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PAPER

Competition in the Rice Industry: An Issues Paper

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EXECUTIVE SUMMARY

Rice is the primary staple of and most widely grown crop in the Philippines. The efficient operation of the rice market depends on free and fair competition throughout the value chain. Recently though, concerns have been raised about the degree of competition in rice markets. This paper presents a rapid appraisal of the industry, including production, harvesting, milling, distribution, and trade. Using results from past studies, the study evaluates competition issues at each stage from production to distribution; identifies potentially anti-competitive laws and regulations that affect supplier entry and expansion; and provide recommendations on possible measures to address competition issues. The paper also presents results of market integration diagnostics to determine whether industry conditions are conducive to the formation and stability of a cartel.

Past studies offer a mixed assessment of the state of competition in the rice industry. First, market structure appears to be highly competitive at all levels, based on sheer number of players. Within the domestic market, there is a limited impact from most forms of government intervention, except for statutory restrictions on private sector importation. Departures from competitive markets cannot be ruled out, especially at the level of wholesalers and millers. Marketing margins are high in the Philippines relative to margins in other countries, though in the long run rice regional prices are integrated.

Based on field interviews, market players attest to strong competitive pressures at every stage in the marketing chain, but are unable to rule out episodes of price manipulation, especially in periods of scarcity. Data from government surveys show a sharp demarcation between commercial-type and village-type rice mills in terms of size, though little evidence of dominance among the commercial-type rice mills. Behavior of commercial stocks is consistent with the model of competitive storage: increases in rice prices tend to be followed by a withdrawal from stocks, and subsequently a decline in prices.

Market integration analysis finds that the domestic rice market is insulated from world markets, with arbitrage unable to dissipate rents from importation. This is consistent with the findings in the literature concerning the prohibitive entry barriers in rice trade, owing to the statutory import monopoly of the NFA.

Within the domestic market, retail rice prices are found to be integrated in the long run at the regional level. However adjustment to long run equilibrium is a protracted and unpredictable process. Vertical price transmission along the marketing chain of rice is found to be asymmetric, suggesting short-term deviation from competitive behavior when palay supplies run low. There are clearly troubling signs of departure from competitive markets, warranting further investigation.

Further research is recommended for the following: First is to obtain and analyze information at the sub-regional and even enterprise-level about prices and stocks, focusing on large rice growing areas and large mill operators and traders (based on local knowledge of key informants within regional and provincial NFA offices). Second is to understand better the size and sources of the excess marketing margin.

As for policy implications, the findings of this study tend to favor liberalization of entry into rice importation as well as in rice processing and marketing. Lastly, measures related to modernization of rice markets will likely have favorable effects on the degree of market competition in the rice industry.

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1. INTRODUCTION

Rice is the primary staple of the Philippines, with per capita supply accounting for close to sixty percent of the recommended energy intake per person. Palay production covers 35 percent of total area harvested, making it the country's most widely grown crop. The efficient operation of the rice market depends on free and fair competition throughout the value chain.

The Philippine Competition Act (RA 10667) mandates the state to uphold competitive markets for the benefit of consumers and businesses. The law prohibits anti-competitive agreements, abuse of dominant position, and anti-competitive mergers and acquisitions. It aims to promote resource productivity and widen consumer choice. The Act establishes a Philippine Competition Commission (PCC), an independent quasi-judicial body, as the lead agency for implementing competition law.

Recently though, concerns have been raised about the degree of competition in rice markets. No less than the Secretary of the Department of Agriculture (DA) has called for a "stop to the rice cartel", composed of "traders from Bulacan and Binondo who speculate to control prices".¹ A Congressional Representative has filed a resolution (HR 951) calling for an investigation into a rice cartel which is allegedly manipulating the price of rice.²

The Philippine Development Plan (PDP) 2017-2022 expresses the commitment of the government to devote resources for the conduct of studies in priority sectors where the largest impact on consumer welfare and market efficiency are expected, such as the rice industry. The PCC has commissioned this study as a survey of issues that potentially limit market competition in the rice industry in the Philippines.

This paper presents a survey of key issues facing the industry, covering production, harvesting, milling, distribution, and trade. Using results from past studies, the study evaluates competition issues at each stage from production to distribution; identifies potentially anti-competitive laws and regulations that affect supplier entry and expansion; and provides recommendations on possible measures to address competition issues. The paper also presents results of market integration diagnostics to determine whether industry conditions are conducive to the formation and stability of a cartel. The extent of issues to be raised shall determine whether a more in-depth study should be pursued.

The rest of this paper is organized as follows: the methods for analyzing competition issues are discussed in Section 2. Past studies and rice market trends are reviewed in Section 3. Findings of the study based on application of the methods outlined are presented in Section 4. Section 5 concludes.

2. METHODS

2.1 Field interviews

The field interviews characterize the value chain, and illuminate issues of barriers to entry, market concentration, abuse of dominant position, and agreements in restraint of trade. It is not expected that field interviews yield direct evidence of anti-competitive agreements or collusion. This study instead examines indirect evidence by testing for the presence of patterns in market behavior that are inconsistent with competitive markets.

2.2 Analysis of survey data

Two data sources are germane to this study. The first is the Survey of Rice Mills last conducted in 2011 by the Bureau of Agricultural Statistics, now under the Philippine Statistics Authority (PSA). The Survey collected data nationwide at the establishment level covering: type of mill; years of operation; input capacity; milling degree; capital investment; monthly operating cost; grade of rice milled; total palay inputted; milled rice recovered; bran recovered; and milling fee payments.

The second is the Commercial Stock Survey (CSS), a monitoring system of the National Food Authority (NFA) to obtain estimates of total commercial stock inventory of the private sector (grains businessmen) on a monthly basis. The CSS covers various types of grains businessmen and their respective shares in the NFA registry, as follows: Retailers (15%), Wholesalers (25%), Combined Retailers/Wholesalers (25%), and Warehousemen (100% of Big Warehousemen, 50% of Medium and Small Warehousemen).

2.3 Analysis of price data

Another set of indirect evidence is obtained from analysis of price data, in two dimensions: across space (horizontal market integration) and between market levels (vertical price transmission). All analyses are conducted using STATA™.

Horizontal market integration

Consider spatially distinct markets indexed by i and j , with respective prices P_i, P_j . Let δ denote the transaction cost (transport and other distribution costs) of bringing the product from market i to j and vice-versa. Markets are integrated if the following holds:

$$P_i = P_j + \delta_{ij}$$

If, however, the discrepancy is larger than can be attributed to transaction cost, then there is failure of spatial arbitrage, and markets are segmented. Two types of segmentation are posited: first is between domestic and foreign markets; second is across regions of the domestic market.

Integration of domestic and world prices. If there are high entry barriers in rice importation, then domestic and world markets may be horizontally segmented. Express prices in logarithms. Let t index time periods, dp_t denote domestic price, wp_t denote world price (in domestic currency), ε_t the error term, and β_0, β_1 denote constants. The following represents a relationship between prices consistent with integrated markets:

$$dp_t = \beta_0 + \beta_1 wp_t + \varepsilon_t \tag{1}$$

The estimate for β_1 measures the elasticity of transmission from world price to domestic price; the closer to unity, the greater the degree of market integration.

A straightforward regression based on (1) may be rendered spurious by nonstationarity of the price series. If, however, the first differences are nonstationary, then an alternative approach is to consider the equation:

$$\varepsilon_t = dp_t + b_0 + b_1 wp_t$$

Suppose there exists a set of parameters b_0, b_1 for which $\varepsilon_t \sim I(0)$. The parameters are said to form a cointegrating vector, and the price series are said to be cointegrated. The existence of a

cointegrating vector can be detected using the Johansen test; the cointegrating vector itself is estimated based on an error correction model (ECM).

Integration of regional markets. Given the 17 regions of the Philippines, multiple configurations of price integration are possible. There are a maximum of 176 pairwise relations, which are cumbersome to examine. We focus on relationships with the nearest central markets, namely: National Capital Region (NCR); Central Visayas; and Davao Region. This leads to eight pairwise comparisons in Luzon; two in Visayas; and five in Mindanao. Then we consider the pairwise comparisons from the primary center NCR, respectively with Central Visayas and Davao Region, for another set of three pairwise comparisons. (Total number of pairwise comparisons is 17.)

Vertical price transmission and competitive storage

Vertical price transmission has also been used to assess competition issues. The standard vertical price transmission involves regressions across market levels (retail to wholesale, wholesale to palay, and vice-versa), along similar lines as horizontal market integration.

A more specialized strand of this literature focuses on asymmetric price transmission. Consider the interaction from palay price to wholesale price. Asymmetric price transmission involves differences in response when paddy price is rising, compared to when it is falling. Asymmetric price transmission may be construed as evidence of departure from pure competition.

To understand how such asymmetry arises, consider first the model of competitive storage [e.g., Wright and Williams (1982)]. Traders double as inventory holders and select when and how much stocks to sell. Maintaining inventory entails opportunity cost of capital and cost of storage. Traders absorbing this cost out of a speculative motive (i.e., they acquire stocks when palay or milled rice is cheap) to sell when stocks are dear. Suppose milled rice stocks sold at time $t + 1$ at price P_{t+1} requires paddy stocks from time t priced at P_t^F (in milled-rice equivalent), with a fixed cost m per unit stock for processing and logistics. The opportunity cost of capital is fixed at r . Under the model of competitive storage, a trader will opt at the margin to hold stocks for sale in time $t + 1$ if the following holds:

$$P_t^F + m < \frac{1}{1+r} P_{t+1}. \quad (2)$$

Storage is at equilibrium where (2) obtains as a strict equality, i.e., there is no incentive to accumulate stocks at the margin. When prices are stochastic, the competitive storage model assumes that traders' expectations coincide with the true expected value of next period price; that is, $E_t P_{t+1}$ replaces P_{t+1} in (2). For this analysis though we confine ourselves to the deterministic case.

Let (2) hold as an equality at equilibrium and set $m = 0$ to obtain:

$$\frac{\partial P_{t+1}}{\partial P_t^F} = 1 + r. \quad (3)$$

Storage is "competitive" in this model as price is accepted by traders as given. If, however, the amount of stocks to be held over are large enough to influence the next period of price, then

competitive storage no longer holds. Holding of stocks in order to influence next period price is referred to as price manipulation.³

Price manipulation can be explained by considering the case of monopoly storage. Suppose market demand is characterized by constant elasticity with respect to price; the expression for inverse demand is given by:

$$P_t = \alpha_1 Q D_t^{\alpha_2}, \quad \alpha_2 < -1. \quad (4)$$

Quantity sold in the market at $t + 1$ equals harvests in $t + 1$ plus sale of stock. In determining quantity of storage in period t , the monopolist sets discounted marginal revenue equal to marginal cost of holding stocks:

$$P_t^F + m = \frac{1}{1+r} \left[P_{t+1} + \frac{\partial P_{t+1}}{\partial Q D_{t+1}} Q D_{t+1} \right]$$

Using (4), we obtain:

$$\frac{P_{t+1}}{P_t^F} = \frac{1+r}{1+1/\alpha} > 1+r. \quad (5)$$

Hence, other factors held constant, we expect price response of future milled rice price to be larger for a monopolistic market than for a competitive market.

Note that vertical price transmission is still symmetric even under monopoly. For asymmetry to hold, what is required is a regime switch depending on scarcity conditions. A regime switch in pricing behavior in a market is a marker of collusion (Harrington, 2006). Suppose traders are attempting to fix prices by restraining releases from stocks. When harvest is abundant (palay prices falling), traders find it difficult to maintain the agreement. Hence the equilibrium price movement approximates the competitive solution in (3). However, scarcity of stocks (palay prices increasing) enables traders to maintain a price fixing agreement; the equilibrium price movement approximates the monopoly solution in (4). This explains the outcry against price manipulation and hoarding during periods of rising prices, but apparent acquiescence when prices are falling.

The formal test is as follows: define dummy variables D^+ and D^- , such that $D^+ = 1$ if $\Delta p_t^F > 0$ and zero otherwise; and $D^- = 1 - D^+$. Houck (1977) suggests the following formulation:

$$\Delta p_t = \gamma_0 + \gamma_1 D^+ \Delta p_t^F + \gamma_2 D^- \Delta p_t^F + \varepsilon_t. \quad (5)$$

Given estimated values for the γ parameters c_1, c_2 , the F-test for the null $c_1 = c_2$ provides evidence for asymmetry when the null is rejected.⁴

Limitations of the analysis

Availability of data is very limited at the level of enterprises, or even sub-regional areas, constraining the type of analysis that can be performed using secondary sources. As for price patterns, the analysis done in this issues paper is in the nature of a “first-pass” using regional data, which averages across various transaction prices in a region. Sub-regional (e.g. provincial) data is desirable as it is closer to actual transaction prices but introduces greater complexity in the analysis (given the subdivision of the country into 81 provinces).

Interpretation of price integration analysis should be carefully qualified. A finding consistent with price integration relates only to price convergence in the long run; such convergence is compatible with short-run deviations from arbitrage of price differences across space.

3. CHARACTERIZATION OF THE RICE MARKET

3.1 Overview of the value chain and regulatory environment

Product categories

The rice value chain begins at the level of the farm, which produces palay of different varieties. The databank of the Philippine Rice Research Institute (PhilRice) lists at least 80 certified varieties just for inbred varieties suitable for irrigated systems (www.pinoyrice.com).

The main growing seasons are the dry season (January to June) and the wet season (July to December). The harvest season typically falls in March to May (dry season crop) and in August to September (wet season crop). Crop calendars however vary across areas. Farmers harvest palay and sell their crop to palay traders, which sell to mill operators. Many mill operators also procure rice directly through agents.

Milled rice falls into four categories based on official statistics:⁵

- Special rice – glutinous, aromatic rice, and those with excellent eating and nutritive quality;
- Premium rice – rice of highest grade requirements;
- Well-milled rice (WMR) – rice kernel in which hull, germ, and outer bran layers have been removed; lengthwise streaks of bran layers found in fewer than 20 percent of kernels;
- Regular-milled rice (RMR) – rice kernel that has been milled but lengthwise streaks of bran layers found in 20 – 40 percent of kernels;

The average prices of these grades are shown in Table 1. On average, special rice is priced about one-third higher than RMR; premium rice is about one-fifth higher, and WMR about one-tenth higher.

Table 1: Retail prices of rice by grade, and average price index (RMR = 1.00), 2012 - 2016

	2012	2013	2014	2015	2016	Index
Rice Special	43.46	44.59	49.05	50.75	50.92	1.34
Rice Premium	38.48	40.21	45.60	45.87	45.89	1.21
Well Milled Rice (WMR)	35.30	36.87	42.32	42.04	41.72	1.11
Regular Milled Rice (RMR)	32.08	33.70	38.93	37.06	36.67	1.00

Source: PSA CountryStat.

Other ways of classifying rice are: branded rice in supermarkets and groceries; and ordinary rice in wet markets and retail shops (sari-sari). The former is sold in packs of varying sizes (1 to 50 kg), the latter in loose form (and transferred to plastic bags) or also in packs.

Supply, utilization, and geographic distribution

Palay production has been on an increasing trend, from 8.97 million tons in 1988, to nearly double that quantity (17.63 million tons) by 2016 (Table 2). Palay production is unevenly distributed over the country. A single region – Central Luzon – accounts for nearly a fifth of the country’s palay output. This is followed by Cagayan Valley at 13 percent, Central Visayas at 11 percent, and Ilocos Region at 10 percent. The rest of the regions produce only relatively small quantities of palay (ranging from 2 to 7 percent of national output). Production has tended to increase for all regions, except CALABARZON and Davao Region.

Harvested palay is dried, then milled by removal of husk, bran, and germ, leaving only the kernel. The amount of rice obtained per unit palay input is called the milling recovery; currently, the assumed ratio is 64.5 percent. Given rising palay output, production of milled rice has also been increasing, peaking at 11.9 million tons in 2015 (Table 3).

Aside from domestic production, rice supply may also be augmented by imports. The Philippines imports rice owing to high cost of production of domestic palay, relative to production cost in exporting countries (Moya et al, 2016). Rice production in the Philippines is not internationally competitive. Ideally, competition between domestic and foreign suppliers gives consumers access to cheaper rice; in fact, policy distortions (discussed below) limit access to foreign rice.

Table 2: Palay production ('000 tons) and shares in total, by region, 1988 – 2016

	1988	1998	2008	2013	2016	Share (%)
Philippines	8,971	8,555	16,816	18,439	17,627	100
CAR	186	170	445	460	383	2
Ilocos Region	841	854	1,692	1,750	1,805	10
Cagayan Valley	1,091	1,109	2,080	2,423	2,333	13
Central Luzon	1,308	1,370	3,014	3,409	3,343	19
CALABARZON	414	320	428	412	407	2
MIMAROPA	548	509	863	1,034	1,080	6
Bicol Region	709	493	998	1,243	1,275	7
Western Visayas	1,122	1,044	2,118	2,091	1,444	11
Central Visayas	151	116	312	348	176	2
Eastern Visayas	407	362	1,031	990	955	5
Zamboanga Peninsula	338	261	551	639	581	4
Northern Mindanao	316	427	551	675	711	4
Davao Region	436	339	419	422	418	2
SOCCSKSARGEN	682	713	1,235	1,348	1,201	7
CARAGA	199	240	447	584	462	3
ARMM	223	226	632	612	544	3
Negros Island					508	

Note:

1. Shares are based on averages for 2013-15.

2. Negros Island Region was formed in 2016 and dissolved soon after.

Source: PSA CountryStat.

Imports stayed below one million tons over most of the 1990s, but increased dramatically in the 2000s, peaking at about 2.4 million tons in 2010. Since then a strong rice self sufficiency drive has led to reduced imports. In 2014, imports were limited to 1 million tons; this was accompanied by sharp increases in prices of WMR and RMR (by 15 - 16 percent). Subsequently in 2015, imports were relaxed to 1.5 million tons, and retail prices of rice levelled off. Increased production in 2016, along with withdrawals from stocks, allowed rice imports to decline to just 0.6 million tons.

Table 3: Supply and utilization of rice, 1990 – 2016 ('000 tons)

	1990	2000	2010	2014	2015	2016
Beginning stock	1,690	2,365	2,629	2,126	2,662	3,199
Production	6,095	8,103	10,315	12,405	11,870	11,528
Imports	606	639	2,378	1,087	1,478	605
Ending stocks	1,899	2,166	3,424	2,662	3,199	2,765
Per capita supply	92.53	103.16	113.82	114.35	111.62	107.84

Source: PSA CountryStat.

Of the sixteen administrative regions, 11 have major ports that receive rice shipments from abroad. These regions, corresponding ports, and annual import arrivals, are summarized in Table 4. NCR and Central Visayas are major population centers with the highest levels of rice consumption, but limited palay production; hence rice import arrivals are largest in these ports. Similarly, Southern Tagalog is a large population center with significant levels of imports

through Batangas City. La Union, Subic, Tabaco, Cagayan de Oro, and Zamboanga City are important arrival ports with significant land transport of rice to other nearby population centers.

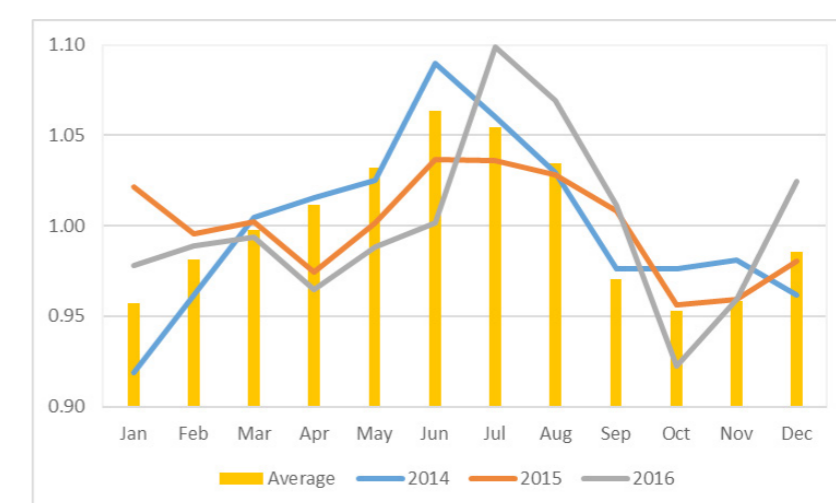
Table 4: Rice import arrivals by region and port, annual average (2000-2012), in tons

Region	Port	Arrivals
NCR	City of Manila	4,871,428
Ilocos Region	La Union	929,671
Central Luzon	Subic	1,761,105
Southern Tagalog	Batangas City	1,121,945
Bicol Region	Tabaco	1,167,740
Western Visayas	Iloilo City	169,943
Western Visayas	Bacolod City	370,738
Central Visayas	Cebu City	2,078,745
Zamboanga Peninsula	Zamboanga City	717,696
Northern Mindanao	Cagayan de Oro City	839,827
SOCCSKSARGEN	General Santos City	363,082
Davao Region	Davao City	410,684

Source: NFA <http://nfa.gov.ph/images/files/statistics/summary.pdf>. Accessed 12 March 2018.

Seasonality

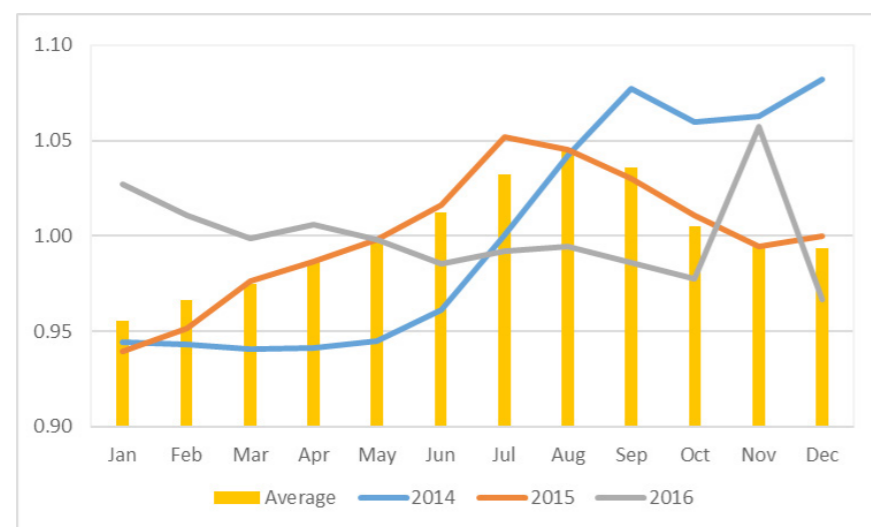
Palay monthly prices exhibit a pronounced seasonal cycle. The column bars in Figure 1 show the monthly palay price indexed to the annual average. The index reaches a peak in June, after which it drops to its lowest point by October. It then resumes its upward climb until January the following year, when it reaches another local trough. Price then rises towards June, repeating the cycle. The low price months coincide with harvest seasons, while the high price months with lean seasons. Individual years do not exactly reproduce the stereotypical pattern, as observed in the line graphs for 2014 - 2016.

Figure 1: Seasonal price index (annual average = 1.00), palay prices (ordinary), 1990 - 2016

Source: PSA CountryStat.

Wholesale prices also follow a cycle but over a different monthly pattern (Figure 2). On average, the wholesale price peaks during July-September, after which it falls to its bottom level by January. It then resumes its climb back to peak level in the third quarter. Individual years though exhibit significant deviations from the seasonal cycle, as seen in the line graphs for 2014 - 2016.

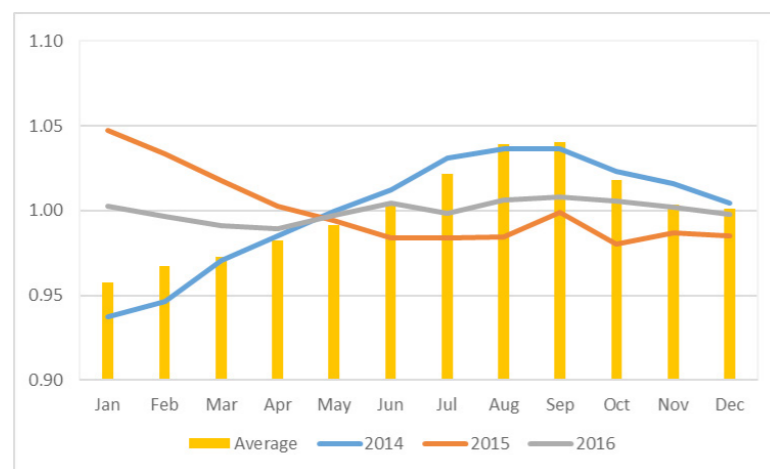
Figure 2: Seasonal price index (annual average = 1.00), wholesale prices (RMR), 1990 - 2016



Source: PSA CountryStat.

Retail prices on average follow the same pattern as wholesale prices (Figure 3). Wholesale and retail prices are able to avoid the local trough of palay prices in October, as rice traders can keep stocks over the rest of the year until the next harvest season. Palay prices tend to be more volatile than either wholesale or retail prices. The standard deviation of the latter over the entire series of the seasonal index is 0.05, whereas that of the palay price is 0.06. Similarly, individual years show divergent seasonal patterns as seen in the line graphs for 2014 to 2016. The year 2015 is striking as it moves contrary to the typical cycle.

Figure 3: Seasonal price index (annual average = 1.00), retail prices (RMR), 1990 - 2016



Source: PSA CountryStat.

3.2 Review of related studies

Market structure

Based on the number of players, market structure appears to be highly competitive at all levels. However, exercise of dominant position may be possible at the level of wholesalers and millers.

In the Philippines, wholesalers and millers have been suspected of cartel-like collusion.⁶ The claim of a rice cartel has been repeated often; e.g., Tadem (2002) alleges that rice marketing in the Philippines involves a network of middlemen working closely with rice cartels which control 90 percent of the country's rice supply.

The number of players provides some idea of rivalry and market concentration. The number of rice farmers in the Philippines is about 2.4 million; average farm size is only 1.29 ha (PSA, 2015a), which are probably also true of Philippine rice farms. Land reform in the 1970s broke up the large rice haciendas and successfully converted share tenants into leaseholders (Otsuka, 1991).

Along the supply chain, Table 5 shows the large number of players in the milling, warehousing, and retailing stages (where NFA data is available). In 2017 (without SOCCSKARGEN), there were over 54 thousand licensed retailers, over 3,800 wholesalers, and more than 9,500 performing both. Another 14,531 warehouses were operating in the country. Millers, meanwhile, numbered 7,606. The fewest number of registered firms were in importation, at just above 300.

Across the regions, wholesalers tend to cluster in the rice growing areas of Ilocos Region, Cagayan Valley, and Nueva Ecija; rice mills are most plentiful in Ilocos Region and Cagayan Valley; and the top-ranked regions in terms of warehouses are Cagayan Valley, Central Visayas, and Davao Region. As expected, NCR has a significant share of the country's importers; however, Central Luzon by far has the largest number of importers.

Table 5: Number of licensed firms, rice business, Philippines, as of August 2017

Region	Retailing	Wholesaling	Retailing-Wholesaling	Milling	Warehousing	Importing
Philippines (except Region XII)	54,152	3,820	9,507	7,606	14,531	304
I	5.6	10.5	16.7	16.0	5.5	6.6
II	6.3	24.0	6.5	15.3	15.4	1.0
III	6.8	16.3	9.4	8.5	11.8	38.5
IV	9.3	4.5	10.8	8.4	9.3	8.6
V	9.6	2.7	6.1	8.4	2.7	4.9
VI	7.4	5.9	12.4	8.1	3.1	5.6
VII	9.4	1.6	6.7	6.4	15.1	5.3
VIII	8.6	8.3	3.5	7.3	3.9	0.7
IX	3.2	5.3	4.8	5.9	3.3	4.3
X	5.9	8.1	4.0	4.6	5.6	2.6
XI	6.7	4.4	7.7	4.4	10.8	3.6
NCR	9.0	3.1	5.0	0.4	8.8	14.5
ARMM	2.1	0.3	1.4	0.2	0.8	0.7
Caraga	10.1	4.9	5.2	6.1	4.0	3.3

Source: NFA (2017).

There is a large concentration of rice mills in Intercity, Bulacan, in Central Luzon. These mills mostly serve retailers in the northwest part of Metro Manila, covering Valenzuela, Malabon, part of Navotas, Caloocan, and Quezon City. Retailers in this part of the city also procure directly from rice millers in Nueva Ecija (also in Central Luzon). Meanwhile the northeast and central parts of Metro Manila (Marikina, Pasig, Pateros, Taguig, Quezon City, Makati, San Juan, Mandaluyong, and Manila) typically obtain their stocks from the Dagupan-Binondo rice center of Manila City. This center obtains rice from traders operating in Bulacan, Isabela, Cagayan, Nueva Ecija, Tarlac, and Pangasinan (PSA, 2015b).

There has indeed been no publicly voiced suspicion of anticompetitive agreements at the level of farmers or even retailers. However, mill operators and wholesalers have been suspected of collusion, despite the large number of registered firms. Cabling (2002) found that there

was high degree of inequality within the rice milling, wholesaling, and wholesaling-retailing industries; there were high barriers to entry in both palay and rice trading. As a result, the industry concentration ratio had increased over time.

Furthermore, palay trading has been villified often as being exploitative of farmers. Beyond some anecdotes though, evidence for widespread exploitation is weak. Hayami and Kikuchi (2000) portray palay trading at the grassroots as being highly competitive. In their study village, as many as 37 private traders were competing for the produce of 45 farmers; the former include 12 agents (of other traders), 12 independent traders, and 13 rice mills. None of the private buyers procured a disproportionate share of palay. No farmer has difficulty comparing prices across the various buyers simply by word-of-mouth. Nor are farmers strongly tied to specific traders owing to credit arrangements, as is often believed: credit advances from traders to farmers account for 20 percent of transactions. Only three farmers purchased fertilizers from a trader.

Similar findings are obtained from PSA (2015b), which is based on a sample survey of 268 respondents, of whom 139 were palay farmers. The majority of the farmers (62 percent) self-financed their production activities; only 5 percent were financed by traders.

Marketing margins

Marketing margins are relatively high in the Philippines.

Indirect evidence for market structure may be seen in returns to marketing activities. Bordado et al. (1996) test the notion that existing market intermediaries are earning rents that can be arbitrated by farmers by direct marketing using producer groups. It turns out that marketing cost of producer groups exceeded that of traders, i.e., activities of traders lead to narrower marketing margins owing to efficiencies in specialization.

Dawe et al. (2008) traced the rice value chain from farm to wholesale level in the Philippines and in Thailand; a more recent study updated the comparison to 2015 with more cross-country comparisons (Indonesia and Vietnam). The earlier study found that gross marketing margin in Thailand is much smaller, at \$16 per ton of palay-equivalent, compared to \$67 dollars per ton in the Philippines). Itemized marketing costs are able to account for virtually all the marketing margin in Thailand, but only 55 percent that of the Philippines. The remaining 45 percent of the margin in the Philippines implies excess profit (over measured marketing costs).

In principle, such excess profit should be competed away, but is not, owing to barriers to entry, or to expansion by existing low cost traders. Barriers may include high working capital requirement for palay trading, large capital requirements for modern rice milling, and asymmetric information about timing and quality of palay supplies.

The updated study using 2015 data (Beltran et al., 2016) confirms the persistence of the excess margin in the Philippines; in peso terms, the returns above measured cost is P4.43 per kg. Excess margin is close to being competed away in Indonesia (P0.65 per kg) and Vietnam (P0.77 per kg); even Thailand, the country with the second highest margin, has an excess margin that is 43 percent lower than that of the Philippines.⁷ This opens the possibility that lack of competitiveness of milled rice in the Philippines is linked to lack of competition in rice marketing and processing.

Rice market policies

Within the domestic market, there is a limited impact from most forms of government intervention, except for statutory restrictions on private sector importation.

The NFA was established in 1972 by Presidential Decree (PD) No. 4 as the lead agency for regulating the grains market to promote food security and farmers' welfare. It procures palay from farmers at support prices and sells subsidized milled rice at the retail level.

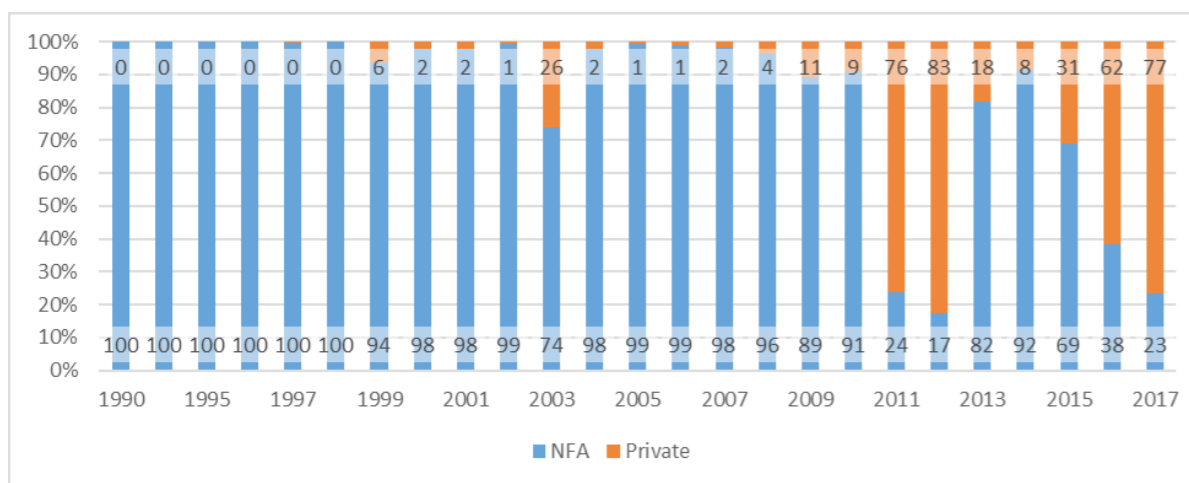
In fact, save for a few exceptional years, it has procured less than one percent of palay production since 2001. On the other hand, its distribution activities are sizable, averaging 8 - 10 percent of the market in 2010 - 2013 (Briones and de la Pena, 2015). This suggests that, while NFA is capable of stabilizing the retail price (mostly by imported stocks), it probably fails to influence palay price. Regression analysis for monthly prices over the period 1983 - 2003 show that NFA stabilization efforts hardly matter at the national level, but are effective in selected regions. In five regions, its marketing activity appears to have raised palay prices; similarly, it has reduced retail prices in five regions (Yao et. al., 2007) .

The NFA also licenses all segments of the rice business, from marketing (retail and wholesale trade), operation of postharvest facilities (e.g., rice mills, threshers, and warehouses), to transport of rice. Its approval is required for the export of rice and corn. The NFA retains the sole right to import rice. This right can be delegated to private traders, subject to issuance of an import permit, and a ceiling on the amount of rice to be imported. Finally, foreign investors (at least 40 percent foreign-owned) are barred from the culture, production, milling, processing, and trading of rice (except retail trading), and its by-products.⁸

Meanwhile, the former type of barriers include various regulations and legal restriction mentioned above. A rapid appraisal study (Briones and de la Pena, 2015) elicited the opinion of value chain stakeholders about the domestic licensing requirements of NFA. According to the respondents, domestic licensing measures are easy to comply with. Domestic regulation by NFA does not appear to affect competition in the domestic rice market.

On the other hand, the same rapid appraisal study notes that NFA import monopoly does constitute a significant entry barrier protecting the domestic industry from foreign competition, while increasing the price of rice for the consumer. The large discrepancy between border and domestic wholesale prices (about 66 percent in early 2018) is an enormous incentive for private sector to undertake rice importation (Figure 4). Since 1999, there has been some private sector participation, becoming substantial in 2003 and 2009, and the major conduit of rice imports in 2011 and 2012. After some reports of anomalous transactions (smuggling and false identity in the import permits), private sector participation was limited in the following years, until becoming again the main conduit for imports in 2016 to 2017.

Note though that the government itself sets limits on the overall size of private sector imports (under the QR system), as well as a ceiling on allocation for individual importers. This removes the need for private participants to collude on the amount being imported in order to keep domestic prices high. In fact, actual delivery is close or equal to the private sector allocation, i.e., there appears to be no additional coordination among players other than what the government already imposed as a QR.

Figure 4: Shares in importation, NFA and private sector (%)

Note: 1991, 1992, and 1994 were years of zero importation.

Source: Briones and de la Pena (2015); NFA Annual Reports for 2014-2017 data.

Price transmission in the rice market

In the long run, rice prices are well integrated across space; varying degrees of integration are also observed in the short run, and across different market levels.

One of the earliest studies of price transmission in the rice market found that price changes in one level of the marketing system are typically reflected at other levels, with an approximately constant marketing margin. The study concluded that market power of wholesalers and retailers is of only local significance or short duration (Mangahas, Recto, and Ruttan, 1966).

Umali and Duff (1992) also conducted a vertical transmission study using regional prices and three seasons (rather than monthly data), namely wet, dry, and off-season. The method relied on a regression of palay price against itself (lagged once), wholesale price (lagged once), and the change in wholesale price. Another model used wholesale price as a dependent variable. The time series 1974 to 1986 was broken up into two periods, namely 1974 - 1982 (when retail price ceilings were imposed) and 1983 - 1986 (after the period of price ceilings). The study found that transmission from wholesale to palay price was weak or even statistically insignificant. Similarly, the wholesale to retail levels showed weak integration, though the effect seems to be stronger than that of wholesale to palay price (especially for the post-ceiling period).

Silvapulle and Jayasuriya (1994) advocated the use of Johansen's multiple cointegration technique to test for integration of prices across space. They find that markets are generally well integrated in the long run with Manila as the dominant market; other inter-regional relationships though are important in the short run.

The most recent attempt at horizontal market integration using Johansen's approach is by Rufino (2008). At the regional level, he found that regional wholesale prices of regular milled rice are well integrated in the long run; moreover, even short-run deviations from long run equilibrium dissipated rapidly.

Asymmetric price transmission in the Philippine rice market has been tested by Reeder (2000), though his formulation uses a variant of Equation (5), based on Wolfram (1971). He also includes seasonal dummy variables. Using data on palay, wholesale, and retail prices, he confirmed symmetry in upward and downward movement in rice prices. There is no evidence to support the view that traders over-react to shortages.

4. FINDINGS

4.1 Information from field interviews

Market players attest to strong competitive pressures at every stage in the marketing chain, but are unable to rule out episodes of price manipulation, especially in periods of scarcity.

The vast network of palay buyers - composed of specialized traders and rice mills - implies considerable competition for farmers' produce. Agents typically roam far - in the case of Intercity (Box 1), supplies are sourced from all over Luzon, as available harvest from surrounding areas quickly runs out. Rice mills send their own agents to procure rice (using their own money) in order to assure quantity and quality; however, most of their rice is procured from walk-in trade.

Box 1

The Case of Intercity

Intercity was established in the early 1990s when a private real estate developer opened up an industrial park devoted to rice milling. It is near the Bocaue exit of the North Luzon Expressway and offers easy access to Metro Manila as well as palay traders from all over Luzon. At the start, there were few takers; over time, there were more locators as operators saw the advantage of forming a cluster. Buyers are attracted to the cluster as they can shop around for the lowest price relative to quality; likewise, palay suppliers are attracted to the cluster as they can search for the highest price and best terms of payment. The creation of the cluster dramatically reduces transaction cost. Currently there are over 100 rice millers in Intercity and surrounding neighborhoods (Golden City has also formed a large cluster of mills). It is estimated that up to 80 percent of rice sold in Metro Manila originates from the Bocaue cluster (Briones and de la Pena, 2015).

In 1995, the developer turned over management of the park to the Intercity Rice Millers Association. The Association maintains common facilities (e.g., roads, which are costly to maintain); organizes waste disposal in coordination with the LGU; and offers other collective goods to the members. The Association also organizes philanthropic or socially oriented activities for the members such as rice donations for food relief. Another key service is dispute resolution for outside parties (e.g., failure to issue a receipt, delay/failure to make payment), as well as among members. A common complaint is "poaching" by a mill operator of buyer/supplier under exclusive arrangement with another mill operator. Lastly, the Association provides a collective front in dealing with the government, which aids in lobbying for the industry (e.g., to oppose smuggling) as well as protection against potential abuses from anti-hoarding or anti-price manipulation moves of government.

Source: Personal interviews.

Palay is typically sorted into three grades (A, B, and C, with A being Premium grade and C being Ordinary). The mill operator will usually test rice for moisture content, milling recovery, percent head rice, and general appearance. Pricing is agreed upon on the spot and the trader can move to another mill operator if the offer is unsatisfactory.

Similarly, most buyers are retailers based in Metro Manila. They make a personal visit with a small truck (capacity of 5 - 6 tons), examine the quality, agree on the price, and return with a full load of rice for retail sale. The buyer can visit numerous operators until they obtain a satisfactory offer.

Margins can go as high as 70 pesos per sack for the retailer; this prevailed in 2014 during the period of high retail prices. However, the margin has fallen since then as retail prices have fallen while wholesale prices have increased. At the mill operator stage, margins can go as high as 50 pesos per sack for premium rice; the more typical rates are 20 - 30 pesos per sack. Despite

low margins, mill operators are able to earn high incomes because of large volumes of stocks milled.

The existence of a quality premium may offer one explanation for the excess profit in wholesaling/milling. Profit margins may be an implicit payment for the service of sorting palay into quality categories. Farmers are unable to capture this margin for themselves owing to asymmetric information (i.e., their inability to classify their produce in terms of market categories).

The typical size of a mill operator for medium size mills (e.g., in Intercity) has a capacity of about 2.5 tons per hour (approximately 1,200 sacks every 24 hours). The large size mills are at least double that size, up to 10 tons per hour. These large mills are typically found in large rice producing provinces such as Nueva Ecija and Cagayan Valley. The latter will also possess large storage facilities, even grain silos for bulk storage.

Market players claim to have no experience with price manipulation. No operator in Manila has enough storage space to be able to influence the market price. Nonetheless, price manipulation cannot be absolutely ruled out in the case of large mill operators outside Metro Manila, especially when harvests are unexpectedly low.

4.2 Analysis of relevant secondary data

Rice mill survey

There is a sharp demarcation between commercial-type and village-type rice mills in terms of size, but there is little evidence of dominance among the commercial-type rice mills.

Upon request, the PSA provided a detailed summary of the results of the 2011 Survey of Rice Mills (Table 6). The sampling frame consisted of 8,648 mills, of which 81 percent were village-type, and 1,657 were commercial-type. The survey covered 198 samples, of which 124 (63 percent) were village-type, while 74 (37 percent) were commercial-type. Table 6 provides some indicators of mill distribution.

Table 6: Distribution of mills, by type of mill and operating cost, 2011

	Village type		Commercial type	
	Number	Percentage	Number	Percentage
Operating cost:				
Below 10,000	65	52	4	5
10,000 to 19,999	30	24	8	11
20,000 to 29,999	21	17	9	12
30,000 to 49,999	5	4	9	12
50,000 to 99,000	2	2	5	7
100,000 to 199,999	1	1	18	24
200,000 to 299,999	0	0	9	12
300,000 and higher	0	0	12	16
Total	124	100	74	100
Milling capacity (tons/hr)	0.56	NA	2.077	NA

Source: PSA.

Rice mills are old, with an average age of 17.13 years. Rice is mostly low quality, with only 19 percent of rice produced of premium and first grade rice, and another 22 percent of medium quality (Grade 2 rice). Bigger mills seem to be more efficient: milling recovery for commercial-type mills is 64.85 percent, while that of village-type mills is only 62.87 percent. Milling capacity of commercial-type mills is nearly quadruple that of village-type mills. Assuming both types of mills operate at the same duration per year, then commercial type mills account for as much as 69 percent of milled output, despite their smaller number. By operating cost, 93 percent of village-type mills operate at low levels (less than P1,000 per day). In contrast, 28 percent of commercial-type mills operate at this low level. Rather, the majority (52 percent) of commercial-type mills operate at medium to large scale (at least P3,000 operating cost per day).

Assuming output is proxied by operating cost and estimating average of each bracket at its midpoint (with the top bracket midpoint set at P400,000), then the top 12 sample mills account for about 40 percent of total output of the sample. This represents an unequal distribution of output, but is no evidence of excess concentration of capacity among a few firms.

Commercial stock survey (CSS)

Consistent with the model of competitive storage, increases in rice prices tend to be followed by a withdrawal from stocks, and subsequently a decline in prices.

Data for CSS (sample size = 11,706 respondents) turns out to be available in NFA Central Office only in summary form (for submission to PSA). Establishment-level data is only available in NFA field offices; disaggregated CSS data is available at the Central Office only for selected provinces and years. Upon request, the NFA provided total monthly rice stocks for the provinces of Cagayan Valley and Isabela (Region I); Nueva Ecija and Bulacan (Region III); and NCR; for the years 2012 to 2016. Table 7 provides annual summaries, juxtaposed with average retail prices over the same period.

Table 7: Average monthly stock and retail price of rice, selected provinces/areas, 2012 – 2016

	2012	2013	2014	2015	2016
Bulacan					
Stocks (tons)	29,376	31,289	37,055	54,419	67,514
Price (PHP/kg, WMR)	35.22	35.32	42.00	39.88	38.52
Cagayan Valley					
Stocks (tons)	42,136	41,479	33,650	64,152	98,957
Price (PHP/kg, WMR)	33.17	34.43	41.41	35.45	36.14
Isabela					
Stocks (tons)	77,497	85,791	66,837	95,735	113,037
Price (PHP/kg, WMR)	36.79	37.25	42.92	41.16	41.89
NCR					
Stocks (tons)	39,897	48,746	36,003	43,018	24,782
Price (PHP/kg, WMR)	35.00	36.02	41.84	42.50	41.61
Nueva Ecija					
Stocks (tons)	34,993	41,614	69,866	88,047	73,582
Price (PHP/kg, WMR)	34.60	35.78	43.90	43.92	43.86

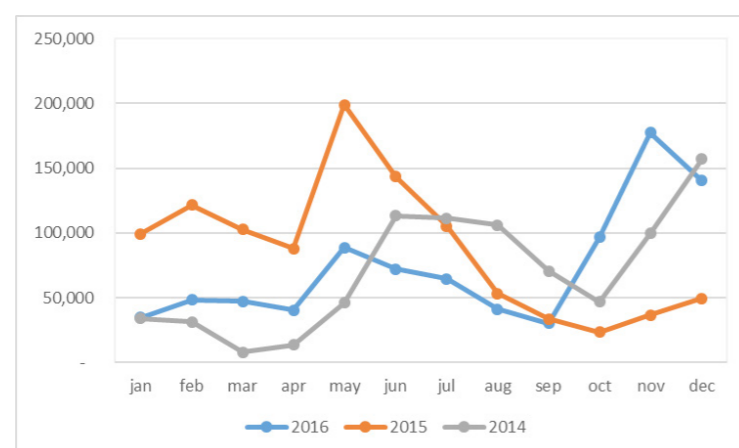
Source: PSA CountryStat for price data; NFA (2017) for stock data.

The province with the largest average inventory of stocks is Isabela, followed by Nueva Ecija – both large rice producing provinces. The lowest stocks are found in NCR – hence any claims of “hoarding” seems more likely to be done outside NCR. The drastic increase in retail price in 2013-14 was accompanied by a sharp decline in stocks in three out of five provinces/areas, namely in Cagayan Valley, Isabela, and NCR. The subsequent decline in price was accompanied by an increase in stocks. Stocks continued to accumulate in 2015-16 as the retail price remained fairly stable.

Within the year, the stereotypical pattern for stocks is to accumulate during peak harvest months from April onward, reaching maximum levels at around June-July, then falling as stocks are drawn down during lean months. Another period of accumulation occurs during the wet season harvest months from October to November or even December. The monthly stocks for Nueva Ecija generally follows this pattern (Figure 5), at least in 2014 to 2016.

Competitive storage offers yet another explanation for the persistence of excess margins at the wholesale stage. Large margins may be a return to intertemporal arbitrage made possible by storage. Unfortunately, farmers are unable to capture these returns by performing their own storage, due to their need for cash during harvest periods (compelling them to dispose their stocks rather than wait for a better price), as well as the diseconomies of scale from individual storage. Hence, excess margins accrue to traders during peak periods (when palay prices are low) and are squeezed during lean periods (when palay prices are high).

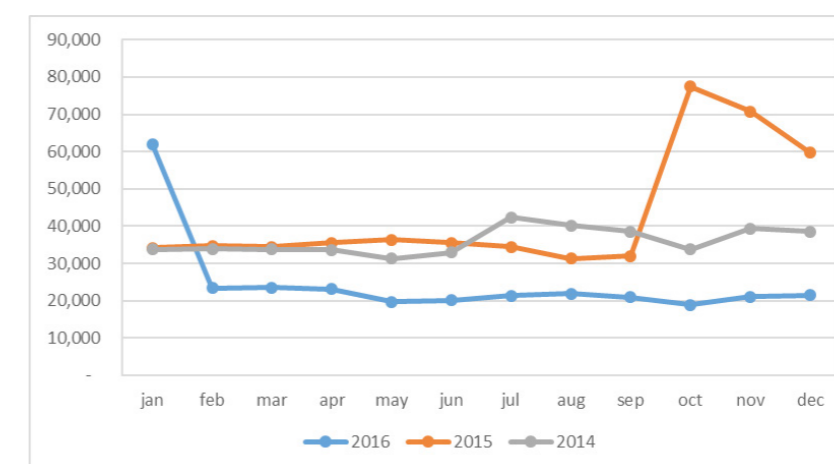
Figure 5: Total monthly commercial stocks in milled rice equivalent, Nueva Ecija, 2014 - 2016



Source: NFA (2017).

The stereotypical pattern should not be seen as prevailing for all years, nor for all areas. For instance, monthly stocks in NCR are basically flat at around 30 to 40 thousand tons in 2014 and most of 2015 (Figure 6). In September to October though, stocks rapidly increased to nearly 80 thousand tons before declining towards a new stable level of about 20 thousand tons. It appears then that consumption in NCR relies on inventories located outside the metropolis.

Figure 6: Total monthly commercial stocks in milled rice equivalent, Metro Manila, 2014-2016



Source: NFA (2017).

4.3 Analysis of horizontal market integration

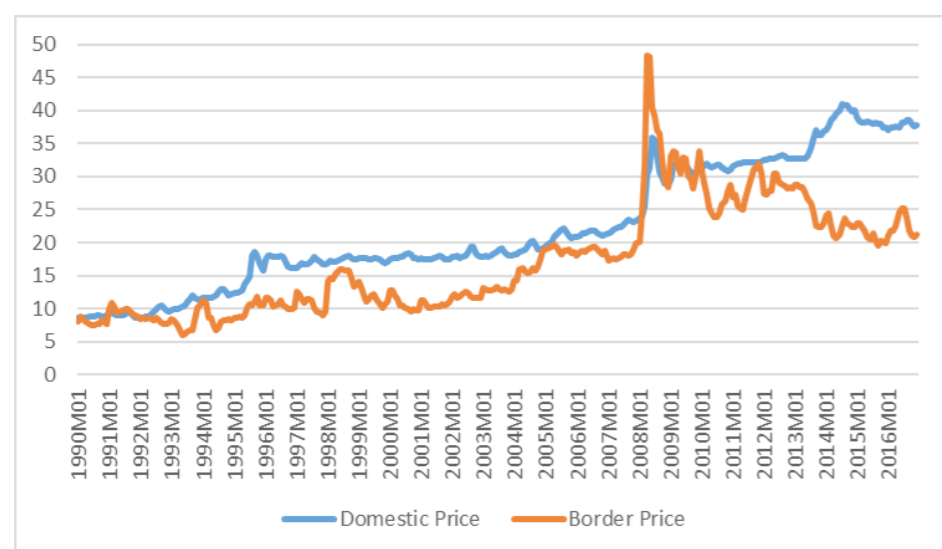
Integration between domestic and global markets

The legal restriction on private sector participation in imports excludes foreign suppliers from domestic markets and perpetuates high domestic prices.

The domestic rice market is insulated from world markets, with arbitrage unable to dissipate rents from importation. Domestic price from 1990 onward is represented by the monthly wholesale price in logs. The world price is proxied by Thai White Rice 5 percent f.o.b. (converted into pesos using the contemporaneous exchange rate).⁹ Note that the product more closely comparable to Philippines’ WMR is Thai White 25 percent; unfortunately, the time series for this product suffers from breaks. The 5 percent and 25 percent prices in any case move closely together.

Figure 7 compares the domestic price with the border price, which is the world price adjusted upward by 10 percent to account for freight and ancillary cost to bring the product across the border. The domestic price typically hovers above the world price; the exceptions are February to April of 1991, and June, then September - December 2009, as well as January - March of 2010.

Figure 7: Monthly domestic and border price, 1990 – 2016



Sources: PSA CountryStat for domestic price; World Bank (2017) for border price.

The price series do tend to move together; the correlation coefficient between the two is fairly high, at 0.87. The domestic price spiked in 2008, then retreated, but at levels higher than pre-2008. The spike in early 2008 closely tracks developments in the world market; likewise, the world market price spiked in early 2008 and levelled off, but at higher levels than in pre-2008. However, this indicator is far from sufficient to establish integration between domestic and world price; for this, a systematic treatment using cointegration analysis is needed.

The first step is to check for the presence of a unit root using the Dickey Fuller test (Table 8). Presence of a unit root cannot be rejected for the wholesale and world price in levels. However, presence of a unit root is rejected for first difference in both the wholesale and retail price.

Table 8: Results of Dickey-Fuller test, domestic and world prices, null: unit root present

	Levels		Differences	
	Domestic price	World price	Domestic price	World price
Test statistic	-1.336	-1.967	-11.359	-11.629
P-value	0.6127	0.3014	0.0000	0.0000

Source: Author's calculation.

The next step is to run a vector autoregression (VAR) between domestic and world price. The Akaike information criterion favors two lags; the Lagrange multiplier test fails to reject the null of no autocorrelation. This result is confirmed further by the Johansen cointegration test, using 2 lags. The test finds that the test statistic is already rejected at rank zero, i.e., the null hypothesis of no cointegrating relation is maintained (Table 9). In short, there is no evidence to suppose a relationship between domestic price and world price.

Table 9: Result of the Johansen test for cointegration, domestic and world price (two lags)

Maximum rank	Eigenvalue	Test statistic	Critical value
0	.	5.6260	15.41
1	0.01288	1.4527	3.76
2	0.0450		

Source: Author's calculation.

Additional confirmation is obtained from a Granger causality test, based on a VAR with an extra lag (Toda and Yamamoto, 1995). The appropriate test fails to reject absence of Granger causality from domestic price to world price (Table 10), consistent with the Philippines being a small player in the world rice market.

Table 10: Result of Granger causality test, domestic and world price, null: coefficient of lags is zero

Independent variable	Lagged values tested	Chi-squared	Prob > Chi-squared
World price	Domestic price	2.00	0.57
World price	Domestic and world price	2.00	0.57
Domestic price	World price	2.41	0.49
Domestic price	World and domestic price	2.41	0.49

Source: Author's calculation.

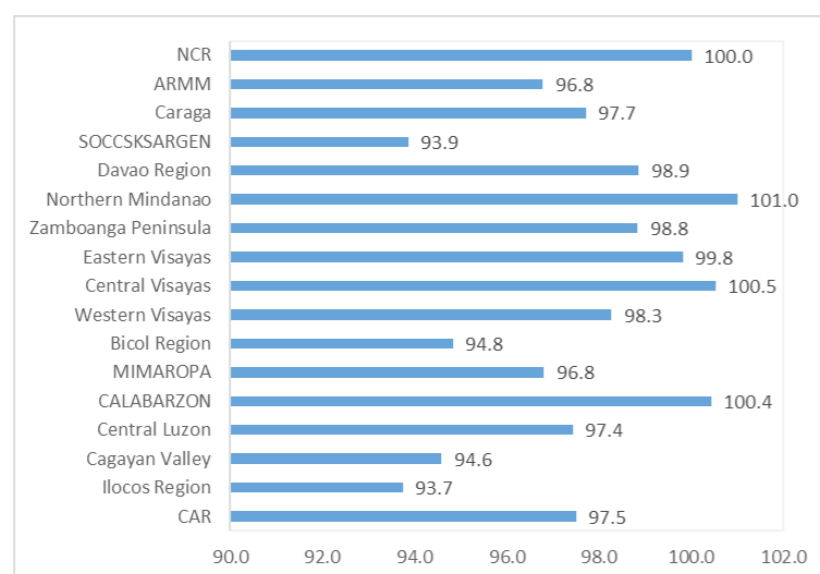
However the same test also fails to reject absence of Granger causality from world price to domestic price, consistent with the absence of a long run relationship between domestic and world price. These findings offer unambiguous evidence of the effectiveness of the NFA import monopoly in conjunction with the QR in isolating the domestic rice market. Hence, foreign rice is unable to compete with domestic rice in order to bring down price of the latter to the level of the border price. For instance, the domestic wholesale price averaged 74 percent above the border price in 2013-2015. Such a large and persistent difference highlights the state import monopoly as the key competition issue in the rice sector.

Integration between regional markets in the Philippines

Prices are integrated at the regional level; however convergence of prices across regions is a protracted and erratic process.

The following implements horizontal market integration analysis using monthly retail prices of well-milled rice for the regions of the Philippines. The analysis opts for retail prices as Rufino (2008) has already analyzed market integration at the wholesale level. Moreover, retail prices are ultimately what matters to consumers. Figure 8 shows the average monthly price per region over the period 1990 - 2017, relative to NCR price. As expected, NCR is a region where rice is relatively expensive, though rice in Northern Mindanao and Central Visayas is, on average, more expensive. The cheapest price is found in Ilocos Region, SOCCSKSARGEN, and Cagayan Valley. These averages conceal a tremendous regional variation; the coefficient of variation of regional prices ranges from 5 to 9 percent, and in one instance rises to 11 percent.

Figure 8: Regional price index, average of 1990 – 2017 (NCR = 100)



Source of basic data: PSA CountryStat.

The procedure for cointegration analysis is similar to the previous case of domestic and world markets. The results are summarized as follows:

Dickey-Fuller unit root test. For all the regional price series, presence of a unit root cannot be rejected at 5 (or even 10) percent significance level. However, presence of a unit root for the first differences is rejected at 1 percent level.

Cointegrating vector. Results of the ECM estimation are summarized in Table 11. Each of the posited ECMs are first subjected to the Johansen rank test; for all posited ECMs, the hypotheses of at most zero are all rejected; but the hypothesis of at least one cointegrating vector cannot be rejected. Selected coefficient estimates from the ECMs, together with the probability of the computed test statistic exceeding the critical value, are also shown in the Table. In each ECM, the coefficient of the cointegrating vector is significant at 1 percent (or even lower) level. In absolute terms the coefficient value varies from -0.85 to 1.15, with an average value of unity. This implies an approximately one-for-one transmission of price effects from a central market to a regional market, i.e., regional rice markets are integrated in the long run.

The coefficient estimates in the short run equations for lagged dependent and lagged explanatory are mostly of expected sign (i.e., negative, positive, respectively). That is, when the regional price (dependent variable) is “too high” then it tends to fall, whereas the relevant central market price will tend to rise. However, the magnitudes are small (in absolute terms, ranging from 0.03 to mostly under 0.10); in a few ECMs, the coefficients are not statistically significant. In short, the adjustment to long run equilibrium is a protracted process that remains poorly understood.

Table 11: Results of estimation for cointegrating vector in the ECMs, monthly retail prices by region, 1990 - 2016

Region of dependent variable	Region of explanatory variable	Coefficient of explanatory variable	Coefficient of lagged term for dependent	Coefficient of lagged term for explanatory
CAR	NCR	-1.15 (0.00)	-0.08 (0.41)	0.09 (0.00)
Region I	NCR	-1.10 (0.00)	-0.06 (0.05)	0.05 (0.08)
NCR	Region II	-0.90(0.00)	-0.15 (0.00)	0.12 (0.78)
Region III	NCR	-1.03 (0.00)	-0.10 (0.03)	0.09 (0.06)
Region IV-A	NCR	-0.95 (0.00)	-0.05 (0.07)	0.09 (0.06)
Region IV-B	NCR	-1.04 (0.00)	-0.02 (0.46)	0.09 (0.02)
NCR	Region V	-0.95 (0.00)	-0.08 (0.01)	0.06 (0.08)
Region VII	Region VI	-0.85 (0.00)	-0.10 (0.00)	0.08 (0.06)
Region VIII	Region VII	-1.14 (0.00)	-0.11 (0.00)	0.06 (0.05)
Region IX	Region XI	-0.96 (0.00)	0.03 (0.39)	0.18 (0.00)
Region X	Region XI	-0.91 (0.00)	-0.06 (0.13)	0.12 (0.02)
Region XII	Region XI	-0.93 (0.00)	-0.09 (0.24)	0.27 (0.00)
Caraga	Region XI	-0.98 (0.00)	-0.06 (0.02)	0.08 (0.02)
ARMM	Region XI	-1.04 (0.00)	-0.08 (0.00)	0.04 (0.17)
NCR	Region VII	-1.04 (0.00)	-0.08 (0.00)	0.07 (0.00)
Region XI	NCR	-1.15 (0.00)	-0.08 (0.00)	0.07 (0.00)

Note: The term in the parenthesis is the probability that computed test statistic exceeds its critical value. Italicized items represent estimates which exceed the threshold of 10 percent probability.

Source: Author's calculation.

4.4 Analysis of vertical price transmission

Movements of wholesale prices track movements in palay prices, but the effect of palay price drops are more pronounced than the effect of palay price increases.

Vertical price transmission along the marketing chain of rice is asymmetric, suggesting short-term deviation from competitive behavior when palay supplies run low. Let t refer to a time index for month; wmr_t denote log of monthly wholesale price of wellmilled rice; $palay_t$ denote log of monthly farmgate price; $dpos_t$ ($dneg_t$) a dummy variable equal to one when current farmgate price is higher (lower) than the previous month's farmgate price; $jan_t, feb_t, \dots, nov_t$ denote dummy variables for months; and ε_t an error term. Least squares estimation is applied to the following model:

$$\Delta wmr_t = \gamma_0 + \gamma_1 \cdot dpos_t \cdot \Delta palay_t + \gamma_2 \cdot dneg_t \cdot \Delta palay_t + \gamma_3 \cdot t + \gamma_4 \cdot jan_t + \gamma_4 \cdot feb_t + \gamma_5 \cdot mar_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \gamma_4 \cdot feb_t + \varepsilon_t$$

Results are shown in Table 12. The F-test rejects the hypothesis that the coefficients are jointly zero; the goodness-of-fit of the model is decent at an adjusted R^2 of 0.47. The Breusch-Godfrey test fails to reject the null of “no serial correlation” of residuals at 10 percent level of significance.

Coefficients of $dpos \cdot \Delta palay$ and $dneg \cdot \Delta palay$ are each statistically significant. The key result is that the former differs markedly from the latter. The hypothesis of equal coefficient is strongly rejected by the test of linear restriction – a result that sharply contrasts with the earlier finding of symmetric price movement from Reeder (2000). An increased price of palay raises wholesale price on a one-for-one basis; this is about four times bigger than the effect of a reduction in the price of palay. Asymmetry of price transmission from palay to wholesale price suggests a short-run deviation from competitive behavior among producers under conditions of scarcity.

Table 12: Regression model for testing asymmetric price transmission in rice market

Independent variable	Coefficient estimate	P(t>t-critical)
$dpos \cdot \Delta palay$	1.002	0.00
$dneg \cdot \Delta palay$	0.236	0.00
t	-0.000	0.10
jan	0.295	0.08
feb	0.207	0.09
mar	0.217	0.02
apr	0.298	0.00
may	0.187	0.00
jun	0.250	0.06
jul	0.488	0.04
aug	0.512	0.00
sep	0.249	0.06
oct	-0.281	0.02
nov	-0.128	0.30
constant	-0.188	0.06

Notes:

1. Time series from PSA Countrystat; uses monthly prices from January 1990 to December 2016 ($n=324$)

2. $P(F > F - critical) = 0.00$; adjusted $R^2 = 0.47$

3. Breusch-Godfrey LM test (H_0 : no serial correlation): $P(\chi^2 > \chi^2 - critical) = 0.19$.

4. Linear restriction test for $H_0: \gamma_1 = \gamma_2$: $P(F > F - critical) = 0.00$.

Source: Author's calculation.

This interpretation needs to be qualified, however, as the asymmetry might have an alternative explanation. For instance, Briones (2017) finds that the combined policy objectives of price stabilization, support for rice farmers, and import timing lags, lead to a “ratchet effect” in which price movements are biased upward. Such a ratchet effect is independent of any market power supposedly prevailing during periods of rising prices.

5. CONCLUSION

5.1 Summary

This issues paper confirms many of the findings of earlier studies. By far, the most serious entry barrier in the rice market is in foreign trade, owing to the chartered import monopoly of the NFA. Within the domestic market, previous assessments of the state of competition have been mixed, ranging from fully competitive, to being controlled by palay traders (at the farmgate stage) and wholesaler/millers (at the wholesale stage).

The market integration diagnostics likewise obtained mixed results. The diagnostics found that regional markets are integrated in the long run, and that stock behavior is broadly consistent with the competitive storage model. However, the following findings fail to rule out anti-competitive behavior at the wholesale/milling stage:

- For one well-studied marketing chain, wholesalers/millers receive persistently high excess profit. This is suggestive (but not conclusive) of the presence of entry barriers into this stage of the market – though alternative explanations cannot be ruled out.
- Within a regional market, short-run adjustment towards long-term equilibrium is slow and unpredictable.
- Response of wholesale price to increases in palay price (i.e., in periods of scarcity) are much larger in absolute terms than responses of wholesale price to reductions in palay price (i.e., periods of abundance).

5.2 Recommendations for further research

These mixed findings for the state of competition in the domestic market warrant further research. First and most immediate is to obtain more direct information about stocking, product classification, and prices at the subregional level. Secondary data that can be subjected to further analysis are provincial- and city-level data from PSA's Survey of Retail Prices and Farm Price Survey; and price proxies at the level of barangay using unit values implicit in the household expenditure and quantity data from the PSA's Family Income and Expenditure Survey. A specific research plan within this broad research area is developed in Appendix 1.

Second is to understand better the size and sources of the excess marketing margin. This finding is obtained for a single marketing chain from Nueva Ecija to the nearby wholesale market. Additional measurements across space, seasons of the year, and product categories are warranted. Note that PSA (2015b) found a wide range of marketing cost and marketing margins across provinces and regions of the country. There is an ongoing study on the margins characterizing the rice value chain by PhilRice with funding support from the Department of Agriculture. The study focuses on the top 20 producing provinces. Unfortunately, results of this study will be available only by end 2018. Should data gaps remain despite the PhilRice study, it is worthwhile to pursue the breakdown. For instance, it is likely that the PhilRice study does not examine product differentiation, which will require a further study of consumer demand.

5.3 Policy recommendations

Given the uncertainties associated with the research findings, policy recommendations directly concerning competition in the rice market might be premature, with two exceptions: One is the need to abolish the NFA import monopoly; the other is the need to liberalize investment rules in rice processing and trading, opening up the sector to foreign competition. The former has been

treated in detail elsewhere (Briones et al, 2017); Box 2 provides a brief discussion and update of current developments.

A final set of recommendations are of general nature related modernization of rice markets, which will doubtless have salutary though indirect effects on competition. These include the following:

- Protracted adjustment of regional prices to long term equilibrium implies a need to develop closer transport connectivity from farm to consumer, including large-scale investments in farm-to-market roads. Precisely this move is being contemplated under the current administrations' Build-Build-Build infrastructure thrust.
- Large variations in quality of paddy suggest a role for introducing mandatory grades and standards (G&S), as in Thailand; this was part of the original mandate of NFA, and has led to codification of rice G&S, but has been only feebly enforced.
- Exclusion of farmers from palay storage and intertemporal arbitrage implies the need to establish palay wholesale markets a warehouse receipt system for rice (Dawe et al, 2006; Briones and Tolin, 2016).

Box 2

Policy background and update on the rice QR

The state's legal mandate to impose import quotas on agricultural products was limited by the Agricultural Tariffication Act (RA 8178). The Act converted all QRs in agriculture into tariffs, in compliance with the tariffication requirement of the WTO, which the Philippines joined in 1995. However, it explicitly excluded rice from its coverage, consistent with the country's application for a special treatment of rice. The WTO approved special treatment up to 2005; extended it to 2012; and provided a waiver to 2017.

Since then, both House of Representatives and the Senate, with technical inputs from the Executive, have conducted proceedings to amend RA 8178 and bring rice into compliance with international law. Emerging bills in both Houses provide for repeal of the sole right of NFA to import rice.

Note, however, that repeal of the QR is no guarantee of removal of all anti-competitive distortions in importation. This is evident in the case of garlic, onion, and sugar, which had already been covered by RA 8178. The exact configuration of the regulatory regime, post-QR, remains critical for competition policy in importation of agricultural products.

Appendix 1: Research Plan for Future Research

Several research directions were identified in the concluding section of the paper. This Appendix elaborates on the first, which serves as research plan for future research. The thrust of the Research Plan is to obtain more conclusive evidence using more disaggregated data by area, period, firm, product category, and product sourcing (i.e., domestic versus imported stocks).

Denote traders and mill operators collectively as players. The objectives of the proposed study are:

- To gauge market share of the top players during peak (harvest) and lean seasons in major rice producing areas of the country using inventory and sales; and
- To relate inventory management, product sourcing, and product differentiation practices of top players within a province to area- and company-specific movements in palay and milled rice prices.

Key to the study is local knowledge of NFA key informants, together with data from NFA offices, at the provincial and local levels. This distinguishes the Second Phase from the current study, where the key informant interviews were very limited in geographic scope.

The proposed study targets the five top producing regions in the country, namely: Central Luzon, Cagayan Valley, Ilocos Region, Western Visayas, and Bicol Region. Within these regions we choose the top ten provinces, namely:

Bicol Region: 1) Camarines Sur;

Cagayan Valley: 2) Cagayan; 3) Isabela;

Central Luzon: 4) Bulacan; 5) Nueva Ecija; 6) Pampanga; 7) Tarlac;

Ilocos Region: 8) Ilocos Norte; 9) Pangasinan; and

Western Visayas: 10) Iloilo.

The study involves consultations with NFA Central Office, to obtain provincial data (as of end-2016) of rice stocks; visits to the aforementioned Regional Offices; and interviews of key informants in the Provincial Offices (POs) of the aforementioned ten provinces.

At the PO level, key informants will be asked to identify the top four players in each province (based on average monthly inventory in 2016). Data will be gathered from the top provincial players, involving identification of product source, product types, and prices and monthly inventory of stocks by product type.

Differentiation of pricing and inventory by product type will enable assessment of supply-side substitutability.¹⁰ Comparisons with the monthly stocks in the CSS will help measure the four-firm concentration ratio in each province, as well as trace patterns in stock movements of the top four in relation to the rest of a province's stock. The latter comparison will check for synchronized movement, and whether the dominant firms' stocks anticipate movements in aggregate stocks. Furthermore, monthly and product-specific price movements at the provincial and even firm level will enable exploration of market segmentation in terms of product type, product source, geography, as well as patterns of deviation from competitive pricing, such as asymmetric price transmission.

Appendix 2: Field Notes

The author interviewed the following stakeholders:

- A Metro Manila-based retailer (Pasay City Public Market);
- Philippine Confederation of Grains Associations;
- Intercity Rice Millers Association; and
- Rice miller in Intercity.

Retailer

- They opened up a sari-sari in the market 3 years previously; one of the goods sold is milled rice.
- At the time (2014), rice prices were high relative to wholesale prices, and she was able to charge a gross margin of 70 pesos. However, since then the margin has deteriorated to current levels, owing to a squeeze due to higher wholesale prices and lower retail prices.
- She obtains rice from only three wholesalers, located in Paranaque; she is unaware of where in turn they obtain their rice. She has heard that a few wholesalers are operating in Binondo (which is nearer), but she is happy with her current suppliers in Paranaque.
- She is satisfied that the prices she receives are the prevailing wholesale prices, as she can compare across the three suppliers; whoever sets the lowest price gets her order. At the same time, her own prices are set so as to maintain an adequate margin (which is around the current level), or higher if market permits. As one of the bigger retailers in the public market, she claims her price is used as benchmark of the other retailers in the market.

Philcongrains

- Philcongrains explains the origin of the claims about the rice cartel. The Quedancor, a government financial institution, at the time was justifying the use of funds to widen participation in the rice trade; apparently officials of the Quedancor were the source of information. Subsequent investigation failed to substantiate the existence of such a cartel. (Recently, Quedancor was ordered abolished by Presidente Duterte for mismanagement of government funds.)
- Isabela rice mills: 5 – 10 tons/hour. Versus medium size mills in Intercity: 2.5 tons/hr
- Philcongrains supplies various types of buyers: wholesalers and retailers in Isabela; wholesalers in Manila (used to be many in Binondo, now only few); institutional buyers (supermarkets); retailers
- Retailers will not pay cash, usually 15 – 30 days consignment. Orders are small, say 20 sacks. So he prefers institutional buyers. A few retailers are his suki
- Procurement is concentrated

- There cannot be cartel. There is no discussion about price – only time they coordinate price is during rice distribution campaigns which they organize when associations sense an impending panic in rice market.
- If ever there are stocks, government can assert its regulatory power to inspect stocks – they know where rice stocks are stored.
- Stocking rice are not reasonable, high storage cost, easily deteriorates – he needs fast turnover to get cash.
- Their perennial advocacy is to stop rice smuggling. This is really harmful to domestic rice industry.
- Peak buying period for palay is March, April, and May, which is harvest season in Cagayan Valley
- Poor state of farm-to-market roads really hampers development of rice industry. Most roads in provinces are gravel, should be paved.

Intercity Rice Millers Association

- In early 1990s: the private real estate developer offered industrial park specifically for rice mills. In the beginning few takers, remained scattered throughout Bulacan.
- As mills saw the advantage of clustering: started to get locators. The advantage mainly is to attract buyers, who can “shop around” for quality rice with most favorable terms from rice mills.
- Association was formed in 1995 to:
 - Maintain common facilities, roads; organize waste disposal activities of members in coordination with LGU
 - Perform self-regulation, act as grievance committee for buyers, dispute settlement among rice mills
 - Collective action to lobby government or protect against harassment (e.g., charges of hoarding, inspection by NFA/CIDG, even EIIB (now defunct)
 - Exercise of social responsibility, e.g. food relief distribution (latest is Marawi donation)
- Now more than 100 mills. Nearby cluster of Golden City also formed. They account for 60 percent of bigas of Metro Manila
- Most of rice sold by pick up retailers – about 70 percent. Cater mostly to ordinary rice (not high quality rice)
- Procurement is on harvest seasons April-May, then Sept-Oct; they process and sell rice in peak months – June, July, August; then Jan – Feb.

- During peak months (five months of year) they operate at peak capacity; and perhaps at only 50 percent capacity rest of year. Medium size mills, 1,200 sacks per 24 hours. Just the machine requires investment of P12 million. Hopes locally fabricated equipment becomes more common.
- Margin was only P20/sack - that is already high.
- The better quality the rice, the worse nutritive quality
- There is no price manipulation or hoarding. There is no space in Intercity for big warehouses. Typical mill has warehouse of 1,200 square meters for inventory - can store maximum 100,000 sacks for 2-3 months.
- Categories of rice: Class A, B, C. About 0.50 cents difference
- Quality of milled rice depends on quality of palay, especially moisture content. Ideal moisture content is 14-15%, same as for milled rice.
- The big rice mills are in the provinces near large rice growing areas like Nueva Ecija. These are the ones selling to institutional buyers. They are more careful about quality. They do bulk storage in silos.
- Intercity procures rice from all over Luzon.
- They are open to inspection 24/7 in case there is suspicion of hoarding.

Rice miller in Intercity (27 years)

- Strong competition from imports; without this price will be higher. Imports are cheap, quality is good; however not as fresh as local rice as it needs to travel a few weeks overseas, and undergo fumigation at ports.
- They also do marketing of imported rice. However stocks are limited, not enough to bring down prices.
- Local milled rice stocks normally kept only 1-2 weeks, then disposed
- No hoarding in intercity - storage is small, always open; perhaps happens to people with big warehouses (in provinces)
- Used to be only in marketing, but makes more profit with milling - obtain the margin from processing; however need significant investment
- Capacity is 2000 bags per 24 hours. Everyday mill about 700 sacks. Have their own brand. They have Premium, Grade B (Angelica), Grade C.
- Margin is about 20 pesos/sack rice, can go up to 50 pesos/sack, but only for Premium rice. When there are large harvests their margins are much lower.
- Sorting is done upon arrival of palay trader's truck. Sample is tested for moisture content, milling recovery and percent broken. Normally rice already sorted, but sometimes arrives "ramble", which gets lower price.

- Buyers prefer to pick up rather than have them delivered - they want to inspect for quality.
- Competition for suppliers (palay) and buyers (milled rice) strong. If they do not give favorable terms then supplier sell to another buyer, or buyer source from another mill (they are all easily accessible). They have suki but in no way are they exclusive - they just have a good relationship.
- There is such thing as big-time rice trade with big amount of capital - this may be source of imperfect competition - not intercity.
- Most of their storage is in palay, they can keep 3 to 5 months. This is source of daily sales even when no delivery.
- She has her own agents for which she advances money - these are people she trusts; numbering four. She needs them to assure sufficient stocks and quality - as well as keep margin from palay trading.

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Endnotes

- 1 <http://newsinfo.inquirer.net/895939/pinol-vows-to-crack-down-on-rice-cartel#ixzz4orDA2cLa>. Accessed 30 September 2017.
- 2 http://www.congress.gov.ph/legisdocs/basic_17/HR00951.pdf. Accessed 15 September 2017.
- 3 See RA 7581 or the Price Act of 1991.
- 4 Models such as (5) are referred to as “pre-cointegration” approaches. In contrast, asymmetric ECM have been proposed in case time series are non-stationary, e.g. Barahona et al. (2014). However, Meyer and von Carmon-Taubadel find that pre-cointegration approaches remain workable; in fact asymmetric models such as (5) are based on first differences, which in any case tend to be non-stationary.
- 5 Other (rarer) grades are overmilled rice (completely white rice) and undermilled rice (or brown rice).
- 6 The rice cartel was apparently first mentioned by then-Senator Teofisto Guingona Jr. in a privilege speech. He named seven Binondo-based rice wholesalers as the leaders of this cartel (<http://www.bworldonline.com/content.php?section=Opinion&title=what&8217s-up-most-likely-power-and-rice-prices&id=90550>).
- 7 One way to qualify these findings is to account for risk: variability of returns to palay trading have been estimated earlier in a study by Mears and Anden (1970). Over the period 1957-58 to 1968-69, both the palay farmer who stocks palay, and the palay trader who stocks palay and sells milled rice, face a high probability of loss (incorporating carrying cost and opportunity cost of capital). High returns may be simply compensating for the high risk of palay trading. However for risk to be a plausible explanation for relative excess margin in the Philippines, it must first be shown that relative price risk in the Philippines is higher than for Indonesia, Vietnam, and Thailand.
- 8 P.D. 194 allows foreign firms in the rice and corn industry upon certification of urgency by NFA, and subject to a guaranteed divestment to Filipinos (or exit from the industry) after a 30-year period (NFA Council Resolution 193 s. 1998).
- 9 Thai White price available from <http://data.worldbank.org>.
- 10 Note however that demand-side substitutability will require a consumer survey (see Section 5.2) that is outside the scope of this Research Plan.



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