Review of Domestic Broiler Market: Interim Report

21 December 2012

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Executive Summary

Pursuant to section 11(1) of the *Competition Act 2010* ("Act"), Malaysia Competition Commission ("MyCC") has undertaken a competition review of the domestic broiler market in Peninsula Malaysia. This review focused on the current structure of the market; the interactions of broiler enterprises and suppliers at the *ex farm*, wholesale and retail levels; and any other matters of relevance.

The review process involved the release of an Issues Paper on 16 July 2012 that was publicly accessible on MyCC's website. Submissions from all parties were invited with a closing date of 30 August 2012. Submissions were received from DVS, FLFAM and KFC Holdings.

This Interim Report presents the findings based on MyCC's research and analysis, as well as on the matters that were raised in the submissions received.

MyCC looked into the respective make-up of the *ex farm*, wholesale and retail segments of the broiler supply chain. At the *ex farm* level, 292 broiler farming establishments were officially registered as businesses by the Companies Commission in 2008. However this number was only about 10 per cent of the 2,978 broiler farms for which data has been collected by DVS. The vast difference between the formally recorded number of broiler business establishments and broiler farms may be due to two factors; *viz.* multiple farm ownership and operation by integrators (on the one hand) and the non-business registration of independent broiler farmers. MyCC is of the view that the currently obscure form of market structure at the *ex farm* level can be clarified by a common database on broiler farming activities.

RECOMMENDATION 1

The Ministry of Agriculture and Agro-based Industries should, in consultation with other ministries, government agencies and business associations that collect broiler farming data, develop and maintain a common database on both registered broiler businesses and unregistered broiler farming operations in the entire *ex farm* segment of the broiler supply chain.

MyCC also looked into the level of market concentration at a specific segment of the broiler supply chain. This approach is consistent with the measurement of market concentration with reference to a relevant market. Based on available data on a broadly defined group of broiler products (as defined by the Department of Statistics in the *Annual Manufacturing Establishment Survey 2004*), a CR-4 ratio for the downstream poultry processing segment of the supply chain (at the MSIC 4-digit level) was calculated as 88.5 per cent, and the Herfindahl-Hirschman Index ("HHI") for the same segment was calculated as 3,450. Although both these calculated indices are considerably higher than the "safe harbour" of 75 per cent (in the case of CR-4) and 1800 (in the case of HHI), both of them are only indicative, and not determinative, of possible dominance by any poultry processing firm or group of firms.

FLFAM presented in its submission a CR-4 ratio of 31.3 per cent and HHI of 508 for the parent stock market These indices were calculated on the basis of FLFAM's estimated market shares held by 8 integrators and 28 non-integrated parent stock companies.

MyCC is of the view that the absence of parent stock farming concentration does not necessarily mean that other *ex farm* segments of the supply chain (namely, broiler growing), or further downstream segments (namely, broiler wholesaling and processing) may not be overly concentrated. MyCC is aware of the fact that there are currently more than 3000 broiler growing farms outputting close to 600 million broilers in 2011. However what is current unknown (due to lack of data) is the level of concentration that reflects the ownership of broiler growing farms by integrators, non-integrators and independent farmers (who are engaged in broiler growing via contractual arrangements with integrators and/or non-integrators).

RECOMMENDATION 2

MyCC should, in consultation with other ministries, government agencies and business associations that collect broiler farming data, undertake further empirical research and estimation of market concentration within the broiler growing, wholesaling and processing segments of the supply chain.

Poultry is one of the specific consumer products which has been declared as a "controlled item" under the *Control of Supplies Act.* Currently, a "permitted maximum" retail price for a two-week period before and after a festival season is publicly announced by MDTCC. MyCC understands that the "permitted maximum" retail price will prevent consumers from being charged exorbitantly by retailers. But it may also inadvertently weaken retailers' competition with one another, and engenders market distortions and opacity in the commercial relationships between wholesalers and retailers. Instead of actually competing with one another, all retailers in a "wet" market may decide to sell their broilers at a price close to or at the level of the "permitted maximum" price. Although this could be seen as retailers' compliance with the "permitted maximum" price, it could also be an outcome of collusive pricing by the retailers. Thus, even if consumers have benefitted from paying the "permitted maximum" price, any collusive behaviour on the part of retailers will effectively deny consumers of the potential benefits of lower prices that will result from actual market competition.

COMMENT

A "permitted maximum" retail price may have an unintended effect of dampening or lessening competition between broiler wholesalers and retailers over a festival season. MDTCC should closely monitor the conduct of both these parties (in terms of their supply and pricing decisions over the two-week period before and after a festival) to ensure that consumers can be made better-off by the sale of broilers at competitive prices that are below the "permitted maximum" level.

Coordinating mechanisms along a vertical broiler supply chain include integrated ownership and operation, as well as contract arrangements between independent farmers (upstream) and broiler processing firms (downstream). Both the commercial

decision to merge as well as the merger itself are not subject to the Act. Nonetheless, MyCC has the responsibility of looking into the market activities of a merged entity that are anti-competitive or potentially anti-competitive.

Although MyCC did not receive any submissions from integrators, MyCC has learnt (through a literature review of overseas experience) that poultry contracts have two main components, *viz.* the division of responsibility for providing inputs and the method used to determine farmer compensation. There are advantages as well as disadvantages to contract production of broilers. It can benefit integrators by contractually retaining some if not total control over the grower's production methods in order maintain product quality control. Production contracts can also benefit independent growers by providing diversified opportunities to earn income and by alleviating cash flow problems that typically plague small farms. However they can also be disadvantageous to growers. Even though broiler ownership remains with an integrator, most of the farming risks and expenses (e.g. mortality rates and utility bills) are shouldered by the grower. Furthermore, a term (or a combination of terms) in the contract may place a greater business burden upon growers, e.g. the contracted input price of chicks are "too high" (i.e. not reflective of open market prices); or the contracted input price of chicken feed and its specified quantity are "too high"; or the contracted output price for live chickens are "too low".

MyCC was made aware by DVS of a particular form of trading practice that is related to contract farming. Farmers in contract with an integrator are obliged to provide wholesalers, who are partially linked to the same integrator, the "first option" to buy live chickens at the price specified in the contract. Once the broiler supply of the contracted farmer is exhausted, the wholesaler who still needs live chickens for its businesses will only buy them from other independent farmers who are willing to sell live chickens at the same price as that charged by the contracted farmer.

RECOMMENDATION 3

MyCC should, in consultation with DVS and other public agencies, undertake research or commission research into the existing forms of contractual arrangements for poultry growing by independent farmers.

1 Introduction

The *Competition Act 2010* ("Act") came into force on 1 January 2012. Pursuant to section 11(1) of the Act, Malaysia Competition Commission ("MyCC") undertook a review of the domestic broiler[1] market feature (or combination of features) that prevent, restrict or distort competition. More specifically, MyCC's review focused on:

- the current structure of the domestic broiler market in Peninsula Malaysia;
- the interactions of enterprises and suppliers at the *ex farm*, wholesale and retail levels; and
- any other matters of relevance.

On 16 July 2012, an Issues Paper was made publicly accessible on MyCC's website. Submissions from all parties were invited with a closing date of 30 August 2012.

Submissions were received from DVS, FLFAM, and KFC Holdings. MyCC wish to thank them for their comments and feedback over the course of the public consultation period.

This Interim Report is organised as follows:

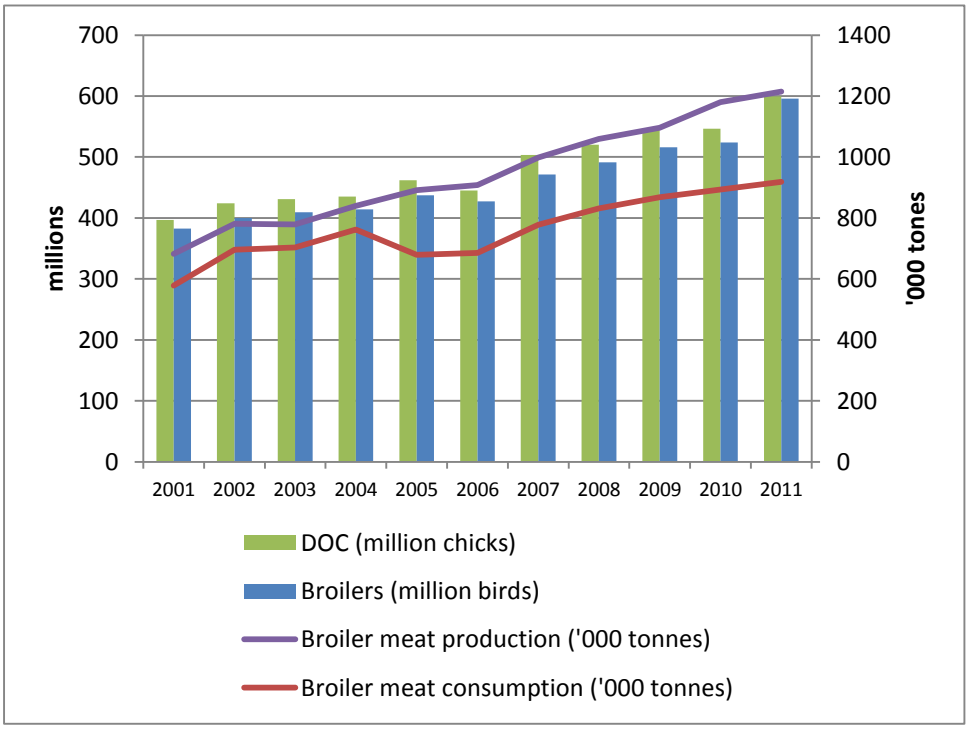
- Chapter **Error! Reference source not found.** presents the findings on the omposition and structure with each segment the broiler supply chain in Peninsula Malaysia.
- Chapter 3.3 presents the findings on the price trends and pricing transmission effects along the broiler supply chain.
- Chapter **Error! Reference source not found.** presents MyCC's views on ertical coordination of broiler businesses and likely forms of market power and buyer power that may prevent, restrict or distort competition if it is misused by the parties concerned.
- Chapter **Error! Reference source not found.** puts forth MyCC's reliminary conclusions.

[1] Chickens that are reared for commercial meat production are referred to as "broilers" in the industry literature. In this Final Report, the terms "broiler" and "poultry" will be used interchangeably.

2 Broiler Sector

Of all livestock products sold in Peninsula Malaysia, broiler meat is the main type that is consumed for cultural and religious reasons. On the basis of data collected by the Department of Veterinary Services (hereafter "DVS"), it can be observed that domestic consumption of broiler meat increased steadily from 577,900 tonnes in 2001 to more than 918,000 tonnes in 2011 (see Figure 2-1).[2]

Figure 2-1. Broiler supply and production and consumption of broiler meat, 2001 – 2011



On the supply side, the 682,000 tonnes of broiler meat produced in 2001 has also increased steadily to over 1.2 million tonnes in 2011. Malaysia today has in fact continued with its self-sufficiency of poultry meat supply that was first achieved in 1990.

The composition and structure of the present-day broiler sector in Peninsula Malaysia is very different from the one that existed in the nineties, due largely to agribusiness consolidation and integration over the last decade or so. Independent and self-operated activities that once made up the broiler production process in have been replaced by a system of contracts or outright ownership and operation of the broiler production by integrators. It is now common for broilers to be raised by growers who contract independently with integrators who retain ownership of the birds over their entire life cycle.

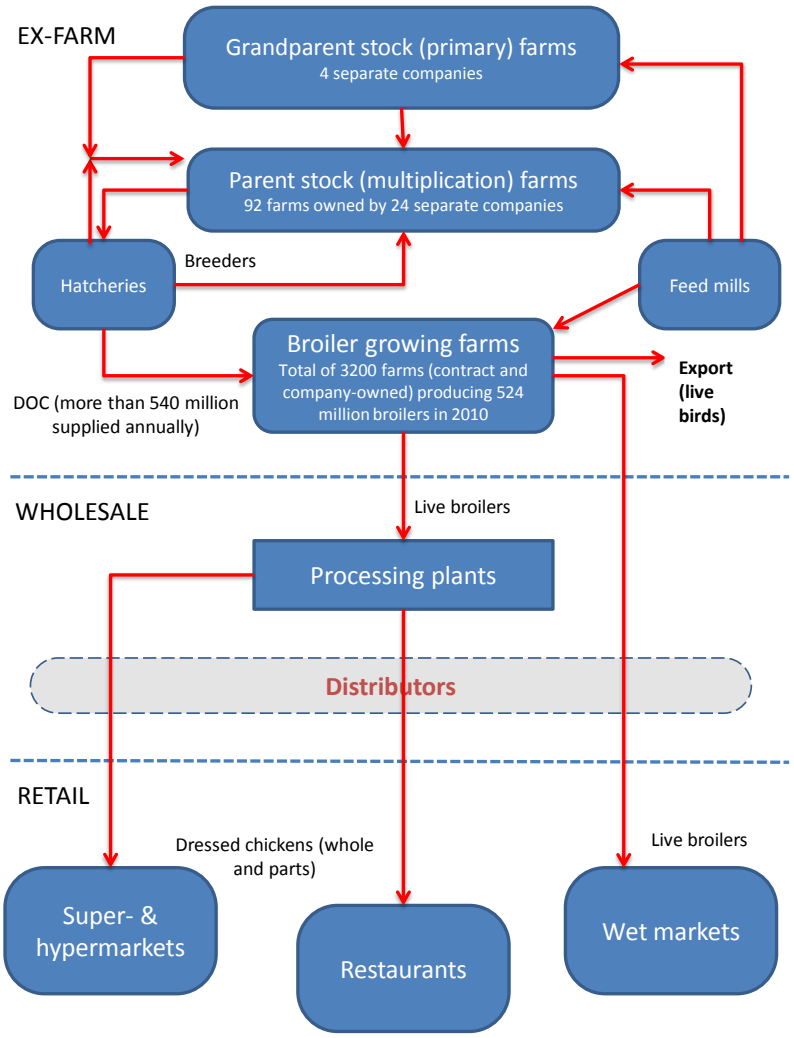
[2] The drop in consumption over the 2004-05 period was due to the outbreak of avian influenza at the time.

The continuing business growth of the broiler sector is a promising one, yet it has been marred by public complaints of the increasingly higher prices in metropolitan "wet markets". For example, it was reported in late September 2011 that the retail price of a standard chicken rose to more than RM9.00 per kg following removal of the Hari Raya Aidil Fitri festival price ceiling of RM7.60 (*The Star*, 30 September 2011); a price increase of more than 18 per cent. Responses from the supply-side (such as those attributed to the Federation of Livestock Farmers' Associations of Malaysia, or FLFAM) referred to the commercial need for price increases to cover the on-going cost changes at the *ex farm* stage of broiler production.

2.1 Supply chain

The present-day activities along the broiler supply chain, as depicted in Figure 2-2 below, range from *ex farm* activities of rearing grandparent and parent stocks, hatching of breed chicks, and rearing of broilers for meat production; to the *post farm* processing of whole chickens and further value-added packaging of chicken meat (in whole or in parts), and the wholesaling and retailing of both live broilers and dressed chickens.

Figure 2-2. Broiler supply chain



2.1.1 *Ex farm* segment

According to DVS data, there are currently 4 grandparent stock (or primary) farm operators involved with the production of DOC for their own parent stock farms as well as for other parent stock farmers.

All of the primary farm businesses are owned and operated by integrators who are (in alphabetical order) CAB Breeding Farm Sdn Bhd, Charoen Pokphand Farm Sdn Bhd, Huat Lai Breeding Farms Sdn Bhd and Leong Hup Poultry Farm Sdn Bhd.

At the next stage of *ex farm* activities, there are a total of 92 parent farms operated by 24 parent stock (or multiplication) companies. 10 of all the parent stock companies are owned by integrators (see Table 2-1 below).

In its submission, KFC Holdings stressed that although it operates in the ex-farm market, it most of its broiler production output is to support its own use in KFC's core business, i.e. the restaurant business through KFC, Pizza Hut, and Rasamas.

Table 2-1. List of parent stock companies (in alphabetical order)

Integrators	Non-integrators
Ayamas/KFC Breeder Farm Sdn Bhd	FFM Farms Sdn Bhd
CAB Breeding Farm Sdn Bhd	Hyperbird Sdn Bhd
Charoen Pokphand Farm Sdn Bhd	Kami Farming Sdn Bhd
DBE Breeder Farm Sdn Bhd	LKPP Sdn Bhd
Dindings Breeder Farm Sdn Bhd	Medan Juara Sdn Bhd
Huat Lai Breeder Farm Sdn Bhd	Pinwee (Taiping)
Lay Hong Sdn Bhd	Pertanian Tani Jaya (Shizul Sdn Bhd)
Leong Hup Poultry Farm Sdn Bhd	Prestige Fortune Sdn Bhd
Pin Wee Breeder Farm Sdn Bhd	Shunshing Feed And Breeding Farm Sdn Bhd
Sinmah Breeder Farm Sdn Bhd	Sin Long Heng Breeding Farm Sdn Bhd
	TD Poultry Sdn Bhd
	Yithai Poultry Sdn Bhd
	Zenxin Agric Sdn Bhd
	Zue Heng Farming Sdn Bhd

Source: DVS

The annual parent stock has almost doubled from about 8.68 million birds in 2006 to 16.96 million birds in 2010 (see Table 2-2 below). Over the same time period, the parent stock of free-range chickens fell significantly from about 236,000 birds in 2006 to about 48,000 in 2009; before it rose slightly to 64,000 birds in 2010.

Table 2-2.Chicken population by type and year (with percentage of total within brackets)

Type		2006	2007	2008	2009	2010
Broilers	'000 (% total)	102,639.9 (70.5)	106,890.6 (71.1)	106,233.6 (67.3)	121,455.5 (69.7)	117,844.3 (63.8)
Layers	'000 (% total)	30,989.2 (21.3)	31,699.0 (21.1)	37,987.1 (24.1)	37,816.4 (21.7)	41,789.4 (22.6)
Breeders (parent stock)	'000 (% total)	8,685.7 (6.0)	8,342.0 (5.5)	8,647.8 (5.5)	10,504.5 (6.0)	16,968.1 (9.2)
Free-range (ayam kampung)	'000 (% total)	3,075.1 (2.1)	3,206.2 (2.1)	4,949.0 (3.1)	4,507.2 (2.6)	8,085.9 (4.4)
Free-range breeders	'000 (% total)	236.2 (0.2)	236.7 (0.2)	55.5 (0.04)	48.5 (0.03)	63.4 (0.03)
Annual Total	'000 (% total)	145,626.1 (100)	150,374.6 (100)	157,873.0 (100)	174,332.1 (100)	184,751.1 (100)

Source: DVS

In its submission, FLFAM cited the data collected by the Ministry of Agriculture and Agro-based Industry which shows an increase in the number of free-range chicken farms from 169 in 2002 to 242 in 2008 (see Table 2-3). The population of live free-range chickens nearly doubled from 9 million birds in 2002 to 16 million birds in 2008. According to FLFAM, there has been no change in live bird population since 2006 due to the lack of economic viability in rearing free-range chickens.

Table 2-3. Free-range chicken farms and population, 2002 – 2008.

YEAR	2002	2003	2004	2005	2006	2007	2008	GROWTH RATE (%)
Number of farms	169	241	196	187	223	219	242	6.16
Number of live birds (million)	9	24	18	17	16	16	16	10.06

Source: Ministry of Agriculture and Agro-based Industries, as cited in FLFAM's submission.

Of the 53 hatcheries in Peninsula Malaysia, 22 are located in Johor (see Table 2-4). Only two other States have more than 5 hatcheries each, namely Perak (with 8) and Penang (with 6). Furthermore, 31 hatcheries (or more than 58 per cent of total) are owned and operated by integrators.

Table 2-4. Hatcheries by State in Peninsula Malaysia (as of September 2011)

State	Number of hatcheries	Number integrator-owned
Perlis	0	0
Kedah	3	1
Penang	6	0
Perak	8	7
Selangor	2	2
N. Sembilan	4	1
Melaka	4	3
Johor	22	16
Pahang	2	0
Terengganu	1	0
Kelantan	1	1
TOTAL	53	31

Source: DVS

In its submission, FLFAM presented its data on the supply of day-old chicks (DOC) which shows a close-to doubling from 377.8 million in 1996 to 653.1 million in 2011 (see Table 2-5).

Table 2-5: Supply of day-old chicks (DOC) and broiler chickens, Peninsular Malaysia, 1996-2012

Year	Number of DOC	Number of broiler chickens
1996	377,759,818	354,323,151
1997	386,342,670	363,294,259
1998	377,536,771	357,537,324
1999	361,556,297	343,840,094
2000	382,886,932	364,280,142
2001	396,606,193	382,555,567
2002	422,111,952	397,914,804
2003	430,815,416	409,545,060
2004	434,860,240	414,350,008
2005	461,961,488	437,054,987
2006	445,313,525	427,225,469
2007	552,066,597	513,799,017
2008	544,174,447	507,853,929
2009	545,282,847	516,231,809
2010	546,398,347	524,035,048
2011	653,096,763	614,496,996
2012 (Forecast)	683,121,353	634,216,393
CAAGR (%)		
1996-2011	3.99	4.01
1996-2005	2.26	2.36
2005-2011	5.94	5.84

Source: FLFAM
Note: CAAGR – Compounded average annual growth rate

According to FLFAM,

> output of DOC [has] expanded much more rapidly since 2005 when it recorded a growth rate of about 6.0 per cent from 2005 to 2011 compared to 2.3 per cent from 1996 to 2005. Output of broiler chickens also experienced a parallel growth pattern (p. 13 of FLFAM submission).

As of 2010, there are 2,978 broiler farms in Peninsula Malaysia of which 1,594 (or more than 50 per cent) are in Johor, Perak and Terengganu (see Table 2-6 below). The farms in these States account for slightly more than 55 per cent of the total broiler population in Peninsula Malaysia.

Table 2-6. Broiler farms by State (as of 2010)

State	Number of farms	Broiler population	
		Number ('000)	% of total
Kedah	233	8,112.30	7.19%
Pulau Pinang	200	5,915.03	5.25%
Perak	592	25,663.23	22.76%
Selangor	187	7,222.81	6.41%
Negri Sembilan	187	9,927.95	8.80%
Melaka	134	5,139.10	4.56%
Johor	703	37,248.49	33.03%
Pahang	182	6,267.28	5.56%
Terengganu	299	3,729.52	3.31%
Kelantan	248	3,358.70	2.98%
Perlis	13	179.90	0.16%
TOTAL	2,978	11,764.75	100.00%

Source: DVS

There is no publicly published information on the ownership of commercial or farming entities that operate broiler farms. MyCC also did not receive any submissions with such information.

According to the Department of Statistics' (DOS) *Report on the census of agricultural establishments – livestock 2009*, there were 292 poultry farming "establishments" in the whole of Malaysia. In this census, an establishment is defined as "an economic unit engaged in one activity, under a single legal entity and operating in a single physical location", and "each branch of a multi-branch organization at a different location was conceptually treated as a different location establishment." The entities covered by this census were businesses officially registered by the Companies Commission of Malaysia in 2008.

The difference between the total number of registered poultry farming establishments covered by the census (i.e. 292) and the number of broiler farms in the Peninsula (recorded as 2,978 by DVS) suggests that integrators are likely to own and operate multiple broiler farms, and that a number of independently operated farms are not formally registered businesses.

RECOMMENDATION 1

The Ministry of Agriculture and Agro-based Industries should, in consultation with other ministries, government agencies and business associations that collect broiler farming data, develop and maintain a common database on both registered broiler businesses and unregistered broiler farming operations in the entire *ex farm* segment of the broiler supply chain.

2.1.2 Wholesaling (processing, distribution) and retailing

According to the data collected by the Ministry of Domestic Trade, Cooperative and Consumerism (MDTCC), there are (as of November 2011) a total of 317 licensed wholesalers and 1,240 licensed retailers in the Peninsula (see Table 2-7 below). Most of the registered wholesalers and retailers are in Johor. Other Peninsula States that have more than 100 registered retailers include Negri Sembilan, Pahang and Selangor.

Table 2-7. Licensed broiler wholesalers and retailers by State (as of November 2011)

State	Number of wholesalers	Number of retailers
Johor	54	216
Kedah	22	22
Kelantan	17	30
Melaka	15	39
Negri Sembilan	19	103
Pahang	30	140
Perak	32	68
Perlis	0	3
Pulau Pinang	36	25
Selangor	47	101
Terengganu	12	37
Kuala Lumpur Federal Territory	20	33
Labuan Federal Territory	13	42
Putrajaya Federal Territory	0	1
TOTAL	317	860

Source: MDTCC

It is well-understood that when the quantity of product supplied in a market exceeds that of the quantity demanded by buyers, there is a tendency for the market price to be lowered when all other economic factors (such as household income or consumer preferences) remain the same. This does not mean that the market price will drop instantaneously; rather the interplay of supply and demand forces will eventuate in a long-run price that can be expected to be lower than, or *at most* the same as, before.

FLFAM puts forth the view that

> [a]bout 65 to 70 per cent of the output of live broilers is sold directly to wholesalers, while the remaining 30 to 35 per cent is channelled to processing plants which sell the dressed broilers directly to restaurants, hypermarket chains or to wholesalers and retailers. Thus almost two-thirds of the broilers are processed by non-integrators. The off-farm processing can range from primary processing or dressing of chickens to the manufacture of a range of products such as chicken frankfurters, cocktail sausages, burgers and nuggets (p. 9 of FLFAM's submission).
>
> ...

> The notion that the quantity of broiler meat supplied far exceeds the total quantity demanded (domestic demand by consumers plus exports), and therefore the excess supply should exert pressure on domestic prices does not arise, especially with a thriving downstream processing industry. Excess supply is absorbed by the integrators who own and operate plants to further process broilers into a wide variety of chicken meat products (p. 14 of FLFAM's submission).

Wholesale and retail pricing survey

In embarking upon a review of the domestic broiler market, MyCC wrote to KPDNKK on 24 April 2012 requesting its assistance with a survey of broiler wholesalers and retailers who "do business" in no more than 3 "wet markets" in each of the Peninsula State's capital, as well as in each of the State's rural districts. This survey was conducted by KPDNKK over the month of May 2012. The main pricing question asked of an interviewed party (wholesaler or retailer) refers to the selling price of live chickens that was being charged – by a wholesaler on retailers; or by a retailer on consumers – on the day of the interview as well as two weeks before the day of the interview. The price data that has been collected (and summarised in Table 2-8 below) does not necessarily reflect any monthly or seasonal trends in broiler price changes.

Table 2-8. Summary of survey data collected

State	Sample size		Wholesale price (RM per kg)		Retail price (RM per kg)	
			On the day of interview	2 weeks' before the day of interview	On the day of interview	2 weeks' before the day of interview
Kelantan	50	Min	3.70	3.50	5.29	3.99
		Max	6.50	6.30	7.50	7.30
		Average	5.23	4.84	6.40	5.95
Perlis	12	Min	4.60	3.90	6.80	5.90
		Max	6.00	5.50	8.00	7.50
		Average	5.21	4.78	7.16	6.79
Putrajaya	7	Min	4.50	3.50	5.80	5.20
		Max	6.20	5.80	7.00	6.80
		Average	5.37	4.67	6.46	5.87
Kedah	7	Min	4.60	4.10	6.00	6.00
		Max	5.80	5.30	7.80	7.30
		Average	5.13	4.52	6.91	6.47
KL	18	Min	5.20	4.50	6.00	5.60
		Max	6.20	5.50	7.00	6.00
		Average	5.63	4.70	6.67	5.80
Melaka	27	Min	4.50	3.50	6.30	5.30
		Max	6.40	6.80	7.60	7.80
		Average	5.39	4.84	7.23	6.75
Pahang	27	Min	3.60	3.20	5.10	4.20
		Max	6.60	7.50	8.00	8.00
		Average	5.07	5.05	7.19	6.93
Selangor	58	Min	4.20	3.50	3.80	3.10
		Max	7.00	5.80	7.50	8.00
		Average	5.22	4.66	6.75	6.45
Johor	84	Min	4.80	4.60	6.00	5.80
		Max	6.30	6.70	7.50	7.20
		Average	5.60	5.48	6.75	6.58
Negri Sembilan	40	Min	3.90	3.10	5.39	5.39
		Max	6.50	6.50	7.60	7.50
		Average	4.71	4.25	7.03	6.74
Pulau Pinang	46	Min	4.40	3.50	7.00	6.00
		Max	7.00	7.00	8.70	8.50
		Average	5.80	5.33	7.87	7.44
Terengganu	48	Min	3.50	3.40	4.00	4.00
		Max	6.00	5.60	7.50	7.50
		Average	4.73	4.68	6.40	6.44

The 2-week time-pattern of wholesale and retail pricing appears to differ across the Peninsula States. For example, in the case of Melaka, both of the minimum wholesale and retail prices of live chickens two weeks before the interview day (respectively RM3.50 and RM 5.30 per kg) were less than those on the day of the interview (respectively RM4.50 and RM6.30 per kg). On the other hand, the maximum wholesale and retail prices of two weeks' ago (respectively RM6.80 and RM7.80 per kg) were both higher than the prices charged on the day of the interview. In contrast, all of the minimum and maximum prices that were charged in Pulau Pinang on the day of interview were (with one exception) higher than those charged two weeks' ago.

Furthermore, the additional information collected from interviewed parties revealed that:

- the wholesale supply of live chickens was usually delivered on a daily basis;
- the final price of live chickens was usually set by retailers on a daily basis; and
- retailers will usually keep the stock of unsold live chickens in a day to sell them on the following day.

2.2 Market concentration

A market is considered to be concentrated when a few businesses in that market hold, respectively and collectively, large market shares. The market share held by a firm may be calculated on the basis of its sales, the number of its customers, its production capacity, value added, or volume of output.

The only published paper on broiler market concentration that MyCC came across is one that looked into the make-up of the *ex farm* segment on the basis of 2001 data.[3] According to this publication:

- 67 per cent of parent stock was supplied by 5 integrators.
- 59 per cent of breeder farms' output was supplied by 5 integrators and 39 per cent was supplied by 21 non-integrators.
- 5 integrators supplied between 50 to 60 per cent of the total output from all broiler growing farms.

Based on available data on a broadly defined group of broiler products (as defined by the Department of Statistics in the *Annual Manufacturing Establishment Survey 2004*), MyCC computed the CR-4 ratio for the downstream poultry processing segment of the supply chain (at the MSIC 4-digit level) to be 88.5 per cent, and the

[3] Kaur, Bisant and Fatimah Mohamed Arshad (2007). "Marketing of poultry in Malaysia: Structural issues and challenges" in Fatimah Mohamed Arshad *et al* (eds), *50 Years of Malaysian Agriculture: Transformational Issues, Challenges and Direction*, USM Press, Serdang, 2007; Chapter 24.

Herfindahl-Hirschman Index ("HHI") to be 3,450.[4] Both of these computed indices are considerably higher than the "safe harbour" of 75 per cent (in the case of CR-4) and 1800 (in the case of HHI).

It should be noted that the computed CR-4 ratio and HHI are only indicative, and not determinative, of possible dominance by the poultry processing firms or group of firms with large market shares. To account for the possible or likely competitive effects in the processing segment of the supply chain, other factors (e.g. barriers to market entry, scale economies, pricing practices) will need to be assessed.[5]

In response to MyCC's queries on market shares held by businesses at the *ex farm* segment, and (separately) at the processing and/or wholesaling segment of the broiler supply chain, FLFAM made the following remarks in its submission:

> The computation of … market concentration indices such as CR4 and Herfindahl-Hirschman Index (HHI) must be based on the relevant market segment. In the Issues Paper, both these indices have been computed using the processing activities classified under the MSIC 4-digit level, and this has been applied to the entire supply chain [underlined by MyCC]. Thus it does not reflect the extent of market concentration in the broiler industry, i.e. poultry farming (p. 14 of FLFAM's submission)

MyCC is strongly of the view that FLFAM has misread MyCC's CR-4 ratio and HHI that were estimated with reference to the processing (or downstream) segment of the supply chain, and not that of the entire broiler supply chain. MyCC agrees with FLFAM's view that, in the context of competition law, market concentration indices must be calculated with reference to the relevant market segment. In that regard, market concentration at the respective segments of parent stock farming, broiler growing, and downstream processing are all conceptually and empirically different from any other statistical measures of the distribution of production or output within the entire broiler supply chain (i.e. the entire broiler industry).

In its submission, FLFAM also reported the CR-4 ratio and HHI that it has calculated on the basis of the estimated market shares held respectively by 8 integrators and 28 non-integrated parent stock companies (which included a group of "Others" who are also non-integrated parent stock businesses).

> The CR4 ratio … is 31.3 [per cent]. This is considered very low compared to the threshold of 75 per cent which is considered the "safe harbour". Likewise the HHI is only 508, which is far below the threshold level of 1800, regarded as "highly concentrated" … Thus the domestic broiler industry operates in a relatively un-concentrated market. It would take significant mergers of firms to place broiler production in Malaysia in the highly concentrated market category (pp. 14 – 16 of FLFAM's submission).

MyCC's read of FLFAM's estimated indices is that the supply market for parent stocks is not concentrated, but MyCC is not convinced of FLFAM's inference that "the domestic broiler industry operates in a relatively un-concentrated market." The absence of concentration at a specific *ex farm* segment of the supply chain

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[4] The CR-4 ratio is calculated on the basis of market shares of the 4 largest firms in the market. The HHI is calculated by summing the squares of market shares of all firms (or the identified group of "largest" firms) in the market.

[5] The topic of pricing practices is addressed in Chapter **Error! Reference source not found.** of this eport.

(namely, parent stock farming) does not imply that the next *ex farm* segment (namely, broiler growing), or the following downstream segments (namely, broiler wholesaling and processing) are also not concentrated. In particular, MyCC is well-aware of the fact that there are currently more than 3000 broiler growing farms outputting close to 600 million broilers in 2011. However what is less known (if at all) is the level of market concentration that reflects the ownership of broiler growing farms by integrators, non-integrators and independent farmers (who are engaged in broiler growing via contractual arrangements with integrators and/or non-integrators).

RECOMMENDATION 2

MyCC should, in consultation with other ministries, government agencies and business associations that collect broiler farming data, undertake further empirical research and estimation of market concentration within the broiler growing, wholesaling and processing segments of the supply chain.

2.3 Cost structure

Based on the information provided by DVS, the *ex farm* cost structure comprises of DOC, chicken feed, vaccination, labour, utility and other inputs (see Table 2-9). The main sources of production cost variations over time are fluctuations in DOC prices and costs of chicken feed.

Table 2-9. *Ex farm* cost structure

Input	% of total cost
DOC	21.0
Chicken feed	72.7
Vaccines and vitamins	1.0
Manpower	2.6
Utilities (water, electricity)	0.9
Transport	1.7
TOTAL COST	100.0

Source: DVS

Further information on the *ex farm* cost structure is provided by FLFAM (on pp. 16-19 of its submission):

> Due to wide variations in the size of farming activities, the COP in the industry varies according to farm size. In general, the larger the farm, the lower is the COP. However, for the purposes of negotiations, FLFAM computes the broiler COP for an average farm size of 30,000 birds per batch. The FLFAM computes the detailed broiler COP on a regular monthly basis. The calculated COP benchmark is used for reference and it takes into account the viability of the various participating farm enterprises at the grand parent, parent and broiler grow out levels. The COP index for January and July/August of each year from 2007 is computed [in Table 9 presented in FLFAM's submission].

The overall COP has risen by about 45.0 per cent from January 2007 and July 2012, whereas feed costs have increased by about 80.0 per cent or almost twice the overall increase in COP during this period. Feed cost is the largest cost component in broiler production costs and it accounts for about two-thirds (69.0 per cent) of the total COP [see Table 2-10 below which is a copy of the table presented in FLFAM's submission]. The weighted average increase in COP since 2007 is 25.1 per cent,

Table 2-10. *Ex farm* cost structure as presented by FLFAM

Input	% of total cost
Cost of DOCs (10,000 x price of DOC)	15.0
Manpower	3.9
Vitamins, Electrolytes & Vaccines	3.0
Utility	1.8
Maintenance	1.0
Housing Depreciation	4.0
Feed Cost	68.7
Bank Interest based on 7%	3.2
Sale of Chicken Manure	(0.5)
TOTAL COST OF PRODUCTION	100.0

Source: FLFAM

Hence, movements in the average COP are largely driven by changes in feed costs. Thus increase in feed prices has a significant impact on the profitability and viability of the industry. A significant portion of the inputs used in the production of broilers is imported. These include superior genetics, broiler feed such as corn, soybean meal and feed additives, as well as vaccines. The only local ingredient of some significance is crude palm and rice bran and these are used at very low percentages of the feed formulation. Even these are purchased at export prices.

Apart from feed price, the price of DOC is also an important determinant of the average cost of production. It accounts for about 15 per cent of the COP. The cost of DOC has been relatively stable with a decline of about 13.0 per cent between January 2010 and January 2011.

…

Like other primary commodity producers, the broiler industry is also increasingly dependent on foreign labour as it is difficult to hire local labour. However, it faces serious difficulties with respect to recruitment (new and replacement workers) and retention of foreign workers (beyond the 5-year tenure). The current on-going modernization and automation of the broilers have reduced demand for labour to some degree. For instance, closed house poultry rearing has increased worker utilization efficiency by three times. However, there are inherent labour-intensive ancillary tasks outside the core farming operations that rely on foreign labour such as vaccination, feed milling, removal and processing of chicken manure, replacement loading etc. The approving authorities fail to take into account the peculiar nature of the broiler industry and approve less number of workers than that recommended by the Ministry of Agriculture and Agro-based Industries.

MyCC concurs that while such matters should be looked into in some detail, they are beyond its regulatory role and responsibilities.

3 Broiler Price Trends and Transmission

According to local media reports as well as the data recorded by DVS (between January 2007 and December 2011),both *ex farm* prices (for DOC and live chickens) and retail prices (for "standard" broilers) fluctuate on a monthly basis. The highest, lowest and annual average prices recorded in 2009, 2010 and 2011 are presented in Table 3-1.

Table 3-1. Highest, lowest and average prices

	2009			2010			2011		
	Highest	Lowest	Average	Highest	Lowest	Average	Highest	Lowest	Average
DOC, in RM per chick	1.50 (May)	1.08 (Jan)	1.29	1.68 (Aug)	1.14 (Dec)	1.45	2.08 (Sep)	1.26 (Jan)	1.78
Ex farm live chicken, in RM per kg	4.55 (Jun)	3.73 (Apr)	4.12	4.60 (Aug)	3.95 (Feb)	4.29	5.45 (Sep)	4.09 (Nov)	4.80
Standard broiler, in RM per kg	6.85 (Nov)	4.73 (Apr)	6.47	7.15 (Aug)	6.60 (Apr)	6.92	8.32 (Sep)	6.30 (Nov)	7.60

Data source: DVS

In 2009, the prices of DOC fluctuated between the lowest level of RM1.08 (in January of that year) and the highest level of RM1.50 (in May of same year). In 2010, the highest price of RM1.68 was in December and the lowest price of RM1.14 was in August. In 2011, prices ranged between the lowest level of RM1.26 (in January) and the highest level of RM2.08 (in September). Furthermore, the annual average price has risen by more than 12 per cent from RM1.29 in 2009 to RM1.45 in 2010. The annual average price of RM 1.76 in 2011 is more than 21 per cent higher than that in the previous year.

The *ex farm* live chicken prices in 2009 varied between the highest level of RM4.55 per kilo in June of that year and the lowest level of RM3.73 in April of same year. In 2010, prices varied between RM3.95 in February and RM4.60 in August; and in 2011, the highest price of RM5.48 was in September and the lowest price of RM4.09was in January. The annual average price of RM4.12 in 2009 increased by more than 18 per cent to RM4.87in 2011.

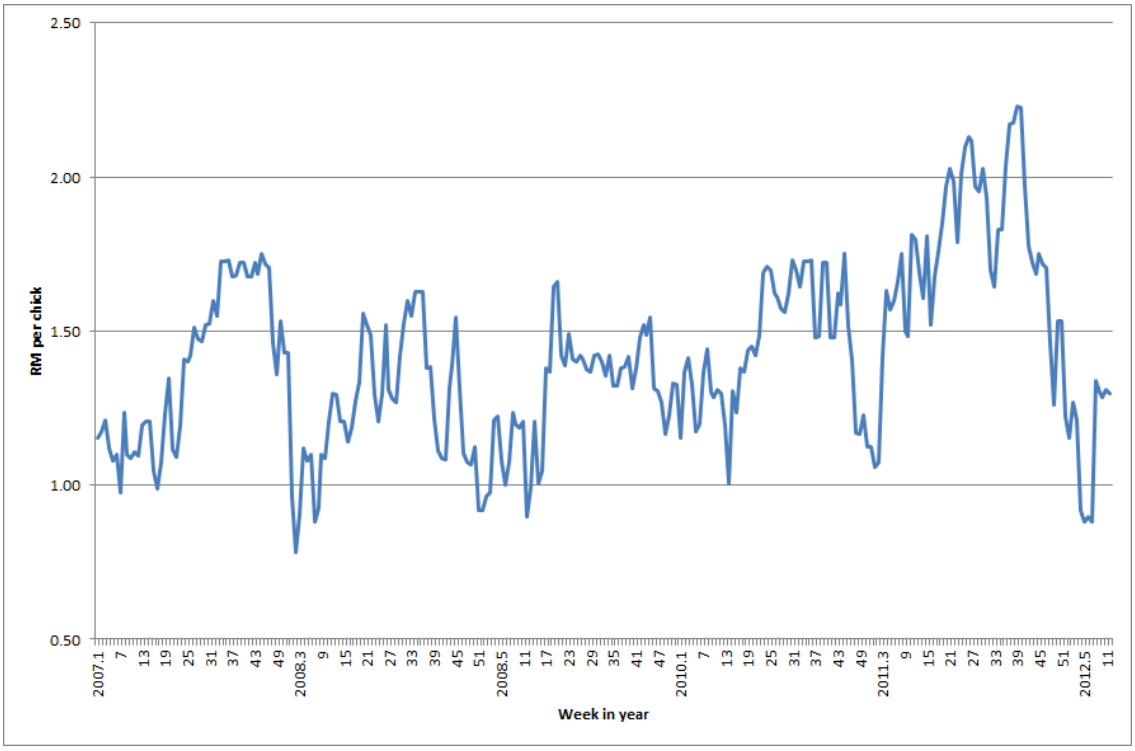
The lowest retail price of a "standard" broiler was RM4.73 per kilo in April of 2009 and the highest was RM6.85 in November of same year. In 2010, prices ranged between RM6.60 (in February) and RM7.15 (in August). In 2011, the lowest price was RM6.30 in November and the highest price was RM8.32 in September. The annual average retail price increased by a rate of just over 19 per cent from RM6.47 in 2009 to RM7.60 in 2011.

3.1 Inclining price trend

MyCC performed a trend analysis of weekly DOC prices, as well as the monthly market prices of live chickens and "standard" broilers. MyCC's main finding, based on this trend analysis, is that the prices for DOC, live chickens and "standard" broilers are all on an inclining trend.

The "adjusted" (or centred) 4-week moving averages of DOC prices between 1 January 2007 and 25 March 2012 are charted in Figure 3-1.[6] The sequential numbers on the horizontal axis refer to the sequential weeks in a year, e.g. the number "2007.1" refers to week 1 in 2007 and the following numbers "5, 9, 13, …, 49" refer to week 5, 9, 13, …, 49 in the same year.

Figure 3-1. Moving averages of weekly DOC prices – 1 January 2007 to 25 March 2012



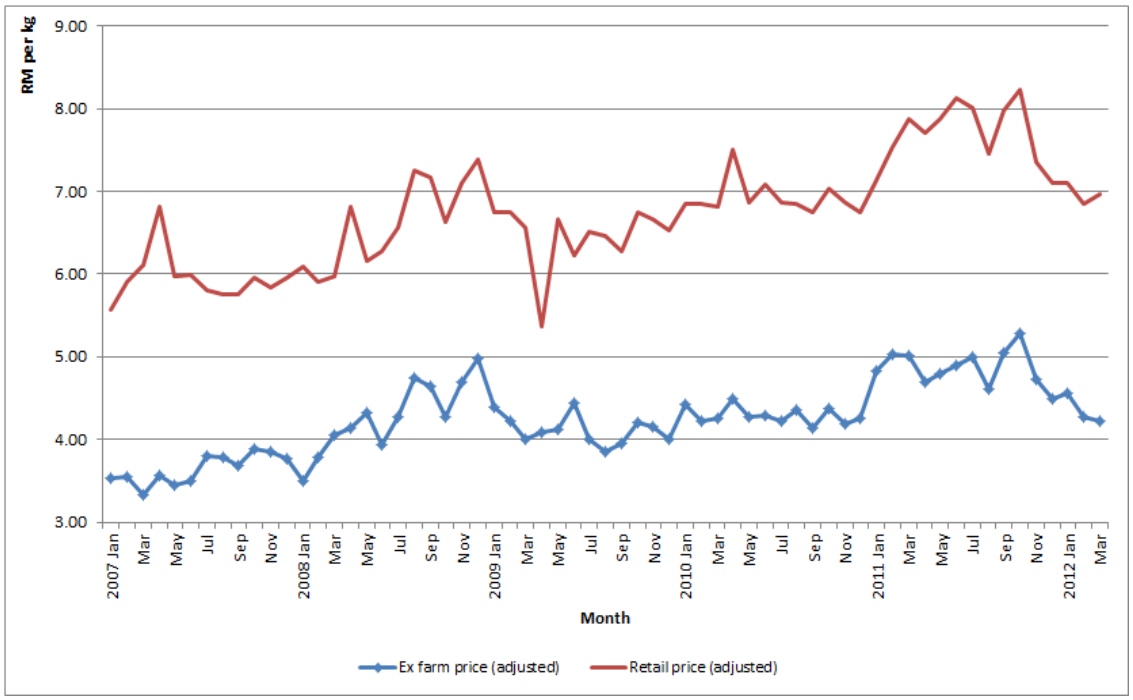
Between 2007.1 (first week of 2007) and 2012.12 (twelfth week of 2012),the DOC price movement appears to be on an inclining trend with an oscillation period of about 26 weeks within each calendar year. The "typical" DOC price pattern is as follows: DOC prices trend upwards from around week 14 of the calendar year (early April) before they trend downwards after week 40 of the same year (early October). The "peak" (i.e. highest) price in each of the oscillation periods have

[6] Technically, a moving average of a price is usually calculated over an odd-period of time (e.g. a 7-day moving average or a 3-month moving average) to "remove" the cyclical, seasonal and irregular components of the time-series data. The price trend can then be discerned. In the case of an even timeframe (particularly, over 4 weeks in a month or 12 months in a year), an "adjusted" (or centred) moving average has to be calculated. For further details on this methodology, refer "Statsoft Electronic Statistics Textbook" that is publicly available at www.statsoft.com/textbook/time-series-analysis/ (accessed on 3 November 2011).

increased from about RM1.75 per chick in calendar year 2007 to more than RM2.00 per chick in calendar year 2011.

The "adjusted" (or centred) 12-month moving averages of *ex farm* and retail chicken prices are charted in Figure 3-2.

Figure 3-2. Moving averages of monthly live chicken and retail prices – January 2007 to March 2012



Since January 2007, *ex farm* price has been on an inclining trend, with an oscillation period of between 3 to 4 calendar months. In the case of retail price, an upward trend can also be discerned, although the oscillation period is unclear due to the "dramatic" moving average price increase in April 2007 and price decline in April 2009.[7]

The linkage of *ex farm* and retail prices varies on a monthly basis. From a business perspective, this should be expected because any change in the costs of farming and wholesaling (as well as the margins that can be earned at each level of the supply chain) would be included in the final (i.e. retail) price for the product.

FLFAM submitted the following comments on price movements:

> The ex-farm prices of broilers have been volatile but much less than retail or wholesale prices of broilers. Price volatility is not untypical of primary commodities, especially perishable items.
>
> The ex-farm price index for broilers shows that prices have increased steadily throughout 2007, but fell by 2.8 per cent in January 2008, before gaining momentum for the next 22 months. Broiler prices dropped the following two months before rising

[7] The "dramatic" drop in the moving average of broiler prices in April 2009 was probably due to Malaysia's high alert for the avian influenza virus (H5N1) following outbreaks in the poultry industries in Egypt, Indonesia, Thailand and Vietnam.

sharply to reach a record high of about 53.0 per cent in November 2010 [see Table 3-2 below which is a copy of the table presented in FLFAM's submission]. These trends coincide with the inclining price trends of corn and soya bean, two important inputs into broiler production.[8] According to the weekly report prepared by US Grains' Council, there is a sharp fall in estimated harvest and yield of corn, wheat and soya bean. The tight supply in these main feed ingredients will push prices further … (p. 22 of FLFAM's submission).

Table 3-2. Price index of *ex farm* broiler, January 2007 to July 2012

Year	Month	Price Index	Year	Month	Price Index	Year	Month	Price Index
2007	Jan	100.0	2009	Jan	102.9	2011	Jan	137.7
	Feb	100.5		Feb	108.5		Feb	143.0
	Mar	101.3		Mar	107.6		Mar	145.2
	Apr	101.7		Apr	101.2		Apr	147.8
	May	101.2		May	121.7		May	147.8
	Jun	102.1		Jun	113.6		Jun	148.4
	Jul	104.3		Jul	111.7		Jul	149.9
	Aug	106.3		Aug	109.7		Aug	150.6
	Sep	107.9		Sep	119.8		Sep	151.0
	Oct	109.3		Oct	122.3		Oct	153.1
	Nov	109.8		Nov	113.3		Nov	153.3
	Dec	107.9		Dec	98.0		Dec	152.2
2008	Jan	97.2	2010	Jan	90.5	2012	Jan	135.5
	Feb	101.6		Feb	114.0		Feb	138.5
	Mar	104.7		Mar	115.6		Mar	135.5
	Apr	107.5		Apr	115.7		Apr	134.6
	May	108.9		May	116.2		May	133.6
	Jun	107.7		Jun	117.4		Jun	135.1
	Jul	108.6		Jul	118.2		Jul	135.1
	Aug	111.7		Aug	118.4			
	Sep	114.7		Sep	119.6			
	Oct	116.3		Oct	120.3			
	Nov	118.8		Nov	120.3			
	Dec	119.5		Dec	119.7			

Source: FLFAM

KFC Holdings remarked in its submission that:

MyCC's … findings in relation to the inclining price trend for day-old chicken, live chicken and 'standard' broilers are not applicable to KFC as the broilers produced by KFC ex-farm are rarely sold to the public save for very limited instances. This only occurs if KFC has broiler production in excess of what it requires for its restaurant business, in which case KFC may sell just this limited amount in the market. However, such instances are rare and the quantity of such excess broilers sold in the market is minimal.

[8] According to FLFAM, the composition of compounded feed for broilers comprises 55 per cent corn, 25 per cent soya bean meal, 3 per cent wheat pollard, 4 per cent corn gluten meal, and 3 per cent crude palm oil.

3.2 Supply control and "permitted maximum" price

Poultry is one of the specific consumer products for which prices were regulated by the Ministry of Domestic Trade, Cooperatives and Consumerism (MTDCC) pursuant to the *Price Controlled Goods Order* (a subsidiary legislation under the then *Price Control Act 1946*). Since June 2008, the retail price ceiling on broilers has been removed. Nonetheless, broilers are still declared as "controlled items" under the *Control of Supplies Act.* Currently, a "permitted maximum" retail price is set by MDTCC for each of the festivals within a calendar year.

FLFAM puts forth the view (on pp. 27-28 of its submission) that:

> … price controls contribute to market distortions that harm consumers and producers alike in the medium to long-term …
>
> Apart from distorting the market, it impacts negatively on the image of the industry. This is especially true of financiers who tend to regard such action as market interferences that impinge on the commercial viability of the industry. The poultry industry had a poor risk rating by financial institutions in the country under the price control regime [which was removed in 2008] … Access and availability of adequate capital is crucial to an industry that is currently in transformation to remain viable in the face of competition.
>
> … ex-farm prices vary between the larger and smaller firms. Based on past industry experience, the ex-farm controlled price is often set at a level that is below the COP for smaller producers and above the COP for larger producers and integrators. Evidently, the price control policy impacts negatively on the smaller farms.
>
> It is common for prices to be sticky downwards even in the most competitive markets. There is a time-lag before prices are restored to market equilibrium prices following the removal of price controls. When the market prices for broilers fall during the control period, farmers have to sell the commodity according to the laws of supply and demand. On the contrary, others down the market chain sell the commodity at the declared control price since the control prices are "ceiling prices" and not fixed prices. The traders along the market chain appear to adhere to the control prices even when the control period is over while farmers are subjected to the laws of supply and demand unless the ex-farm price rises above the control price in which case the downstream market chain would follow suit.

MyCC understands that imposing a "permitted maximum" retail price regime for no more than 2 weeks before and after a festival will prevent consumers from being charged exorbitantly by retailers. But it may also inadvertently weaken retailers' competition with one another, as well as create market distortions and a lack of transparency in the commercial relationships between wholesalers and retailers.

Instead of actually competing with one another, all retailers in a "wet" market may decide to sell their broilers at a price close to or at the level of the "permitted maximum" price. Although this could be seen as retailers' compliance with the "permitted maximum" price, it could also be an outcome of collusive pricing by the retailers. Thus, even if consumers have benefitted from paying the "permitted

maximum" price, any collusive behaviour on the part of retailers will effectively deny consumers of the potential and additional benefits of lower prices that will result from actual market competition.

COMMENT

A "permitted maximum" retail price may have an unintended effect of dampening or lessening competition between broiler wholesalers and retailers over a festival season. MDTCC should closely monitor the conduct of both these parties (in terms of their supply and pricing decisions over the two-week period before and after a festival) to ensure that consumers can be made better-off by the sale of broilers at competitive prices that are below the "permitted maximum" level.

3.3 Price transmission

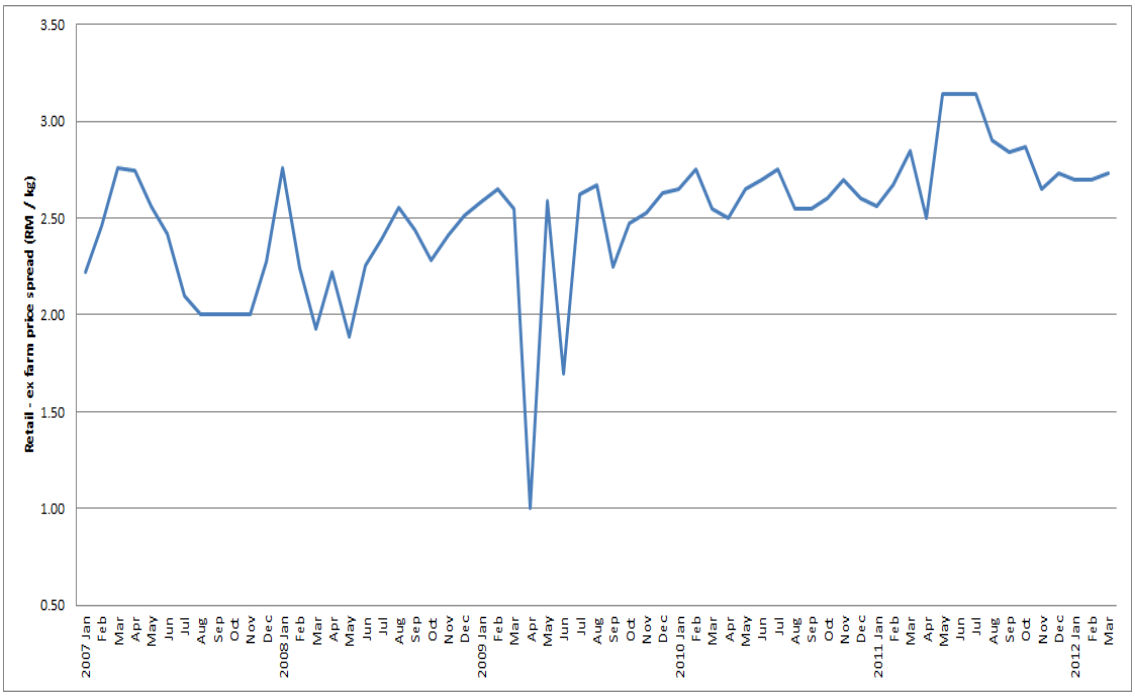
Generally speaking, a business operator in one segment of a supply chain will buy materials from someone in the upstream segment of that chain. From the perspective of this business operator, the price paid for the upstream entity's materials is the economic cost of an input. When there is a change in this economic cost, it may be passed-on through the price of the operator's output that is sold to other parties (i.e. other producers or consumers).

In the context of the broiler supply chain, a seller in the upstream segment of the supply chain can be expected to charge buyers in the immediate downstream segment a price that will not only cover the seller's upstream costs, but also generates a margin.

3.3.1 Retail-*ex farm* price spreads

MyCC looked into the retail-*ex farm* price spread in some detail on the basis of the monthly average data formally recorded by DVS. The monthly pattern of this price spread, which is the difference between the average retail prices of a "standard" broilers and average *ex farm* prices of live chickens, is shown in Figure 3-3 below.

Figure 3-3. Spreads between retail and *ex farm* prices – January 2007 to March 2012



MyCC also performed an ordinary least-squares (OLS) regression of monthly price spreads (the dependent variable measured in terms of RM per kilogram) against a monthly time index (the independent variable). The estimated coefficient of the monthly time index is 0.011, which is moderately small but statistically significant. This means that along the timeline from January 2007 to March 2012, the difference between the retail and *ex farm* price tends to increase by about RM0.011 (i.e. 1.1 sen) on a monthly basis.

In its submission, FLFAM provided an empirical analysis of the spread between COP and *ex farm* prices from January 2007 till July 2012**.** Although the estimated trend line suggests that the spread between COP and *ex farm* prices increase**s** at about 0.3 cents per month on average, FLFAM acknowledged that this relationship is statistically insignificant due to autocorrelation (i.e. successive observations in a time series of data are correlated). In other words, the spreads between COP and *ex farm* prices is a "random walk" over time.

3.3.2 Asymmetric price transmission

Numerous empirical studies of agricultural and livestock markets, especially those in EU countries, have uncovered statistical evidence of price transmission effects.[9] Increases in upstream prices reduce retail margins. For this reason, price transmission effects tend to be positive. Upstream price increases are passed-on through the supply chain, thereby causing downstream prices to rise. Furthermore, price transmission tends to be asymmetric, i.e. only upstream price increases (but not price decreases) are passed-on through the supply chain.

[9] MyCC's review of this empirical literature is summarised in the Appendix.

MyCC has statistically confirmed, on the basis of econometric analysis, that changes in *ex farm* chicken (i.e. upstream) prices between January 2007 and March 2012) are transmitted asymmetrically and positively to standard broiler (i.e. downstream) prices.[10] Specifically, for every 10 per cent increase in the *ex farm* price of live chickens, the retail price of broilers can be expected to increase by 7.5 per cent (all other things being equal).

In its submission, FLFAM did not comment specifically on asymmetric price transmission, Instead FLFAM looked into the asymmetric transmission of production costs to *ex farm* prices (over the period of February 2007 to July 2012) by regressing the logarithmic values of *ex farm* prices against the logarithmic values of COP using an "autoregressive distributed lag" (ARDL) econometric model. According to FLFAM:

- A 1 per cent increase in COP is associated with a 0.3 per cent rise in *ex farm* price in the short term. This relationship is statistically significant at the 5 per cent critical level.
- In the long term, the pass-through of COP to *ex farm* price is close to 100 per cent and "[t]his is to be expected, otherwise farms have to close down." (p. 28 of FLFAM's submission).

3.3.3 Market power

When asymmetric price transmission results in an increase (but not a decrease) in retail prices, the question arises as to whether the retail price increase is justified by the higher input cost that is paid by retailers; or whether the price has increased by an amount more than the change (if any) in the cost of the input.

On the basis of its statistical findings, MyCC has formed of the view that the close-to immediate pace and extent by which *ex farm* price increases are passed-on to wholesale and/or retail prices may be related to or caused by market power and/or the exercise of oligopolistic behaviour in the intermediate (wholesale) stages of supply. That said, it should be noted that market power is neither necessary nor sufficient for asymmetric price transmission. The latter can occur for other reasons, e.g. charging the "maximum permissible" price allowed by government and increasing (instead of reducing) that price after the removal of

[10] Before any inferences about asymmetric price transmission can be drawn from a regression of logarithmic retail prices (the dependent variable) against logarithmic farm-gate prices (the independent variable), the co-integration of retail and farm-gate prices has to be verified. For further technical details on co-integration, refer to Engle, Robert F. and Clive W.J. Granger (1987), "Co-integration and error correction: Representation, estimation and testing", *Econometrica*, 55(2), pp. 251-276. The Engle-Granger approach to verifying co-integration involves a statistical (*viz.* the Dickey-Fuller) test of whether the "errors" between the actually observed and estimated retail prices (calculated on the basis of the estimated regression coefficient) are non-stationary. This statistical test is formalised in Dickey, D.A. and W.A. Fuller (1979). "Distribution of the estimators for autoregressive time series with a unit root," *Journal of the American Statistical Association*, 74, pp. 427–431. MyCC has statistically confirmed, through the Dickey-Fuller test at both the significance levels of 1 and 5 per cent, the co-integration of retail and farm-gate prices that is reflective of both short-run market dynamics (i.e. deviations from market equilibrium prices) and long-run market expectations (i.e. market-driven price adjustments).

government's price control. In a market that is increasingly vertically integrated, there will be a lower number of independent businesses in each stage of the supply chain. This is the main reason why it is more likely for upstream price increases (but not price reductions) to be passed-on downstream.[11]

Thus the market power of an integrated firm (or group of integrated firms) may be the source of asymmetric price transmission. When there is a change in price at the farm level, firms along the supply chain may be colluding tacitly when they all immediately pass-on an upstream price change to minimise or completely avoid any reductions of their margins. Likewise, they would be keen to maintain prices above the competitive level and earn a higher margin by not passing-on any reduction in price at the farm level.[12]

Other forms of strategic actions that may cause by or are related to asymmetric price transmission include the following.

- A firm operating in an increasingly oligopolistic market may, on the basis of "learning by doing", increase the price of its product on the expectation that the higher price will be matched by market rivals. This same firm will never opt for the strategy of price reduction because it may lead to a "price war" in the market.
- When there is an increase in input prices, all firms will follow one another in adjusting the prices for their products upwards. When there is a reduction in input prices, these firms will avoid undermining their tacit agreement by not reducing the prices of their products.
- Inflation could also be a cause of asymmetric price transmission. In this case, firms would increase their product prices in anticipation of inflated input costs. Even when the actual rate of cost inflation is lower than anticipated, none of the firms will find it necessary to readjust or lower the prices for their goods.

On p. 28 of its submission, FLFAM opined that:

- "ex-farm gate prices are determined by the market forces of demand and supply and any increase in input costs is not automatically passed on to the selling price as is practiced in the cost plus method of pricing";
- "… farmers are essentially price takers and have to absorb monthly losses. The market for broilers at the ex-farm level of the chain is highly competitive as reflected in the relatively low margins and the high volatility. Thus most, if not all, of the benefits of lower real costs have been competed away by market forces"; and

[11] McCorriston, S. and I.M. Sheldon (1996). "Trade policy in vertically-related markets", *Oxford Economic Papers*, 48, 664-672.

[12] An overseas empirical study has found that more than 20 and 17 per cent of retail-wholesale price margins for dairy and meat products respectively can be attributed to oligopoly-oligopsony distortions. See Gohin, A. and H. Guyomand (2000). "Measuring market power for food retail activities: French evidence", *Journal of Agricultural Economics*, 51, 181-195.

- "Given the volatility in monthly prices, farmers must ensure that the average price they sell for the year is higher than the average total cost of production. This ensures farmers operate efficiently in order to remain profitable".

KFC Holdings stated in its submission that "KFC makes its pricing decisions independently, taking into considerations all relevant costs components in determining the retail prices of its products to its consumers, … KFC does not coordinate its decisions with other players in the market whether relating to pricing or other market practices."

4 Vertical Coordination

Coordinating mechanisms along a vertical supply chain include contracts and integrated ownership and operation. In most developed economies (such as UK, US and Australia), vertical integration of broiler businesses along the supply chain coincided with the prevalence of contract arrangements between farmers (upstream) and large broiler processing firms (downstream). The main factors that drive vertical integration in the poultry industry are margin control; biosecurity; and economies of scale (particularly in processing). According to the World Bank (2001), vertical integration has considerable economies of scale, especially in the area of disease control that has become prominent in recent times.[13]

The broiler industry in Malaysia has undoubtedly evolved and adapted itself to modern forms of commercial practices. There are now 10 vertically integrated broiler businesses in Malaysia, compared to 5 in the early 2000s. The expectation is that the level of competition between integrators will be more intense now than 10 years ago. Yet the available data shows that retail prices have continue to increase at a rate that is seemingly higher than the CPI.

The level of competition across the supply chain may be lessened by more concentrated upstream and downstream markets due to vertical integration (formally achieved by business mergers).

Recent mergers and acquisitions of broiler businesses include the following:

- On 14 October 2009, it was reported in *The Edge* that Leong Hup Holdings Bhd (LHH) acquired the poultry firm Ladang Ternakan Maju Sdn Bhd (LTM). With LTM as a new subsidiary, LHH aimed to expand its annual production of DOC from about 124 million birds to 134 million birds, and broiler chickens from about 38 million birds to about 47 million birds. According to LHH, this acquisition would strengthen its position as one of the largest integrated poultry farm and hatchery operators in Malaysia.
- On 16 October 2009, it was reported in *The Edge* that DBE Gurney Resources Bhd bought a 51 per cent stake of Visa Jiwa Sdn Bhd, an integrated poultry operator involved in poultry breeding, hatchery, processing, feed milling, broiler farming and distribution of poultry products. This partial acquisition will increase DBE group's annual production of broiler chickens from 10 million to 24.5 million birds.
- On 2 November 2010, it was reported by *Business Times* that KFC Holdings Bhd will be acquiring, via its subsidiary Ayamas Food Corporation Sdn Bhd (Ayamas), four poultry-related companies for RM 1.11 million from Johor Corporation Bhd (JCorp). In its Bursa filing, KFC Holdings said these companies were among the seven farms in Sedenak Kulai, Johor owned by Johor Franchise Development Sdn Bhd (Johor Franchise) and Johor

[13] World Bank (2001). *Livestock Development, the Environment, Poverty and Global Food Security: A Strategy Paper.* World Bank, Washington DC

Ventures Sdn Bhd (Johor Ventures) – both of whom are wholly-owned subsidiaries of JCorp. The other three farms previously owned by Johor Franchise and Johor Ventures have already been purchased by Ayamas. According to KFC Holdings, operation of all the acquired farms by one company (Ayamas) would reap the advantages of centralised resource planning, management and poultry processing to meet the demand of KFC's retail outlets and other retailers in the market.

- On 10 October 2011, it was reported in *The Star* that a proposed takeover of Leong Hup by Emerging Glory could likely to be completed in Q4 2011 or in Q1 2012. Emerging Glory and Leong Hup Management Sdn Bhd, currently have a combined 46.74 per cent stake in Leong Hup. According to Emerging Glory's CEO, the rationale for the takeover bid is purely a business decision that was based on demand and supply factors in the poultry industry and its related activities.

MyCC did not receive any submissions on other recent mergers (if any).

Both the commercial decision to merge as well as the merger itself are not subject to the Act. Nonetheless, MyCC will keep an eye open for any market activities of any merged entity that are anti-competitive or potentially anti-competitive.

4.1 Contractual arrangements

In its literature review of overseas experience, MyCC has learnt that poultry contracts have two main components, *viz.* the division of responsibility for providing inputs and the method used to determine farmer compensation.

Broiler growers usually operate on their own land and they provide labour for the work performed on broiler housing facilities. Operating expenses such as utility (electricity and water) costs, clean-up cost, and mortality disposal are also the grower's responsibilities. Integrators provide chicks (to be grown to processing weight), feed, and vaccination services. They may also make decisions about the frequency of flock rotations on a farm. For example, the growing period of broilers in Peninsula Malaysia has been shortened from 42 days in 2000 to 35 days in 2010.

Just like in any other industries (be it agricultural or manufacturing), there are both advantages and disadvantages to contract production of broilers. It can benefit integrators by contractually retaining some if not total control over the grower's production methods in order maintain product quality control. Production contracts can also benefit independent growers by providing diversified opportunities to earn income and by alleviating cash flow problems that typically plague small farms. However they can also be disadvantageous to growers. For example, under most broiler production contracts, ownership of the broilers remains with the integrator, but most of the farming risks and expenses (e.g. mortality rates and utility bills) are shouldered by the grower. Furthermore, a term (or a combination of terms) in the contract may place a greater business burden upon growers, e.g. the contracted input price of chicks are "too high" (i.e. not reflective of open market prices); or the contracted input price of chicken feed

and its specified quantity are "too high"; or the contracted output price for live chickens are "too low".

MyCC is aware of specific problems that have been identified and documented in overseas research publications.

- A study shows that integrators pass-on the risk of declining broiler prices more fully to contract farmers than they do with price increases. Because a farmer's income is usually determined as contractual fixed fee, the farmer has little opportunity to profit from rising market prices.[14]

- Farmers are at risk of being exploited because they have unequal bargaining power with large contract firms. With increased market concentration, farmers face fewer choices of the company with whom they contract. Furthermore, because the terms of contracts are not generally publicized, farmers cannot compare prices and conditions across contracts.[15]

FLFAM commented on the consolidation of broiler businesses and contract farming.

> The characteristic independent and self-operated smaller farms of the past have been replaced by a system of contracts or outright ownership and operation of the broiler production by integrators in order to remain efficient.
>
> The fully integrated farms are the very large companies that own hatcheries, processing plants and even feed mills. They supply the day-old chicks (DOC) to small independent growers who then raise the broilers. The growers are responsible for setting up the farm facilities and they contract independently with integrators who retain ownership of the birds over their entire life cycle.
>
> One of the effects on the transformation process is the closure of many of the individual farms and the rise in larger commercial poultry farming entities that are able to capture technical, technological and pecuniary economies of size. The market and non-market challenges to broiler farming explain why most of the remaining small broiler farmers have adopted contract farming activities. This is not unique to the Malaysian broiler industry but is a worldwide phenomenon. Thus, poultry farming activities in the country are currently a mix of traditional and modern farming operations with a clear and definite shift towards more modern automated and environmentally friendly controlled closed housing farming production facilities.
>
> By adopting the contract farming arrangement, the smaller farms are able to reduce the risk factors by passing most of the market risks to the integrators. They however have to bear risks with respect to production such as input risks and other external threats such as weather, pests and diseases. Broiler growers in Malaysia have no access to insurance as yet to safeguard against such production risks (pp. 30-31 of FLFAM's submission).

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[14] Perry, J., D. Banker & R. Green (1999). "Broiler farms: Organization, management, and performance", ERS, USDA: 41.

[15] Carstensen, P. (2003). *The Roles of Antitrust and Market Regulation Law in Markets for Agricultural Products.*

MyCC notes that pecuniary economies can be indeed achieved by "larger commercial poultry entities". But such economies, which are typically production cost savings, are directly linked to the use of market power. For example, a large commercial poultry entity such as an integrator can "buy" (i.e. contract for) the services of an independent broiler farmer on "cheaper" terms and conditions than its smaller rival. The lower cost of poultry farming that is achieved by a large commercial entity, even if passed-on to final consumers, is acquired at the expense of the contracted independent farmer. In this regard, pecuniary economies are simply an income transfer from one firm (or group of firms) to another.

Through consultations with DVS, MyCC has also been made aware of a particular form of trading practice along the supply chain. Apparently, farmers in contract with an integrator give wholesalers, who are partially linked to the same integrator, the "first option" to buy live chickens at the price specified in the farmer's contract with the integrator. Once the broiler supply of contracted farmers is exhausted, wholesalers who still need live chickens for their businesses will only buy them from other independent farmers who are willing to sell live chickens at the same price as that charged by farmers who are in contract with the integrator.

RECOMMENDATION 3

MyCC should, in consultation with DVS and other public agencies, undertake research or commission research into the existing forms of contractual arrangements for poultry growing by independent farmers.

4.2 Buyer power

Business consolidation, by way of a contract or a merger, is usually looked upon as a firm's strategy to hold market power as the main (or only) seller of a product. But in an industry where supply chain relationships are commercially important, business consolidation can also be looked upon as a strategy through which the firm can enhance its buyer power as the main (or only) buyer of an input.

Conceptually, buyer power and market power are "two sides of the same coin". Buyer power can be simply defined as a form of market power that is exercised by a firm in its contractual relationship with an input supplier. More formally, buyer power has been defined as "a situation which exists when a firm or a group of firms, either because it has a dominant position as a purchaser of a product or service or because it has strategic or leverage advantages as a result of its size or other characteristics, is able to obtain from a supplier more favourable terms than those available to other buyers".[16]

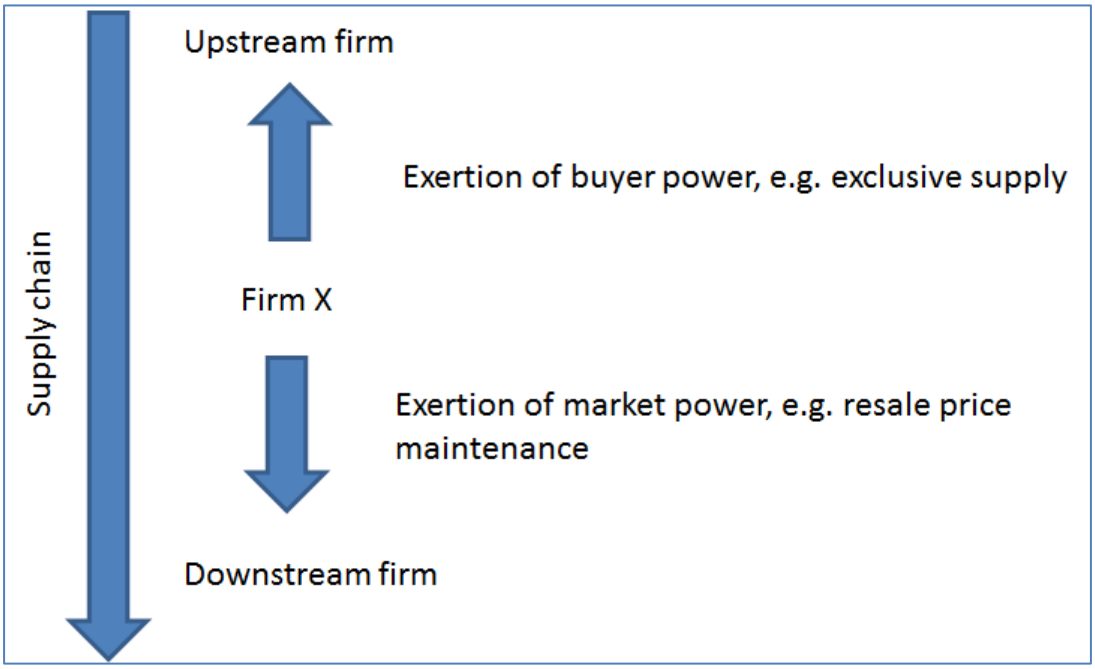
An element of buyer power is bargaining power. Bargaining power refers to the ability of a buyer to obtain a lower price for an input by "threatening" to buy less from the supplier. It is usually regarded as a countervailing force that offsets, in whole or in part, a seller's market power. The extent to which consumers will

[16] OECD (1981). "Buying power: the exercise of market power by dominant buyers." OECD Committee of Experts on Restrictive Business Practices.

benefit from the exercise of bargaining power depends on specific details of the firm's purchase condition or contract with its supplier, as well as the extent of retail competition. The overexertion of bargaining power may cause imbalances in the supply chain by "squeezing" the margins of sellers. On the other hand, if the retail market is competitive and the firm's input prices are lowered by its bargaining power, then consumers may benefit from lower retail prices.

As noted earlier, an independent broiler business along the supply chain (as distinct from an integrator) will operate as a seller *and* a buyer. Depending on market circumstances, this firm could exert its market power as a product seller and/or its buyer power as an input buyer. To assess whether the specific action taken by such a firm amounts to an actual or potential misuse of its power(s), the firm's position in the supply chain *relative* to that of the other trading party needs to be ascertained. An example of this is illustrated in Figure 4-1.

Figure 4-1. Use of market power and buyer power: an illustration



Firm X can influence price transmission by entering into a supply contract with a resale price maintenance clause. In this case, Firm X would have abused its market power to earn a higher margin. On the other hand, when Firm X is party to an exclusive supply contract, it may have abused its buyer power to prevent, restrict or distort competition by foreclosing the market.

4.3 Main competition risks

Vertical agreements may either foster competition by generating efficiency gains, or they may inhibit competition through vertical market foreclosure or by facilitating collusive activities at any level of the supply chain. The main competition risks with particular forms of vertical contracts are summarised in Table 4-1 below.

Table 4-1. Overview of forms of vertical agreement and competition risks

Form of agreement	Description	Main competition risk
Resale price maintenance	Restriction of buyer's ability to set the sale price for final consumers	Lessening of retail price competition
Purchasing agreements	Agreements by otherwise competing buyers to buy an input jointly	Abuse of buyer power. Under certain market conditions, it may foreclose rivals' access to an essential input at competitive terms and conditions. It may be tacit collusion masked as cooperative action.
Exclusive supply agreements	Direct (or indirect obligation)placed on an independent party to sell its good to only one buyer	Abuse of buyer power. Possible foreclosure of market to other buyers (at the wholesale or retail level)
Single branding	Contractual obligation placed on a buyer to purchase from only one supplier	Abuse of market power. Possible restriction of inter-brand competition and/or foreclosure of market to competing suppliers
Private label products	Products made by third parties upstream in the supply chain and sold under retailers' brand	Abuse of market power. Possible restriction of inter-brand competition and/or foreclosure of market to competing suppliers

Besides resale price maintenance and some practices relating to market sharing which are restricted outright by the Act, the competition effects of very common commercial vertical agreements – such as exclusive supply, single branding and private labelling– are ambiguous and they need to be assessed on a case-by-case basis.

The main risk associated with a purchasing agreement entered into by a cooperative body is tacit collusion. It will harm sellers who have very limited access to other buyers.

An exclusive supply agreement, which obliges a supplier anywhere along the supply chain to sell its products to only one buyer, can potentially lead to the foreclosure of other buyers in a particular segment of the chain. As noted earlier, this one buyer must have buyer power and it is the abuse of this buyer power that should be assessed, instead of the market position or abilities of the other buyers. Furthermore, the countervailing power of the supplier should also be taken into account for the simple reason that a profit-maximising firm is unlikely to deny itself of other (additional or alternative) sources of revenue.

Single branding and private labelling, especially in the context of a formal wholesale or retail outlet, may have the effect of restricting competition between products that are completely substitutable for one another; or the effect of foreclosing the market to suppliers of substitutable products.

5 Concluding Remarks

The broiler sector in Peninsula Malaysia has expanded in recent years through higher levels of private investments and entrepreneurship. At the *ex farm* segment of the broiler supply chain, there are currently 4 grandparent stock (or primary) farm operators involved with the production of DOC for their own parent stock farms as well as for other parent stock farmers, 24 parent stock (or multiplication) farm operators of whom 14 are non-integrators, and 2,978 broiler growing farms.

Based on the information presented in FLFAM's submission, the parent stock market is far from being concentrated. However the same cannot be said of the supply market for fully-grown broilers; not because it is factually concentrated, but because there is currently no information on the ownership of broiler growing farms by integrators, non-integrators and independent farmers. MyCC believes that further empirical research into this matter is needed so that all market players, consumers and even government policymakers can be better informed of the possible forms and nature of broiler market competition.

MyCC has performed a fairly sophisticated form econometric analysis and found that changes in *ex farm* prices (between January 2007 and March 2012) are transmitted asymmetrically and positively to retail prices. Specifically, the retail price of broilers can be expected to increase by about 7.5 per cent for every 10 per cent increase in the *ex farm* price of live chickens. But the retail price is unlikely to drop immediately whenever there is a drop in the *ex farm* price. Asymmetric price transmission, which involves the passing-on of a price increase (but not a price decrease) at one level of the supply chain to the next, is not inherently anti-competitive. It is the tacit sustenance of a positive price transmission that would be of some concern to MyCC.

MyCC acknowledges FLFAM's remarks (in its submission) that *ex farm* prices which are determined on the basis of negotiations between farmers and wholesalers (or distributors) will fluctuate daily, and their levels will differ from one farm to another. As such, "there is little avenue for any active or tacit collusion in the production and supply of broiler chickens up to the farm gate … [and] there is no horizontal arrangement between the farms to fix the ex-farm price, or even restrict supply to raise the same" (p. 33).

FLFAM itself recognises there is an increasing level of vertically integrated broiler businesses worldwide, of which Malaysia is one good example. MyCC is of the view that when players in a sector become increasingly vertically integrated, there will be a lower number of competing businesses in each stage of the supply chain. This is the main reason for MyCC's concern with price transmission effects. The lower the level of competition, the more likely it will be for upstream price increases (but not price reductions) to be passed-on downstream.

Looking ahead, MyCC will continue to keep an eye on the market behaviour of all parties along the broiler supply chain. In this regard, MyCC may on occasions consult with parties along the broiler supply chain.

Appendix

The empirical literature on price linkages between *ex farm* and retail markets is extensive, but MyCC did not come across any published work using Malaysian data.[17] The literature summarised below (in chronological order) are primarily those on livestock and agricultural sectors.

- An extensive analysis was undertaken of the transmission of five agricultural producer prices through the food marketing system in seven countries of the European Union (*viz.* Germany, Italy, France, Holland, Belgium, United Kingdom and Denmark).[18] On the basis of monthly price series data between 1971 and 1990, the hypothesis of long-run perfect price transmission is supported for the producer-consumer pair of pork prices in five EU countries, and for the pair of buttermilk prices in six EU countries. The United Kingdom was the only exception where perfect price transmission was rejected for all the pairs of products. For the cases where the hypothesis is rejected, the estimated elasticity of price transmission is greater than 1; i.e. a 1 per cent change in producer prices will result in a greater than 1 per cent change in consumer prices.

- A study of farm-gate and retail prices for beef, lamb and pork in the UK and Wales found a price link in the lamb industry, but not in the beef or pork industries.[19] For the lamb industry, prices are set at the retail level and this is indicative of retailers' market power. The absence of any long-run price relationships in the beef and pork industries is interpreted as evidence against the operation of competitive markets.

- In Australia, the farm, wholesale and retail prices for beef were found to be co-integrated, i.e. they are moved together over time in response to exogenous shifts in demand and supply curves.[20]

- On the basis of a sophisticated statistical analysis (using the so-called "error-correction" model) of 200 weekly observations of producer and wholesaler prices for pork in northern Germany, it was found that the transmission of producer to wholesale prices is asymmetric in the sense

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17 Kaur, B. and Fatimah Mohamed Arshad *op. cit.* referred to an unpublished doctoral thesis by Kaur, B. on "Asymmetric price transmission and market integration in the broiler industry in Peninsula Malaysia" (UPM, 2006). According to Kaur and Arshad, this thesis found significant evidence of asymmetric price transmission through which increases in farm prices were transmitted rapidly to retail prices, but farm price declines took a long time to be reflected in retail prices.

18 Palaskas, S. (1995). "Statistical analysis of price transmission in the European Union", *Journal of Agricultural Economics*, 41, 61-69.

19 Dawson, P.J. and R. Tiffin (1997). "Estimating marketing margins in the meat sector using cointegration analysis". *Agricultural Economics Society Annual Conference*, University of Edinburgh, 21-24 March.

20 Chang, H.S. and G. Griffith (1998). "Examining the long-run relationships between Australian beef prices," *Australian Journal of Agricultural and Resource Economics*, 42, 369-387.

that the farm gate-wholesale margin is corrected more rapidly when it is squeezed relative to its long-run level, than when it is stretched.[21]

- An analysis of the relationships between US farm, wholesale and retail beef prices (on a weekly basis over the period January 1981 to March 1998) found unidirectional price transmission from the farm level to the wholesale and retail levels. The authors also found that the responsiveness to price shocks (at the farm level) had increased in recent years. They inferred that US markets may have become more efficient in transmitting information through vertical marketing channels.[22]

- Using a model of oligopolistic interaction, the authors showed that the weak transmission of coffee bean prices to consumer prices in the Netherlands was due to a relatively large share of other business operating costs other than the costs of coffee beans.[23]

- The spread between *ex farm* and retail prices for lamb in the UK was examined on the basis of 1979-1993 price data.[24] It was found that the casual relationship (or statistically, the direction of a so-called Granger-causality) runs from retail to producer prices.[25] This means that in the long-run, it is the change in retail demand that will impact upon the *ex farm* prices that can be charged.

- A study using monthly observations (from January 1988 to September 1997) of producer and retail prices for pork in Switzerland found evidence of unidirectional and asymmetric price transmission from producers and retailers.[26] Increases in producer prices that result in the reduction of the marketing margin are passed on to retail prices faster than reductions in producer prices that lead to increases in the marketing margin.

- In a study of the diary sector in Spain, the authors argued that the (then) existing government quota on milk supply at the farm level may have led to a situation in which processors will compete strongly for access to the farm-constrained supply of milk. In order to retain or even increase their retail market shares, the processors may choose not to pass any farm level price increase fully to the retail level. The authors concluded that the

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21 von Cramon-Taubadel, S. (1998). "Estimating asymmetric price transmission with the error–correction representation: An application to the German pork market", *European Review of Agricultural Economics*, 1-18.

22 Goodwin, B. K. and M.T. Holt (1999). "Price transmission and asymmetric adjustment in the US beef sector." *American Journal of Agricultural Economics*,81, 630-637.

23 Bettendorf, L. and F. Verboven (2000). "Incomplete transmission of coffee bean prices in the Netherlands", *European Review of Agricultural economics,* 27, 1-16.

24 R. Tiffin and P.J. Dawson (2000), "Structural breaks, cointegration and the farm retail price spread for lamb", *Applied Economics*, 32, pp. 1281-1286.

25 Granger-causality refers to the statistical relationship between one set of time-series data with that of another set of time-series data.

26 Abdulai, A. (2002). "Using threshold cointegration to estimate asymmetric price transmission in the Swiss pork market" *Applied Economics*, 34, 679-687.

presence (but not abuse) of market power could be consistent with symmetric price relationships in the diary product market.[27]

- In a study of price transmissions for several products in Netherlands, it was found that broiler processors will do not pass-on price reductions that they received from farmers (upstream); but they will transmit price increases fully and instantaneously to their downstream customers.[28] On the other hand, beef price changes at the farm level are levelled off at the processing and retail segments of the supply chain, i.e. lower prices are not passed-on to final consumers. The authors concluded that market power may explain why price reductions are not fully transmitted, but it is a less significant cause of poor price transmission than the presence of "sticky" prices (i.e. adjustment costs are higher when firms re-set prices than when they continue to sell at the previous prices).

- In a consulting study of the links between retail and farm-gate milk prices in the UK, Denmark, France and Germany, it was found that a unit increase in the retail price of liquid milk in UK is fully transmitted upstream to the farm-gate price.[29] In contrast, a unit increase in farm-gate price will only result in a 0.56 unit increase in the retail price, whereas a unit decrease in farm-gate price will reduce the retail price by 0.71 unit. It was also found that two-way price transmissions were imperfect in Germany, but price transmissions did not occur in Denmark. In France, farm-gate price changes were transmitted (imperfectly) to retail prices; but not *vice versa*. According to the authors, the different forms of price transmissions may be due to the different market structures or varying degrees of government intervention.

- A major study commissioned by U.K. Department for Environment, Food and Rural Affairs (DEFRA) looked into the determinants of farm-retail price spreads for about 90 products during the 1990s. With the exception of certain dairy products, no evidence of asymmetric price transmissions was found. The study also found no evidence of particular countries (with the exception of France) in which price transmissions along the food chain are systematically asymmetric.[30]

- The authors developed and applied a relatively new "threshold vector" error-correction statistical approach to an analysis of price transmission in the US beef, chicken and egg markets.[31] The results indicated significant

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27 Serra, T. and B.K. Goodwin (2003). "Price transmission and asymmetric adjustment in the Spanish dairy sector", *Applied Economics*, 35, 1889-1899.

28 Zachariasse, L.C. and F.H.J. Bunte (2003). "How are farmers faring in the changing balance of power along the food chain?" Inleiding voor OECD – Conference on Changing Dimensions of the Food Economy: Exploring the Policy Issues. Den Haag, 6-7 February.

29 London Economics (2003). "Examination of UK milk prices and financial returns", Report prepared for The Milk Development Council, February.

30 London Economics (2004). "Investigation of the determinants of farm-retail price spreads", Final Report to DEFRA.

31 Vavra, P. and B.K. Goodwin (2005). "Analysis of price transmission along the food chain", OECD Food, Agriculture and Fisheries Working Papers, No. 3, OECD Publishing.

price transmission asymmetries in response to both negative and positive price shocks along the respective supply chains.