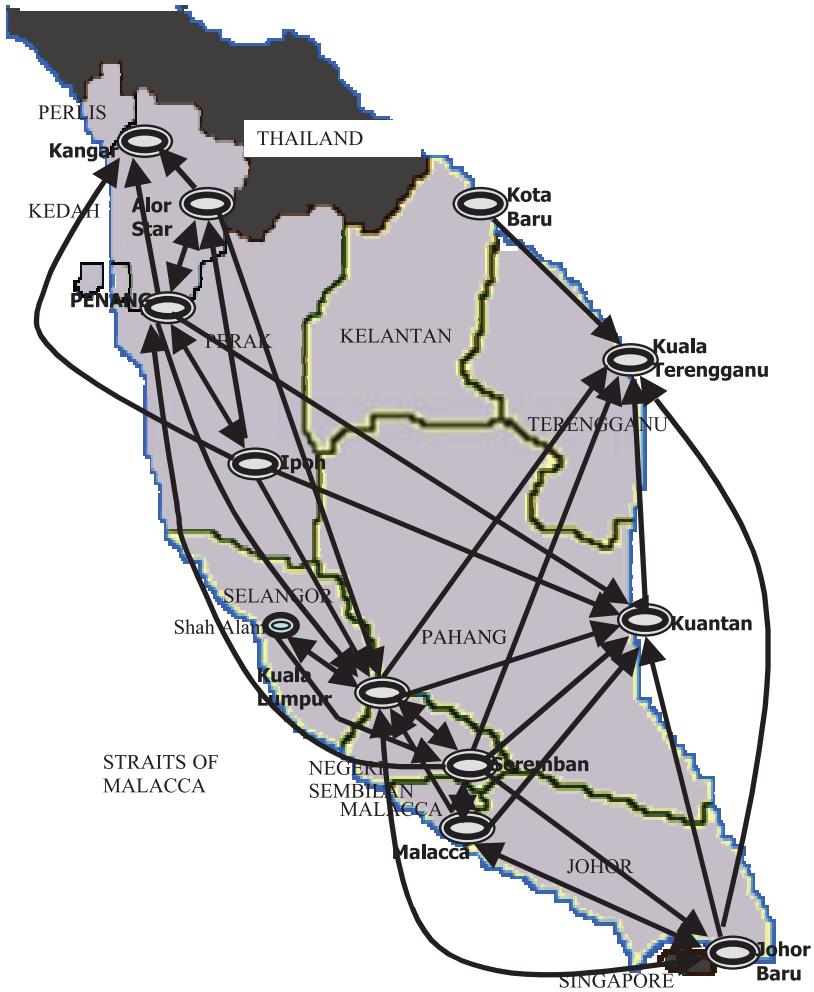
Source: Field Survey of Broiler Wholesalers in Malaysia, FAMA, 2003