

SCREENING FOR COLLUSION IN THE PHILIPPINE CHICKEN MEAT, CHICKEN EGG AND PORK MARKETS

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ABSTRACT

Since chicken meat, chicken egg and pork are regularly consumed by majority of the Filipino population, changes in the quantity supplied and retail prices significantly affect buyers. Protecting the welfare of the consumers and even producers by promoting free and fair competition is of utmost concern. Firms entering into anti-competitive agreements such as market collusion can hurt consumers because of the high prices they are being charged. The paper screened for possibility of market collusion in the Philippine markets of chicken meat, chicken egg and pork, by observing significant breaks in the prices of industry data. Piecewise regression analysis was performed on the nominal retail prices of chicken meat, chicken egg, and pork from 1990 to 2017. Findings revealed that the variations in the retail prices showed statistically significant shifts corresponding to critical events in the industry like entry, exit and mergers within the industry, as well as the acceleration of technical smuggling in the country. While the paper is limited only to the initial work of detecting market collusion, the paper recommends that further scrutiny by concerned agencies be done in order to verify and address the anti-competitive behavior of firms.

Key words: cartels; mergers and acquisition; technical smuggling; piecewise regression

INTRODUCTION

The livestock and poultry industry is one of the major contributors to Philippine agriculture. During the last 16 years, the industry accounted for approximately one-fourth of the country's output (i.e. gross value added) in agriculture and fishery. Pork has the highest output share (14.5%), followed by chicken (12.2%), chicken egg (3.3%), and beef (1.5%) (Philippine Statistics Authority [PSA], 2017). The industry also provides employment and acts as supplementary sources of income to thousands of Filipinos living in the rural areas for live animal production and urban centers as final market destination. Pork, chicken meat, and eggs are regularly consumed by majority of the population and are the main providers of protein to the Filipino diet. Consumers have a wide variety of choice in the purchase of meat products depending on taste, preference, access and income. Thus, from the viewpoint of consumers, domestically produced fresh meat not only competes with imported frozen meat, but also with secondary processed products (i.e. hotdog, pork sausage and cured pork) and canned goods (i.e. luncheon meat).

In order to promote free and fair competition in trade, industry, and all commercial activities in the Philippines, the Philippine Competition Act (PCA) or Republic Act 10667 was signed into law in 2014. This law provides for the establishment of the Philippine Competition Commission (PCC), a quasi-judicial body of the government enforcing the PCA. One of the concerns of the PCC is to penalize anti-competitive agreements such as market collusion or the formation of cartel among industry players.

Cartels are illegal arrangements between players of an industry to control for prices and therefore profit, thereby reducing the level of competition between them and other competitors.

When market players collude and, for instance, agree to set a common price instead of establishing competitive prices, social welfare is sub-optimal. Not only are consumers penalized for paying high prices but new firms can also be discouraged from entering the market since the collusive agreements act as a barrier to entry into the industry. Market collusions are therefore detrimental to the economic welfare of the society. Unfortunately, market collusions happen. Screening for market collusion is crucial in order to identify markets where collusion is suspected. Among developed economies like the US, EU and Japan, cartel detection is typically implemented using two approaches: reactive and proactive (Friederiszick, 2006; Nakazato, 2014; OECD, 2015). Competition agencies take their reaction when market participants file complaints against unfair competition of suspected cartels. Existing cartel members can also apply for clemency or pardon such as the case of whistleblowers. Competition agencies also have the option of granting leniency or reward programs to industries where a cartel has already been discovered.

A proactive approach, on the other hand, requires the active involvement of a competition agency in identifying particular market participants or specific markets associated with cartelization. There are two main economic-based detection tools, called cartel screens, used in the proactive discovery of cartels. These are structural methods using observable economic data and behavioral methods which focus on the behavior of cartel member firms (Abrantes-Metz, 2013). According to Grout and Sonderegger (2005), one of these cartel screens is structural method. A structural approach of cartel detection generally compares the structure and trend of markets with cartel and without cartel (i.e. perfectly competitive industry). For example, the absence of cartel or a competitive market is associated with many firms with low market share, low barriers to entry of new players, high volatility in response to crisis, and significant changes in market share due to many instances of entry and exit. In contrast, cartelization will most likely form in markets with few firms with substantial market share, markets that exhibit high barrier of competitor participation, markets that are stable even at times of economic and/or political crisis and markets that are, across long periods, monopolized by the same participants with constant market share. This approach also involves identifying market attributes generally viewed to be conducive to market collusions such as, an oligopolistic market structure, product homogeneity, and inelastic demand (Harrington, 2004).

The other detection tool is behavioral method, which usually involves the actual observation of communication or meetings of suspected cartel members. The behavioral approach can also take the form of outcomes of cartel behavior (Harrington, 2004). The focus will be on the end result of communication, meetings, illegal agreement, and coordination. This takes the form of market impacts like coordinated price increase and abnormally low production of firms (Harrington, 2004; Abrantes-Metz, 2013; Gomes, 2014). If there are structural breaks in firm behavior, then it follows that there will also be structural breaks in market outcome. However, it should be noted that these breaks are indicative only and does not guarantee that collusion occurred. The major reason is that these structural breaks may also be due to internal factors (e.g. firm efficiency) or external forces (e.g. occurrence of political and economic crisis) (Harrington, 2004). The behavioral approach also entails observations on the manner through which firms communicate or the outcomes of the firms' coordination. In rare occasions, market collusions are known through direct testimonials of individuals who are a party to the coordination or some stumble upon evidence of such collusive coordination. The other approach to detect market collusion is done through observations of firms' output and prices (Harrington, 2004).

The market condition and current policy setting of chicken meat, chicken egg and pork could significantly affect consumers. For instance, high prices offered by producers and market intermediaries would imply reduction of consumer welfare through lower consumption. Since prices are greatly influenced by the degree of competition in the market, increasing market competition through policy

reforms could help lower prices and attract new customers. Thus, market competition aided by policy can help protect the welfare of both consumers and producers. The general objective of this paper was to screen for market collusion in the Philippine chicken meat, chicken egg and pork markets.

RESEARCH METHODOLOGY

In economics, welfare is optimal at the equilibrium point or at the point of intersection between the supply curve and the demand curve. The levels of output and prices beyond the equilibrium point are deemed inefficient and the result is a general economic welfare loss to the society. Addressing market collusion involves three distinct stages: screening, verification and prosecution. Screening identifies which firms exhibit suspicious behavior and may be candidates for further scrutiny by concerned agencies while verification involves singling out competition as an explanation for the observed behavior and provides evidence in support of collusion (Harrington, 2004). The final stage, prosecution, involves offering enough evidence to support the case that the anti-competition law was indeed abused. Due to time and logistical constraints, this study is limited to screening for market collusion or providing an analysis of the likelihood that market collusion is happening.¹

Specifically, market collusion can be detected by observing significant breaks in the prices of industry data (Harrington, 2004; Abrantes-Metz, 2013; Gomes, 2014). For instance, a preceding downward price trend suddenly followed by significant and steady increases in prices could be a sign of market collusion. Changes in the average price, relationship between a firm's price and cost, relationship among firm's prices, as well as the variance of price and market share are some examples of patterns one ought to check for when screening for collusion (Harrington, 2004, Abrantes-Metz, 2013; Gomes, 2014). Moreover, the entry or exit of a significant player can also trigger a break in the price trend. A pattern can also be observed upon a breakdown of the collusive behavior of firms.

These breaks in the pattern of price behavior over time can be detected using segmented regression or piecewise regression models (Pindyck and Rubinfeld, 1981; Gujarati, 1988). Suppose for instance that an entry of a firm in the industry triggers a break in the price trend, then, this change can be captured by a piecewise regression model expressed as:

$$P_i = \beta_0 + \beta_1 T_i + \beta_2 (N_i - N^*) D_i + \varepsilon_i$$

where, P_i is price of the i th observation;

β_0 are the parameter estimates;

T_i is the time trend;

N_i is the number of the i th observation;

N^* is the number at break point; and

$D_i = 0$ if $(T_i - T^*) \leq 0$

$= 1$ if $(T_i - T^*) > 0$

ε_i is the error term

If β_2 is significantly different from zero, then the break in the price trend is significant which implies that the entry or exit, or an event involving major players triggers possible collusive behavior or breaks the collusive behavior.

RESULTS AND DISCUSSION

Among the four commodities included in the study, only chicken egg, chicken meat, and pork were subjected to the piecewise regression analysis as these commodities have major players that

¹ A recent study, for instance, on detecting market collusion was done by Wanhiphang in 2008 for the market of fresh milk in the United Kingdom which surveyed about 14,000 households for three years.

dominate the industry². Monthly price data from January 1990 to December 2017 with a total of 336 data points was used. It was observed from the data that prices for chicken, chicken egg, and pork have been on the rise since 1990. Piecewise regression was used to obtain the difference between two or more different time periods; a method of finding that piecewise continuous function which best describes the data sample³. To do so, the independent variable was partitioned into intervals and a separate line segment was fitted to each interval. This was done in order to control for the unobserved heterogeneity and obtain a more robust estimate of the policy variable.

Since the increase in price may be attributed to several factors such as inflation, ARIMA errors were incorporated in the model to capture the unobserved heterogeneity inherent in time series regression. Based on the Likelihood Ratio (LR) test for no linear trend, the time series for chicken meat and pork retail prices have a linear trend, as it rejects the null hypothesis that no linear trend exists at 1% statistical significance. The LR Test results, Residual Plots, ACF and PACF graphs for chicken meat, chicken egg, and pork can be seen in Annex 3, 4, and 5, respectively. An Engle-Granger test for cointegration for chicken meat and pork was also conducted and, as expected, the price of chicken meat is not cointegrated with the price of pork (Annex 6).

Chicken Meat. The retail price of chicken meat per kilogram has increased from Php 53.07 in 1990, to as high as Php 148.73 in 2017 (Fig.1). While the entire series exhibited an upward trend, there is a distinctive shift in the line at the 156th observation. Scanning the events in the industry during the series, it was established that the 156th observation corresponds to the year 2002, around the time when Bounty Agro Ventures Incorporated (BAVI) operated in full swing its broiler chicken production nationwide.

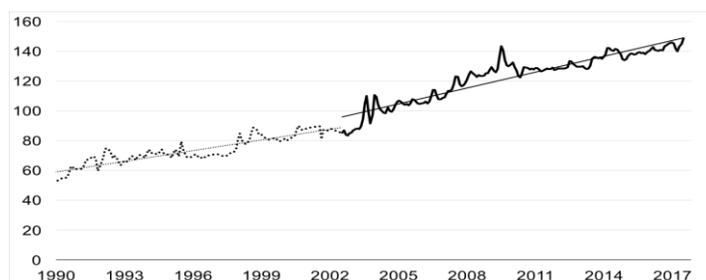


Fig. 1. Chicken meat retail prices from 1990 to 2017 highlighting the effect of the entry of BAVI in 2002

Conceptually, the entry of Bounty Agro Ventures Incorporated would have increased the supply of chicken meat in the country, which by principle would have caused downward pressure on the retail price of chicken meat. Instead, the retail prices of chicken meat, exhibited an exactly opposite pattern. This is an anomalous behavior, which merits further scrutiny in terms of whether or not the new player is in collusion with the other players in the industry. The parameter estimates of the piecewise regression (Table 1) for the trend line showed direct correlation between the retail price of chicken and time, that is from 1990 to 2017, the price has been consistently increasing. Further, the parameter estimate for the break dummy was also established to be positive and significant, which statistically confirms the pattern that the entry of Bounty Agro Ventures Incorporated in the chicken meat production industry shifted the trajectory of the increasing prices, which implies an acceleration of the rate of increase, that is not consistent with the fundamental principles in economics.

² Beef was not included in the analysis as the researchers considered that industry players are primarily backyard and small players. Moreover, the researchers was not able to correlate industry events that may have affected prices in the beef market.

³ McGee, V. E., & Carleton, W. T. (1970). Piecewise Regression. *Journal of the American Statistical Association*, 65(331), 1109. doi:10.2307/2284278

Table 1. Results of the piecewise regression analysis for chicken meat retail prices to highlight the effect of the entry of BAVI and technical smuggling

Model	B	Standard Error	t	Significance
<i>(Unstandardized Coefficients)</i>				
Event 1: Entry of BAVI				
Constant	56.126	0.799	70.212	0.000
Time	0.232	0.008	30.757	0.000
Break_Dummy	0.088	0.012	7.332	0.000
Event 2: Effect of Technical Smuggling				
Constant	51.412	0.691	74.443	0.000
Time	0.29	0.004	65.431	0.000
Smuggling_Break_Dummy	-0.039	0.019	-2.058	0.040

A closer look at the trend of the retail price would reveal that there are actually three segments in the series (Fig. 2). The line showed an acceleration upon the entry of a new player, but in 2010, the rate of increase in the retail prices of chicken decelerated. Annex 1 shows the volume of chicken meat imports and technical smuggling from 1990 to 2016. According to Gordoncillo, et al. (2013), chicken meat is smuggled through misdeclaration of chicken meat into a different and cheaper product). It can be seen from the graph that during the early 1990s, technical smuggling was still minimal ranging from 20 to 350 metric tons but the volume of technically smuggled chicken meat considerably increased starting 1996. In early 2010, the rate of smuggling accelerated and has been increasing towards 2016.

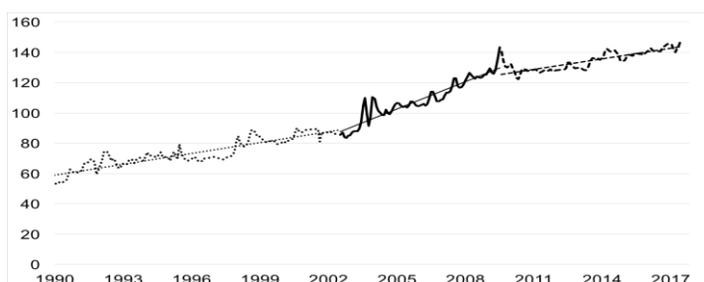


Fig. 2. Chicken meat retail prices from 1990 to 2017 highlighting the effect of the entry of BAVI in 2002, and the effect of smuggling in 2010

The effect of smuggling to the retail price of chicken was also estimated using piecewise regression and the parameter estimates are also shown in Table 1. The negative sign of the parameter estimate indicates that smuggling dampens the retail price of chicken in a statistically significant manner. Figure 2 shows graphically the dampening effect of smuggling to the domestic retail price of chicken.

Chicken Egg. The chicken egg industry is dominated by three major players: Bounty Farms, Universal Robina Corporation, and Venvi Agro-Industrial Ventures Corporation. The older companies like Bounty Farms were established as early as the mid-1950s. For the entire series from 1990 to 2017, the price of chicken egg has been increasing (Fig. 2). In particular, the price per piece of chicken egg has risen from as low as Php 1.77 in 1990 to as high as Php 5.73 in 2017. However, by about 2003, the rate of increase in the prices of chicken egg started to accelerate. This shift in the trend coincided with the entry of Venvi Agro-Industrial Ventures Corporation, which initially started producing about 125,000 eggs per day. Again, the price behavior defies economic logic, because the increase in supply would have exerted downward pressure on the price of chicken egg. Hence, there is reason to look deeper into the relationships of these major players in the chicken egg industry. Table 2 shows the estimated parameters for the piecewise regression intended to isolate the effect of the entry of Venvi Agro-

Industrial Ventures Corporation into the chicken egg industry in 2003. The estimated coefficients, statistically validated the pattern exhibited in the graph that the rate of increase in the prices of chicken egg accelerated after the entry of Venvi Agro-Industrial Ventures Corporation.

Table 2. Results of the piecewise regression analysis for chicken egg retail prices to highlight the effect of the entry of Venvi Agro-Industrial Ventures Corporation

Model	B	Standard Error	t	Significance
<i>(Unstandardized Coefficients)</i>				
Event 1: Entry of Venvi Agro-Industrial Ventures Corporation				
Constant	1.747	0.028	61.616	0.000
Time	0.011	0.000	46.598	0.000
Break_Dummy	0.004	0.000	8.538	0.000

Pork. The retail prices of pork per kilogram showed an increasing trend for the entire series; from as low as Php 52.27 in 1990 to Php 208.50 in 2017 (Fig. 3). However, in about 2001, the rate of increase in prices exhibited an accelerated rate of increase. This noticeable shift coincided with a significant change in the industry, that is, San Miguel Corporations acquired Pure Foods Corporation.

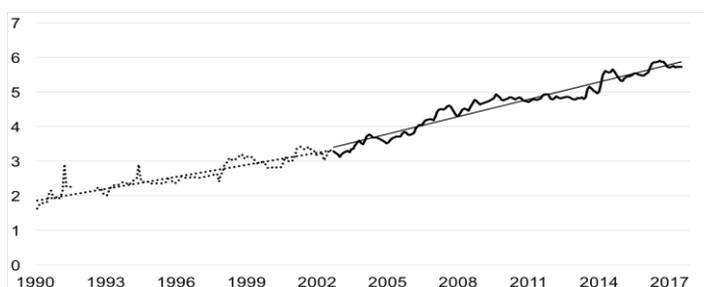


Fig. 3. Chicken egg retail prices from 1990 to 2017 highlighting the effect of the entry of Venvi Agro-Industrial Ventures Corporation

Table 3 shows that the acquisition of Pure Foods Corporation by San Miguel Corporation, shifted the slope of the regression line upwards, which means that the level of rate of increase in prices post acquisition has accelerated. While this significant change may not necessarily be considered collusion, the acquisition of Pure Foods Corporation by San Miguel Corporation increased the latter’s market power. This is also a critical competition issue.

Table 3. Results of the piecewise regression analysis for pork retail prices to highlight the effect of San Miguel Corporation’s acquisition of Pure Foods Corporation and technical smuggling

Model	B	Standard Error	t	Significance
<i>(Unstandardized Coefficients)</i>				
Event 1: San Miguel Corporation's Acquisition of Purefoods Corporation				
Constant	55.101	0.868	63.508	0.000
Time	0.392	0.008	46.355	0.000
Break_Dummy	0.110	0.013	8.497	0.000
Event 2: Effect of Technical Smuggling				
Constant	21.022	3.329	6.315	0.000
Time	0.595	0.015	38.746	0.000
Smuggling_Break_Dummy	-0.277	0.036	-7.782	0.000

While the long term trend for the prices of pork showed an increasing trend, the trend is actually divided into three segments (Fig. 4). The initial increasing trend accelerated around the end of 2001 and started to decelerate towards the early part of 2010.

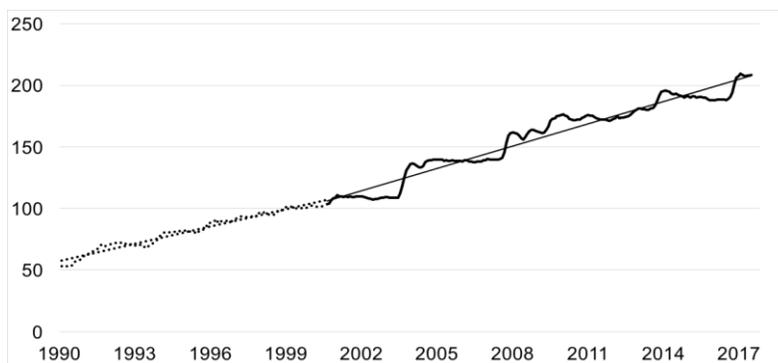


Fig. 4. Pork retail prices from 1990 to 2017 highlighting the effect of San Miguel Corporation’s acquisition of the Pure Foods Corporation

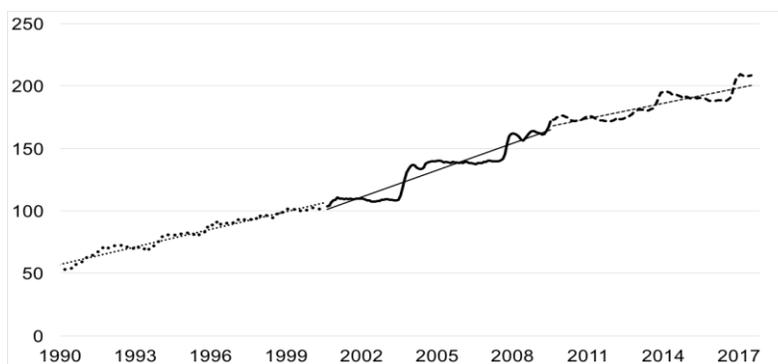


Fig. 5. Pork retail prices from 1990 to 2017 highlighting the effect of San Miguel Corporation’s acquisition of the Pure Foods Corporation and the effect of smuggling

Like chicken meat, pork is also one of the commodities that are being smuggled into the country (Annex 2). Specifically, there was a considerable increase in the volume of pork being smuggled into the country since 2010. While there were fluctuations after 2010, the graph generally shows a rising trend. Moreover, Table 3 shows that the extent of technical smuggling has dampened the domestic prices of pork. This can be validated by the negative sign of the parameter estimate for the dummy differentiating the period when smuggling has become rampant.

CONCLUSIONS AND RECOMMENDATIONS

The variations in the firm and industry level prices showed discernable patterns of associated behavior. The analysis of the industry level prices showed statistically significant shifts corresponding to critical events like entry, exit and mergers within the industry, as well as the acceleration of technical smuggling in the country.

Based on the results of the analysis, the entry of a new player in the industry may have accelerated the rate of increase in prices. However, this behavior refutes economic logic since the increase in supply is expected to exert downward pressure on the prices. Hence, concerned agencies

such as the PCC, the Department of Agriculture – Bureau of Animal Industry, and the Department of Trade Industry may have a reason to look deeper into the relationships of these major players in the chicken egg industry. Mergers are issues that affect competition. One of the results of the regression analysis showed that mergers may have caused an acceleration in the increasing trend of prices. Hence, mergers have to be critically assessed in terms of its potential impact on prices to prevent unnecessarily giving a firm increased monopoly power to control prices.

Smuggling dampens the domestic prices. While these may seem beneficial to consumers, this issue has to be looked at in terms of food safety. Moreover, on the production side, the effect on competition is at the small-scale and backyard producers' level. Prices depressed by smuggling will erode the competitive edge of small-scale and backyard producers. Therefore, the PCC should argue for the merit of anti-smuggling from a competition perspective.

ACKNOWLEDGMENT

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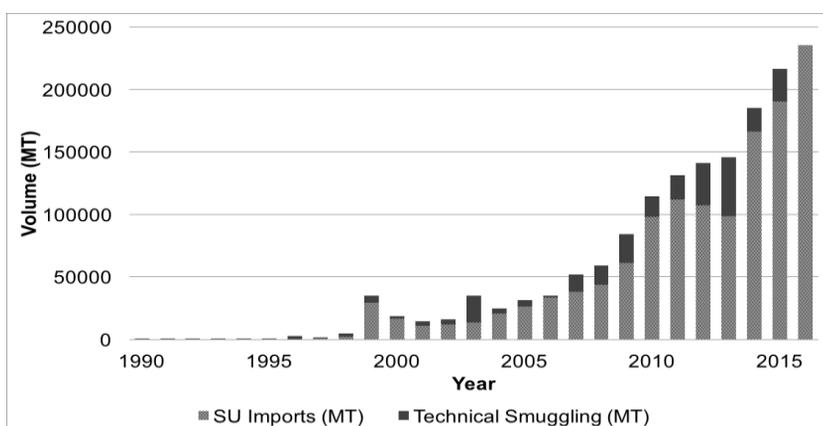
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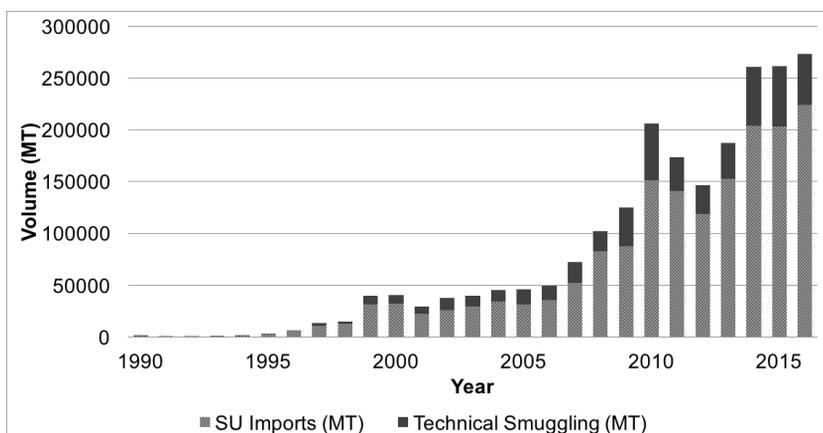
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ANNEXES

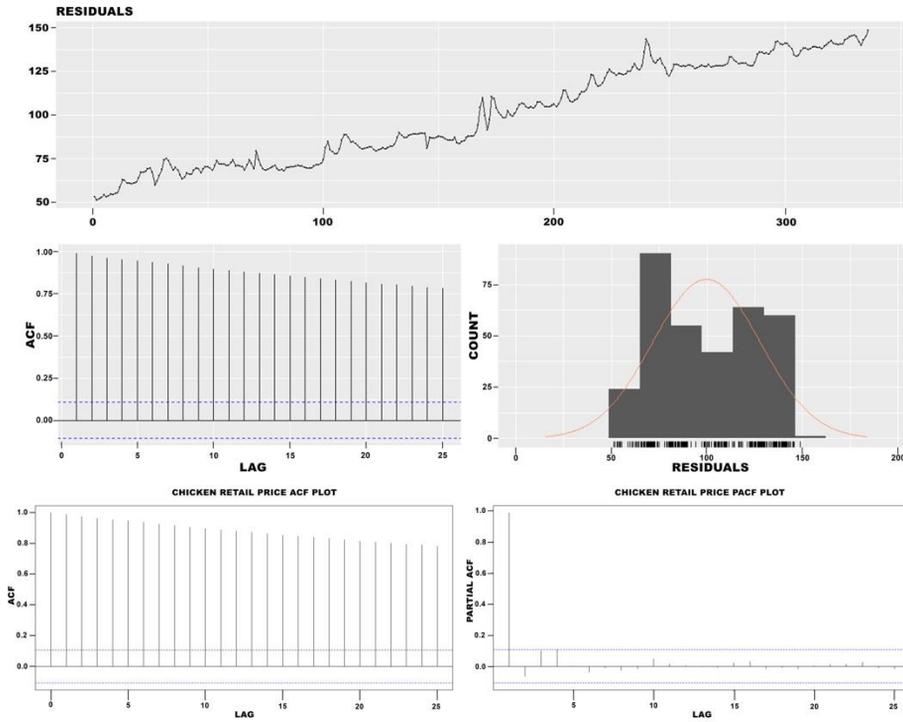
Annex 1. Volume of Chicken Meat Imports and Technical Smuggling from 1990-2016



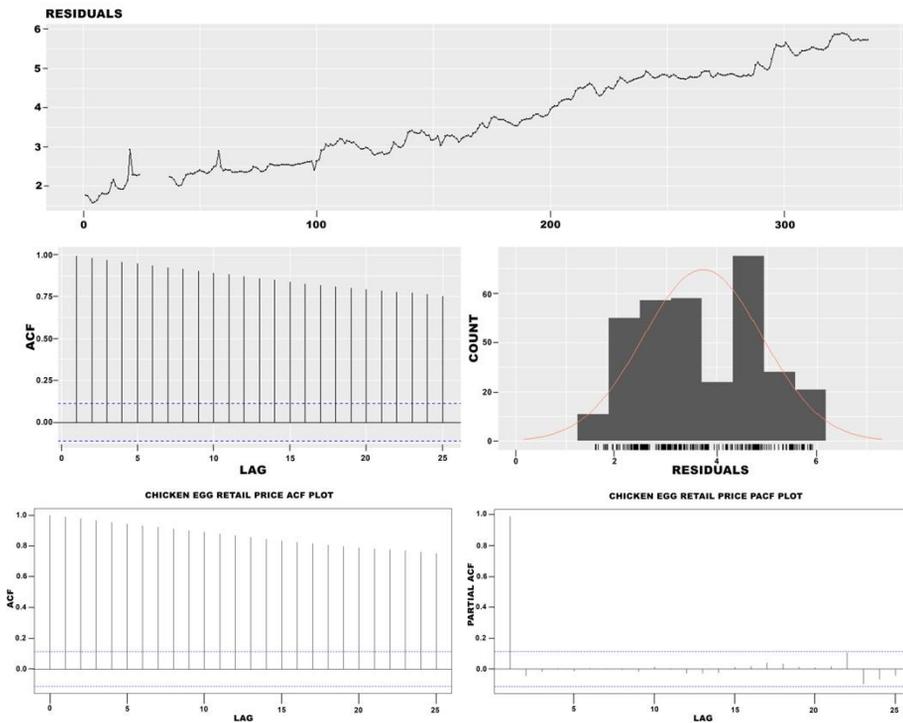
Annex 2. Volume of Pork Imports and Technical Smuggling from 1990-2016



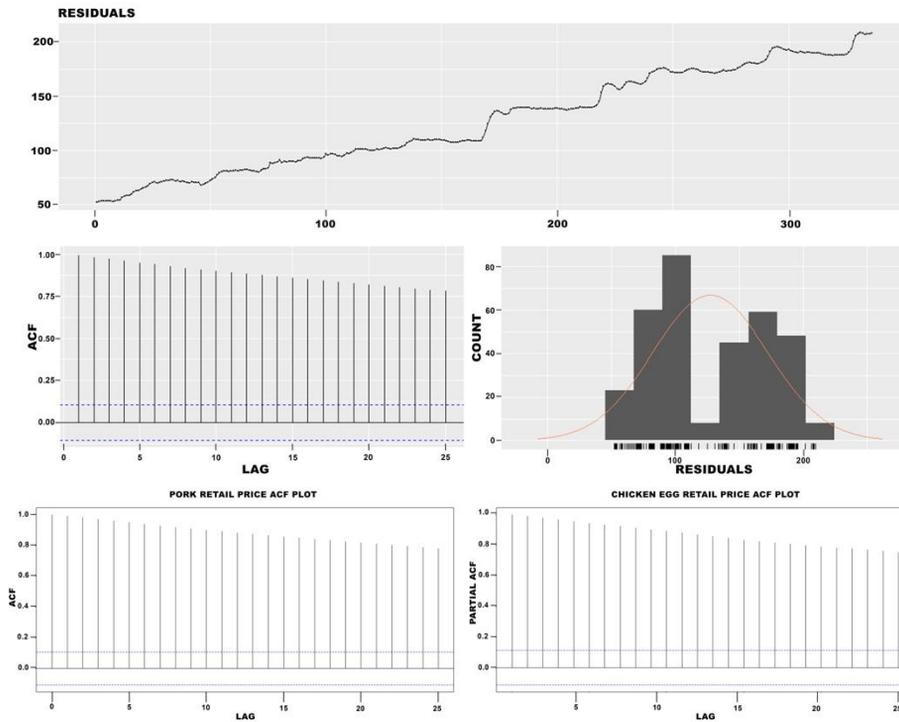
Annex 3. LR Test, Residual Plots, ACF and PACF Graphs for Chicken Meat



Annex 4. LR Test, Residual Plots, ACF and PACF Graphs for Chicken Egg

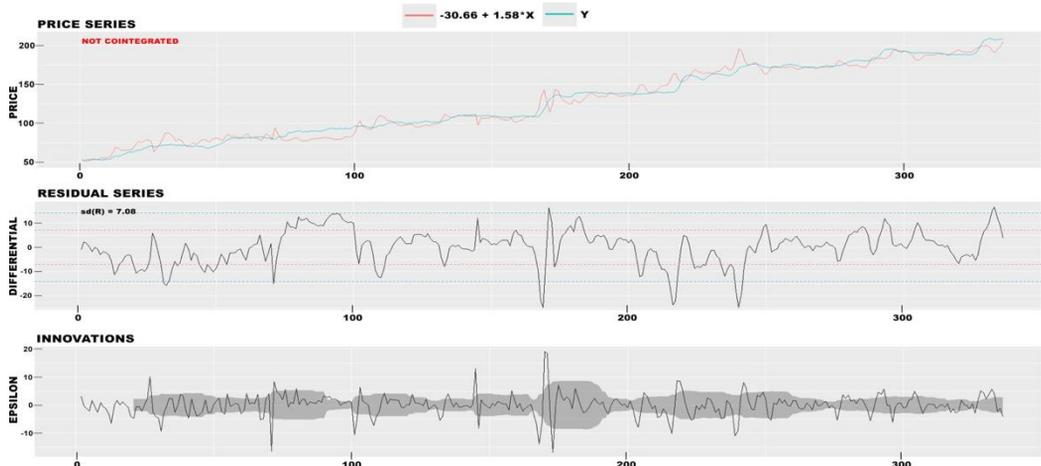


Annex 5. LR Test, Residual Plots, ACF and PACF Graphs for Pork

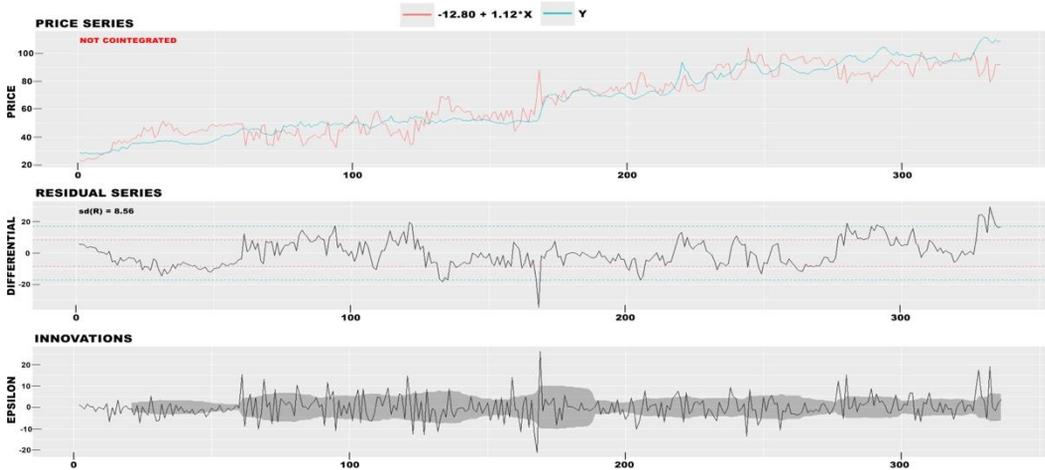


Annex 6. Testing for Cointegration between Chicken Meat and Pork Retail and Farmgate Prices

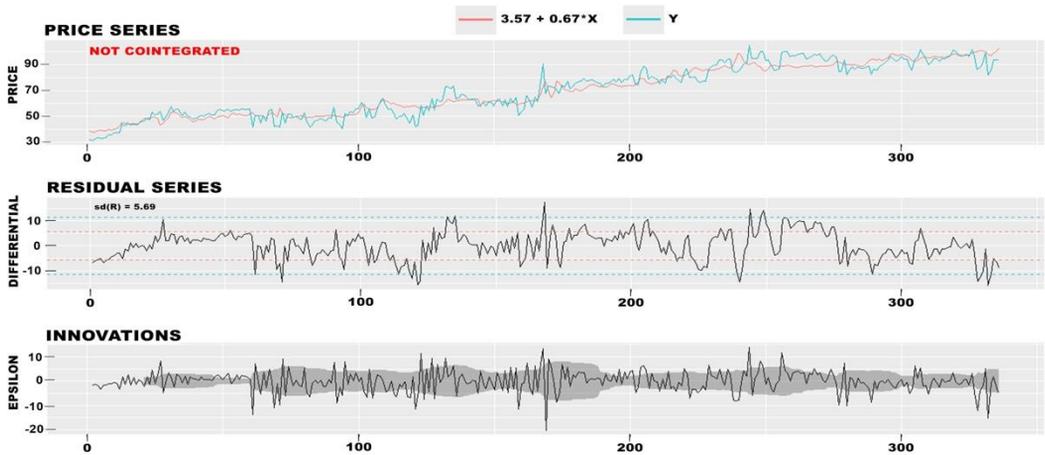
Engle Granger Cointegration test was used to determine whether two series are cointegrated with each other. The following graphs show that retail chicken meat and pork, wholesale chicken meat and pork, retail and wholesale chicken meat, as well as retail and wholesale pork, are not cointegrated. As expected, this could indicate that both products belong to different product markets altogether.



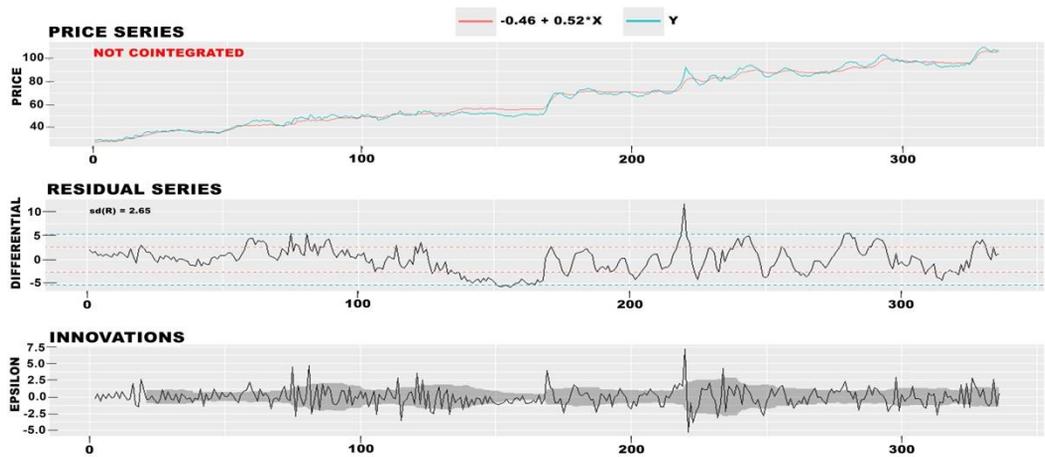
Engle Granger Cointegration Test for Retail Chicken Meat and Pork Prices



Engle Granger Cointegration Test for Wholesale Chicken Meat and Pork Prices



Engle Granger Cointegration Test for Retail and Wholesale Chicken Meat Prices



Engle Granger Cointegration Test for Retail and Wholesale Pork Prices