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Measuring the Intensity of Competition among Rice Exporters to Saudi Arabia

Yosef Alamri
Ph.D. student
Department of Agricultural Economics
University of Kentucky

And

Sayed Saghaian
Associate Professor
Department of Agricultural Economics
University of Kentucky

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Measuring the Intensity of Competition among Rice Exporters to Saudi Arabia

Abstract

The objective of this research is to estimate the residual demand elasticity that rice exporters face in Saudi Arabia. We conducted an empirical exercise to assess the intensity of competition in Saudi Arabian rice import market during the 1993-2014 period. A model using the inverse residual demand method was specified and estimated. Estimation results show that Australia, India and Pakistan, acting as exporters, exercise market power and maintain marketing margins throughout the study period.

Keywords: inverse demand, residual demand, Saudi Arabia, imperfect competition, rice

Measuring the Intensity of Competition Among Rice Exporters to Saudi Arabia

Introduction

Rice is one of the main crops in the world, it is estimated that more than 470 million tons of rice was consumed in 2015, where it ranked third in importance regarding area planted and production after wheat and corn crops (USDA DATA, 2016). The most important countries of the world in rice production are China, India, and Indonesia, as they accounted for 59% of the global rice production in 2013. The global rice production was increased by 108% during the period 2009-2013, from 686.9 million tons to 740.96 million tons (FAO, 2016).

The world rice export is concentrated within five exporting countries which are namely, India, Thailand, Vietnam, Pakistan and the United States, accounting for 70% of the world's rice exportation in 2013. During the period of 2009-2013, the global rice exports increased 123% from 30.2 million tons to 37.1 million tons (FAO, 2016). Moreover, the global rice import also increased 129% from 29.3 million tons in 2009 to 37.8 Million tons in 2013.

Saudi Arabia was the seventh main destination of rice imports in the world (3%) and accounted for 1.26 million tons in 2013 (FAO, 2016). Rice cultivation is unsuitable in Saudi Arabia because of the climate and this has necessitated the import of all of its rice from abroad. The quantity of imports accounted for 4% of the world total imports (1.6 million tons) in 2015 (USDA DATA, 2016). For the period from 2009-2013, Saudi Arabia ranked fourth among the global rice importers (4%), and was also ranked second for the value of the world rice imports (5%). This demonstrates the high-quality rice required for consumption in Saudi Arabia, where it ranked the second highest rice- price imports for the same period compared to other countries in the world.

Rice is staple food in Saudi Arabia. From the data, it is shown that rice consumption quantity is one of the highest compared to other crops. It accounted for 1.6 million tons (8%) of the total

crop consumption in Saudi Arabia in 2015 (USDA DATA, 2016). In the Saudi market, the aromatic thin, long-grained product, which is known as Basmati, is the most popular rice variety. The American long parboiled grain rice imported from the U.S. and medium grain Calrose rice imported from the U.S. and Australia come in second and third, respectively (USDA, FAS 2015). The objective of this study is to analyze the intensity of competition among the main rice exporting countries to Saudi Arabia.

The Saudi Arabian Rice Market

In 2014, the total rice consumption in Saudi Arabia reached 45kg per capita. On average, each Saudi consumed 12 kg more compared to 1995 (USDA and World Bank). The trend of quantity and value of rice imports into Saudi Arabia during the period 1993-2014 is shown in Table 1. This table shows the amount of rice volume imports is, on average, around 952.47 thousand tons, and ranges between a minimum of 433.6 thousand tons in 1994 to a maximum of 1428.5 thousand tons in 2014, and has an annual growth rate of 1.0%. The volume of rice imports increased annually by an estimated 41.41 thousand tons (table 2 and figure 1). Table 1 also shows the value of imported rice to be, on an average, around 2752.18 million Saudi Riyals and it ranged between a minimum of 856.1 million Saudi Riyals in 1994 to a maximum of 6635.1 million Saudi Riyals in 2014, having an annual growth rate of 1.086%. The volume of rice imports increased annually by an estimated of 235.25 million Saudi Riyals (table 2 and figure 1).

The price of rice increased fluctuated during the study period, on an average of around 2664.15 Saudi Riyals/ton and ranged between a minimum of 1794.65 Saudi Riyals/ton in 2001 to a maximum of 4644.80 Saudi Riyals/ton in 2014, which translates into an annual growth rate of 1.039%. The price of rice import is also increased annually by an estimated 115.69 Saudi Riyals/ton (Table 2) (Figure 1)

Table 1: Rice imports in Saudi Arabia during the period (1993 -2014)

Years	Quantity 1000 Ton	Value Million Saudi Riyals	Price Saudi Riyals/Ton
1993	576.6	1161.7	2014.74
1994	433.6	856.1	1974.40
1995	522.9	1040.6	1990.06
1996	721.3	1361.6	1887.70
1997	705.5	1621.9	2298.94
1998	783.2	1882.5	2403.60
1999	787.4	1817.2	2307.85
2000	936.6	1852.8	1978.22
2001	765	1372.9	1794.64
2002	669.4	1213.9	1813.41
2003	844.6	1652.7	1956.78
2004	1148.4	2201.1	1916.67
2005	1106.4	2175.4	1966.194
2006	968.2	1985.4	2050.61
2007	986.7	2346.4	2378.03
2008	1301.6	5772.2	4434.696
2009	1346.4	5195.6	3858.88
2010	1302.3	4914.3	3773.55
2011	1122.6	4217.6	3756.99
2012	1225	4066.1	3319.27
2013	1272.2	5204.8	4091.18
2014	1428.5	6635.1	4644.80
Average	952.47	2752.18	2664.15
Annual growth rate	1.043	1.086	1.039
Annual change rate	4%	9%	4%

Source: Central Department of Statistics & information (CDSI). Ministry of Economy and Planning Annual Statistics Book. Saudi Arabia

Figure 1: Trend of rice quantity, value, and price imported in Saudi Arabia during the period 1993-2014

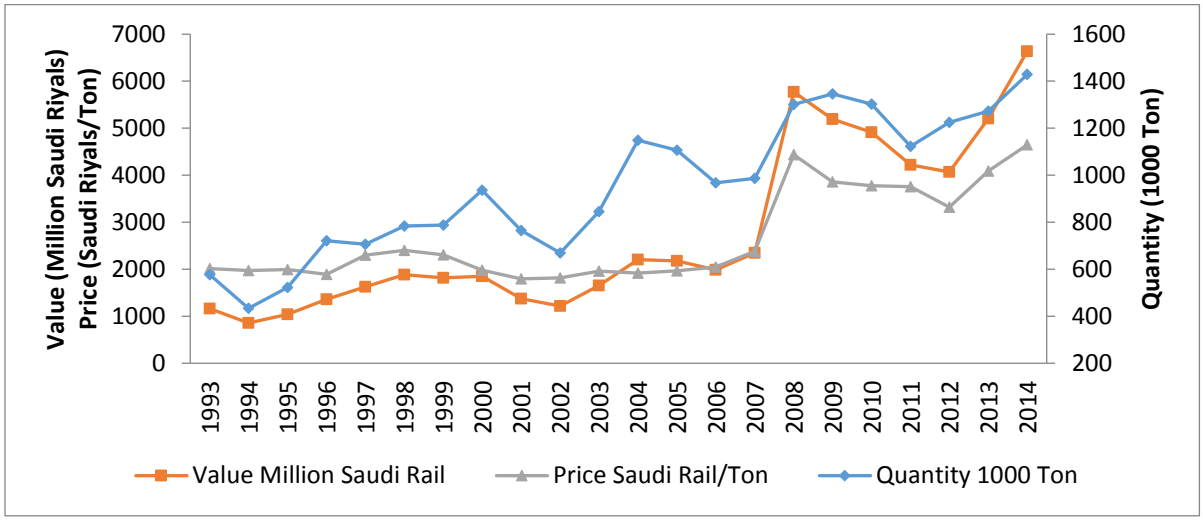


Table 2: Trend for rice imports in Saudi Arabia during the period (1993 -2014)

Model	R^2	F
Quantity = -82017.3 + 41.41 Time (-10.51)** (10.63)**	0.85	112.95
Value = -468575 + 235.25 Time (-7.48)** (7.53)**	0.74	56.67
Price = -229138 + 115.69 Time (-5.46)** (5.53)**	0.60	30.55

Source: collected and calculated from table (A)
The number in Brackets represents t-test, ** Statistically significant at the 0.05 level.

Rice Varieties:

Three main groups of preferred rice varieties in Saudi Arabia are as follows: (Consulate General of Pakistan, 2013) (USDA, FAS 2015) (CDSI, 2016) (GASTAT, 2015) (Ismaiel and Al-rwis, 2009)

1. Basmati rice: Aromatic thin, long-grained product. It is imported from Pakistan, Bangladesh, and India.

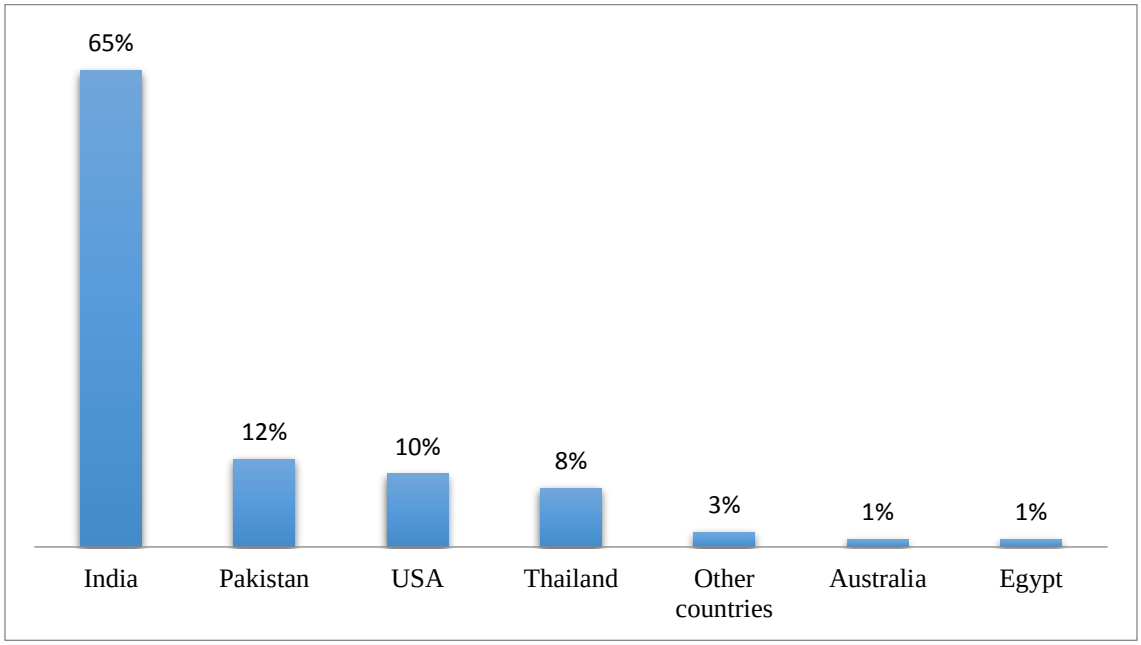
2. Parboiled rice: American long-grain rice is supplied mainly by the United States. A part of this variety of rice is also imported from Pakistan, India, Thailand, Australia, and Canada.
3. Round grain rice: Medium to short-grain varieties, including, Thai rice and Egyptian rice imported from Pakistan, India, Thailand, Egypt, and Australia. Calrose rice was initially imported from the United States and recently from Australia.

In 2003, the Saudi Central Department of Statistics & information changed the old classification of rice, to the new classifications, which are as follows:

1. Rice in the husk (paddy or rough).
2. Husked (brown) rice.
3. Simi-milled or wholly milled rice whether polished or glazed.
4. Broken Rice.

In this paper, we use this new classification. Also, we choose six largest rice exporting countries to Saudi Arabia during the period spanning from 2010 to 2013. They are namely India, as 66% of all rice imported by Saudi Arabia is from India, Pakistan is (12%), the USA (10%), Thailand (9%), Egypt (1%) and Australia (1%). We have deliberately omitted Egypt from our model because of lack of data on Egypt during the study period. (Figure 2)

Figure 2: Saudi Arabia rice import during the average period 2010-2013, in percentage



The Current Situation of Foreign Trade of Saudi Arabia Rice Market

From table (3), the amount of Saudi Arabia's rice imports of Indian, American, Pakistan, Thailand, and Australian rice which was characterized by fluctuation and relative instability trend increased during the period (1993 -2014). The average rice imports reached 625.9, 108.1, 104.5, 78.7, and 18.3 thousand tons respectively, and this accounted for about 64.4%, 12.5%, 10.9%, 8.4%, 2.2% of the total rice imports to Saudi Arabia and the growth rate reached 1.54%, 1.1%, 1.2%, 1%, and 1% respectively.

Table (3) shows that the value of Saudi imports of Indian, American, Pakistan, Thailand, and Australian rice was also characterized by fluctuation and relative instability also during the period from (1993 -2014). The average value of rice imports from India, America, Pakistan, Thailand, and Australia was 1750.5, 293.6, 252.6, 169.4, and 46.7 million Saudi Riyals respectively. Also, it accounted for about 68.6%, 12.6%, 9.2%, 6%, and 2.3% of the average value of rice imports to Saudi Arabia and a growth rate of 1.75%, 1.40%, 1.44%, 1.35%, and 1.29% respectively.

Table (3) shows that the price of Indian rice exported to Saudi market rose from 2454.7 Saudi Riyals per ton in 1993 to around 5301.7 Saudi Riyals per ton in 2014, and we also find that the price jumped during the period from 2007 -2008 to around 6824 Saudi Riyals per ton. The price of the American rice exported to Saudi market also rose from 1916.12 Saudi Riyals per ton in 1993 to around 3753.87 Saudi Riyals per ton in 2014. Moreover, the price of Pakistani rice exported to Saudi market increased from 1624.67 Saudi Riyals per ton in 1993 to around 3505 Saudi Riyals per ton in 2014. Also, shown is the price of Thai rice exported to Saudi market, which rose from 1266 Riyals per ton in 1993 to around 3084 Saudi Riyals per ton in 2014. Australian rice export to the Saudi market had increased from 1866 Saudi Riyals per ton in 1993 to around 4566 Saudi Riyals per ton in 2014.

In 2014, the Saudi Arabia's imports quantity of rice had India with the greater share, as it reached 73.55% of the total amount of rice imports to Saudi Arabia, which translated to the total imports of Indian rice at about 1050.61 thousand tons. Pakistani rice is ranked second with 10.62% of the amount of the total rice imports, which is 151.91 thousand tons. The USA comes is third with 7.32% of the total amount of the rice imports, counting about 104.61 thousand tons. Thailand is on the fourth place of the of rice imports volume to Saudi Arabia with 5.3%, which translates to about 75.7 thousand tons, and Australia, Vietnam, and Brazil are represented with the rates of 1.73%, 0.58%, 0.51%, respectively. (GASTAT,2016)

During 2014, most of the import value of Saudi Arabia went to India, the largest exporter to Saudi Arabia, which accounts for about 79.9% of the total rice imports' value to Saudi Arabia, where imports amounted to the Indian rice at about 5301.7 million Saudi Riyals. Pakistani rice comes in the second rank with 8.02% of the total value of rice imports, counting about 531.91 million Saudi Riyals, the United States is third, and it represents about 5.92% of the total rice

imports, which is 392.69 million Saudi Riyals. Thailand is fourth with 3.52%, and this is about 233.45 million Saudi Riyals, with Australia, Vietnam, and Brazil being represented with 1.70%, 0.3%, 0.27%, respectively.

Evolution of Quantity and Value of Saudi Arabia Rice Imports:

The study of quantity and value of Saudi Arabia rice imports is shown in the table (4). In the said table it is shown that the indices of Saudi rice import quantity as an average period (2009 - 2013) ranged between a minimum of 1109.45 thousand tons in 2011, and a maximum of 1313.15 thousand tons in 2009, with an average period estimated at 1237.15 thousand tons.

The value of Saudi rice imports has ranged between a minimum of $1084.3 million in 2012, and a maximum of about $1384.5 million in 2013 with the average period estimated at $1257.319 million. This represents about 7% of the total value of agricultural imports over the average for the period studied.

The Geographical Distribution of Saudi Arabia Rice Imports:

It estimated that 18 countries competes for the export of rice on the world market to the Saudi Arabia market. Table (5) shows the geographical distribution of the quantity and value of Saudi Arabia imports of rice during the period (2009 - 2013), shows that the India is ranked rank in terms of the export rice to Saudi Arabia. India exports about 805.9 thousand tons to Saudi Arabia on the average in the years that spanned from 2009-2013, where about 65% of the total quantity of rice imports over the average for the period studied while the value of imports was about $888.7 million by 71% at an average price of $1102.8 /ton. Pakistan is placed second, with an average quantity of export rice to Saudi Arabia which was about 155.98 thousand tons, thereby making up an estimated 13% of the total average of the period studied. However, the average value of rice export from Pakistan was about 123.2 million dollars at a rate of about 10% of the total value of imports

from Saudi Arabia at an average price of $789.7 / ton. This said aforementioned countries are followed by Thailand, USA, Australia and Egypt at 10%, 9%, 1%, and 1% respectively. These countries absorb about 99.95% of the quantity of Saudi Arabia rice import.

There is a difference in the average import price of rice between these countries, with the minimum rate estimated at $767.65/tons for Thailand, and the maximum rate estimated at $1985.4/tons for India.

The results from the table (6) show an overall upward trend of 30.19, 8.17, and 6.68 thousand tons per year for India, Pakistan, and Thailand, respectively during the period (2009 - 2013). The study demonstrates an increase in the annual rate of change for Saudi Arabia import of rice in India, Pakistan, and Thailand by 3.9%, 6.4%, and 7.1 respectively.

Table 3: Saudi Arabia imports of rice from the main countries during 1993-2014

Year	India			USA			Pakistan			Thailand			Australia		
	Quantity 1000 Tons	Value Mllion Saudi Riyals	Price Saudi Riyals/Tons	Quantity 1000 Tons	Value Mllion Saudi Riyals	Price Saudi Riyals/Tons	Quantity 1000 Tons	Value Mllion Saudi Riyals	Price Saudi Riyals/Tons	Quantity 1000 Tons	Value Mllion Saudi Riyals	Price Saudi Riyals/Tons	Quantity 1000 Tons	Value Mllion Saudi Riyals	Price Saudi Riyals/Tons
1993	267.61	656.9	2454.714	86.79	166.3	1916.12	129.79	210.87	1624.67	71.06	90.03	1266.95	17.28	32.24	1866.31
1994	250.52	526.85	2103.054	64.63	136.77	2116.17	46.45	81.4	1752.54	50.74	69.91	1377.8	19.88	38.47	1934.77
1995	243.95	542.18	2222.518	158.89	303.26	1908.61	46.85	81.65	1742.71	51.18	70.68	1380.85	17.12	33.81	1975.13
1996	403.42	769.89	1908.412	138.07	277.9	2012.69	82.76	147.35	1780.38	76.5	125.24	1637.18	15.53	32.68	2105.18
1997	417.81	1,011.73	2421.503	152.01	367.95	2420.56	60.78	113.04	1860.02	56.69	92.4	1629.86	15.42	31.75	2058.92
1998	531.35	1,362.04	2563.351	120.78	278.84	2308.7	51.48	112.42	2183.53	53.25	78.99	1483.35	21.97	42.83	1949.29
1999	515.62	1,256.20	2436.274	96.25	242.05	2514.93	88.39	178.5	2019.45	65.6	93.26	1421.62	19.32	38.62	1999.37
2000	619.19	1,249.57	2018.057	128.65	281.7	2189.69	94.46	168.9	1788.07	57.38	77.63	1352.87	31.53	65.13	2065.35
2001	475.61	896.81	1885.596	110.47	213.79	1935.21	79.82	121.69	1524.43	61.96	73.98	1193.99	27.04	53.96	1995.35
2002	464.31	891.65	1920.395	58.82	95.26	1619.41	54.94	96.24	1751.7	50.38	56.53	1122.06	23.4	45.67	1951.57
2003	586.22	1,230.77	2099.485	76.28	113.21	1484.02	77.72	142.19	1829.54	50.29	66.16	1315.6	24.75	49.15	1985.97
2004	856.77	1,659.36	1936.758	82.37	166.41	2020.17	86.05	164.58	1912.58	68.71	108.92	1585.24	21.74	46.7	2147.94
2005	761.93	1,585.27	2080.599	88.13	186.89	2120.55	144.84	194.53	1343.04	51.73	84.38	1631.28	16.27	35.72	2195.55
2006	712.79	1,487.75	2087.222	76.92	179.43	2332.78	91.41	165.76	1813.39	47.26	81.44	1723.43	14.4	31.69	2200.89
2007	667.21	1,620.51	2428.79	105.37	293.32	2783.78	77.28	174.58	2258.87	82.85	155.95	1882.34	20.86	48.04	2303.38
2008	863.85	4,229.92	4896.599	136.26	524.96	3852.73	144.69	559.43	3866.38	131.99	399.19	3024.26	2.49	8.46	3403.44
2009	812.8	3,512.23	4321.149	111.77	497.33	4449.63	174.78	521.61	2984.46	203.16	522.97	2574.2	0.72	1.74	2405.46
2010	832.03	3,555.52	4273.281	106.63	396.29	3716.42	202.29	532.31	2631.46	142.61	376.23	2638.24	0.48	1.9	3968.3
2011	717.82	2,942.16	4098.747	125.97	458.46	3639.28	131.58	392.96	2986.47	127.58	350.03	2743.6	14.65	58.98	4025.36
2012	854.12	2,856.16	3343.987	122.39	422.74	3454.22	128.38	379.32	2954.58	77.79	258.79	3326.99	29.84	115.69	3876.91
2013	863.63	3,810.51	4412.202	126.63	463.65	3661.5	152.26	485.99	3191.86	77.74	261.02	3357.74	23.71	101.22	4269.59
2014	1,050.61	5,301.70	5046.299	104.61	392.69	3753.87	151.75	531.91	3505.05	75.7	233.45	3083.72	24.7	112.77	4566.37
Average	625.87	1952.53	2861.7	108.12	293.6	2645.96	104.49	252.6	2241.14	78.73	169.42	1943.33	18.32	46.69	2602.29
Annual Growth	1.54	1.75	--	1.14	1.4	--	1.16	1.44	--	1.01	1.35	--	1.05	1.29	--

Source: General Authority for Statistics, Minister of Economy and Planning, Saudi Arabia

Table 4: Evolution of quantity and value of Saudi Arabia rice imports, during the period (2009-2013)

years	Imports quantity in thousand tons	value of imports in million $	value of Saudi agricultural imports in million $	% Of the total value of Saudi agricultural imports
2009	1313.149	1379.647	11374.45	12%
2010	1281.024	1310.491	16474.07	8%
2011	1109.447	1124.707	19553.53	6%
2012	1216.801	1084.297	21002.81	5%
2013	1265.557	1387.453	23333.33	6%
Average	1237.196	1257.319	18347.64	7%

Source: compiled and calculated by http://faostat3.fao.org/download/T/TP/E

Table 5: Geographical distribution of imports of rice, the most important import markets during the period (2009 - 2013)

Row Labels	Import quantity in Ton	Relative important %	Import Value ($ 1000US)	Relative important %	import price $/ ton
India	805,866.4	65%	888,710.8	71%	1102.8
Pakistan	155,982	13%	123,178.2	10%	789.7
Thailand	122,574.8	10%	94094.8	7%	767.65
USA	117,230	9%	118,729.6	9%	1012.79
Australia	17169.25	1%	18518.5	1%	1078.59
Egypt	16310.5	1%	14139.25	1%	866.88
Total import	1,237,196	--	1,257,319	--	1016.27

Source: compiled and calculated by:
FAO website: http://faostat3.fao.org/download/T/TP/E
UKComtrade Website: http://comtrade.un.org/data/

Table 6: General trend equations for the quantity of Saudi Rice import came from India, Pakistan, and Thailand in period 2000-2013

Country	Equation	Average 1000ton	Annual Rate of change	R2	F
India	$India = -59787.8 + 30.19T$ (-4.38) (4.44)	778.67	0.039	0.62	19.72
Pakistan	$Pakistan = -16269.4 + 8.17T$ (-3.38) (3.41)	127.75	0.064	0.49	11.62
Thailand	$Thailand = -13314.1 + 6.68T$ (-2.298) (2.31)	94.27	0.071	0.31	3.35

t-statistics are in parentheses * significant at 5% level
Annual Rate of change = the T coefficient divided by the average

Literature review:

(Ismail and Alzaaaki, 1991) Showed that rice imports function had characterized the demand based on the importing framework in the Kingdom of Saudi Arabia. It demonstrated that the real national income in the Kingdom increasing with about 17 billion riyals in 1391 to 305 billion riyals in 1406 was a significant impact on the rise of importing lots of food commodities and their rice. The study concluded that the changes in the real price of imported rice, the real national income, and population explained in all, 86% of the variations of annual rice imports in the Kingdom. Also, the price elasticity of demand and income on rice imports amounted to 0.35 and 0.49, respectively.

Al-Rwis (2004) studied and analyzed the pattern of rice import in the Kingdom of Saudi Arabia during the period from 1992-1998. The results explained that the demand for rice imports from India reached price elasticity, and it represents a necessary commodity. Also, the study shows there was a competitive relationship between the rice imports from India and the rice imported from the US, while price trends and imports trends of rice have similarities from Pakistan and Thailand.

Baazeem (2007) studied the market power among rice exporters to the Kingdom of Saudi Arabia. He found that rice imports were concentrated in six rice exporting countries, which are namely, India, Pakistan, USA, Thailand, Australia and Egypt. Also, rice varieties imports are concentrated in Basmati, American, and Egyptian. The results of the residual, demand models for rice exporters to the Kingdom of Saudi Arabia indicate that both India and Pakistan enjoy market power in Saudi rice importing market. The residual inverse demand elasticities for both countries was estimated and amounted to 0.13 and was statistically significant at 0.05 level

Ismaiel and Al-Rwis (2009) estimated the inverse residual demand for rice exporters to Saudi Arabia to analyze the market power. The results showed that both India and Pakistan enjoy market power in the export of rice to the Saudi Arabia because these countries concentrate in the export of Basmati rice class to the Kingdom of Saudi Arabia. While there was a decline in the market power of both Egypt, Australia as an exporter to Egyptian rice class, and the decline of the United States market power as an exporter to American rice class.

Through previous studies, there were no studies using market power in Saudi Arabia through the new classification, and therefore, this study will be based on the use of the inverse residual demand to demonstrate the impact strength of rice exporting countries.

Research Method:

Market Power and Measurable Standards

The study adopted in achieving its objectives on both descriptive and quantitative analysis through the following methods

1)Time trend models of Saudi Arabia's rice import from the world market.

2)Market share is a competitive indicator since the height of expressing increasing foreign sales volume of the country of the commodity into consideration and thus higher competitive position of that country and market share index showed on the proportion of the exporter countries of particular goods to total imports that market of that commodity.

It calculated by the following equation:

$$MSH_{ji} = \left(\frac{EX_{jci}}{IM_{ci}}\right)$$

Where: MSH_{ji}: market share of the country j of commodity i in a particular market

EX_{jci}: An exporter country's j to the country c of commodity i

IM_{ci}: A total imports Country c of commodity i

j represents the competitive countries such as Australia, Egypt, India, Pakistan, Thailand, and the USA.

i represent Rice and c represent Saudi Arabia

3)Market penetration rate: is the most general competitive measurement standards rate and can be defined as a ratio between imports of a particular country of any commodity from the other country and apparent consumption of that commodity rate, and market penetration coefficient measured as the following equation:

$$MPr_{ij} = \frac{EX_{ij}}{Pr_{ci} + IM_{ci} + EX_{ci}}$$

Where:

MPr_{ij}= penetration rate of the most important markets of the commodity i

EX_{ij}= Exporter country export of the commodity i

Pr_{ci}= importer country production of the commodity i

IM_{ci}= importer country imports of the commodity i

EX_{ci}= importer country export of the commodity i

Conceptual Framework

Many of study measure the market power in different countries in both the domestic and global markets as shown in the table (7).

Table 7: literature review focus on the inverse residual demand

Author name	Market	Import country	Export country	Data	Methods	Mark-up result
Evans & Ballen 2015	Green Skin Avocado	USA	Dominican Republic	Monthly Jan 2004 - Dec 2013	IVGMM Instrumental Variable Generalized Method of Moments	–0.245
Pall et al.J 2014	Wheat	Albania Azerbaijan Egypt Georgia Greece Lebanon Mongolia Syria	Russia	Quarterly 2002-2009	IVPLM Instrumental Variable Poisson Pseudo Maximum-Likelihood Estimator	-0.09 -0.17 -0.005 -0.07 -0.05 -0.06 -0.25 -0.05
Tasdogan et al. 2005	Olive Oil	EU	Greece Italy Spain	Annually 1970-2001	2SLS Two-Stage Least Square	-0.079 -0.36 -0.157
Reed and Saghaian 2004	Beef segmented by (chuck, loin, and ribs), and each cut is separately analyzed on a chilled and frozen basis	Japan	Australia Canada New Zealand USA	Monthly Feb 2002-Aug 2000	2SLS	The highest belongs to U.S. frozen ribs. Canada has limited market power. Australia and New Zealand enjoy some market power, including five chilled beef categories.
Goldberg and Knetter 1999	Beer	USA Canada France UK	Germany	Annually 1975-1993	3SLS	-0.065 -0.14 -0.44 -0.21
Baker and Bresnahan 1988	Beer	France Domestic- three firms: 1. Anheuser-Busch 2. Pabst 3. Coors		Annually 1962-1982	3SLS	-0.31 -0.06 -0.31

The lack of data in the international market to have marginal coast available because of the imperfect competitive market, the extent of competition which expressed as the relative markup of price over marginal cost (Lerner index).

For the purpose of maximizing profit, marginal revenue MR equal to marginal costs MC (MR = MC)

It is known that

$$MR = P(1 + \frac{1}{E})$$

Thus, the Lerner index as follows (Lerner, 1934):

$$\frac{P - MR}{P} = \frac{P - P\left(1 + \frac{1}{E}\right)}{P} = 1 - \left(1 + \frac{1}{E}\right) = -\frac{1}{E}$$

Where P is, the price and E is price elasticity.

The result from Lerner index will be:

1. In the case of perfect competition, Lerner index equal to zero.
2. Increases Lerner index with increased market power.
3. Lerner index varies inversely with the elasticity of demand.

Goldberg and Knetter (1999) developed a method that solves the problem of calculating the unknown marginal cost by measuring market power in the international market for an exporter. They used double log inverse residual demand (the difference between the market demand and the competitive fringe's supply curves) to capture the exporter's market power through the elasticity.

The double-log inverse residual demand function developed by Goldberg and Knetter (1999) is as follows:

$$lnP_{mt}^{ex} = \lambda_{m} + \eta_m ln\hat{Q}_{mt}^{ex} + \alpha'_m lnY_{mt} + \beta' lnW_{mt}^{N} + \varepsilon_{mt}$$

Where m denotes a specific destination market, and t indicates the number of competitors an exporter faces in that market. The vector Y_m denotes the demand shifters and consists of a combination of a time trend, real income, and the price level for the destination market. W^N_m indicates the cost shifts for the n competitors the export group faces in a specific destination market the measures of input prices. Exchange rate movements offer ideal cost shifters in international markets because they move the relative costs of the exporting countries. The price charged by the exporter group P^{ex}_m and the demand shifters are expressed in the destination market currency. The coefficient of η_m can be interpreted directly as the residual demand elasticity. If the estimated value of η_m is not significantly different from zero, the exporter group operates in a perfectly competitive market and faces a perfectly elastic curve in the destination market.

In this specification, export unit prices and demand shifters are expressed in units of the destination currency. The error term is assumed to be independent and identically distributed.

$\hat{Q}$ (Import quantity) is endogenous because it is determined with the import price and correlated with error term ε because of simultaneity of price and quantity (endogeneity bias $E(\hat{\beta}) \neq \beta$) and needs to be instrumented as suggested by Goldberg and Knetter (1999). An instrumental is a variable that determines the (Q) endogenous regressor but only affect the dependent variable through it's effect on the independent variables.

So, we will regress Q with all the exogenous variables

$$Q = \alpha_0 + \alpha_1 Z + \alpha_2 W + \alpha_3 Y + u$$

Where Z is instrumental variables. The W denotes cost shifters such as exchange rate. Y vector of exogenous variables affecting the demand such as time trend, real income, the price level for the destination market.

We can apply IV estimations because IV is used to cut correlations between the error term and independent variables. We say the endogenous variables are just identified of η, When we have the same number of endogenous and IV's. However, we say the endogenous variables are over-identified of η, When we have more IV's than endogenous variables. We need to test ~~of~~ instrumental using F-test. The null hypothesis that the coefficients on the Z in the first stage are zero.

After we use IV, we will find that $\hat{Q}$ is an unbiased estimate of price and uncorrelated with ε_t.

Then we plug the $\hat{Q}$ in our model and we will find that $\hat{\eta}$ is an unbiased estimate

Empirical Model

This paper will estimate the residual demand model for rice exporter to Saudi Arabia as used by Saghaian and Reed (2004) as follows:

$$\boldsymbol{LnP_t^i = \lambda \quad + \eta Ln\widehat{Q}_t^i + \alpha \quad T_t + \beta \quad Ln\left(\frac{DY_t}{CPI_t}\right) + \sum_{j\neq i} \delta^j \ lne_t^j + \varepsilon_t}$$

Where *Ln is* Natural Logarithm, *P* is import price measured by Saudi Riyals, η is the residual demand elasticity, *Q* is the quantity of import rice, t index time, *i* and *j* are *index* countries that Saudi Arabia imported from, *T* is denoting time trend, *e* is the bilateral exchange rate, *DY* is Saudi Arabia nominal disposable income, and *CPI* is cost of living index.

In this study, we assume the Saudi Arabia rice market to be different by country of origin. Also, that each exporting country faces a residual demand curve that is downward sloping.

The main point of the parameters is the coefficient on quantities imported represents the inverse of the residual demand elasticity. The null hypothesis that each country that exports rice to Saudi Arabia faces a perfectly elastic residual demand. The null hypothesis of estimated residual inverse demand elasticities at the different type of rice equal to zero. It means we reject

the null hypothesis that we have a perfect competition in the market, and there is no market power.

The Two-Stage Least Squares (2SLS) were used to estimate the model, but after testing for heteroskedasticity and autocorrelation, we suffer from these problems.

Note that whereas asymptotic theory gave the result that the 2SLSE is (asymptotically) unbiased, small-sample theory indicates that it is in fact biased. From $\varepsilon(\hat{\alpha} - \alpha) \approx \frac{\sigma_{uv}}{\pi`X`X\pi}(K - 2)$, this bias decrease as the sample size n increases, but increases as k, the number of excluded exogenous variables, increases. (Bowden and Darrel, 1984).

Data:

The inverse residual model was estimated using annual data from 1993 to 2014. The challenge of this paper has solved the lack of the data from Saudi Arabia and the missing data. We use different sources to fix this problem. Data on the import and export of rice was collected from various countries. The These said various sources are listed below;

1)National Economy and Finance ministries and other official authorities in Saudi Arabia.

2)United Nations and USDA, UN Comtrade Database from United Nations Statistics Division and Food and Agriculture Organization of the United Nations-Statistics Division websites 1993-2013.

3)The Government of Pakistan, Statistics Division-Pakistan Bureau of Statistics data for the year 1997.

Nominal disposable income and CPI will be based on available secondary data from the Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC), as well as, World Development Indicators- World Data Bank. However, Exchange rates will be from the World Development Indicators.

Study Results

Market Share in Saudi Arabia Rice Imports

The study clarifies the relative importance of the most important import market rice for Saudi Arabia in stating that the import quantity are concentrated in six countries, which are namely, India, Pakistan, Thailand, USA, Australia, and Egypt (Table 5). The market shares of those markets to Saudi markets show that the Saudi market absorbs the largest share of India's rice which was estimated at 13% on average from the period (2009-2013), followed by Australia at 7% and then Egypt 5% (table 8).

Table 8: Market share indices for Saudi rice imports during the period (2009 - 2013)

Country	Total Export quantity in Ton	Export quantity to Saudi Arabia in Ton	Market share%	Market Penetration rate
India	6229609	805,866.4	13%	0.657
Australia	251 868	17169.25	7%	0.014
Egypt	354 211	16310.5	5%	0.013
Pakistan	3517348	155 982	4%	0.127
USA	3253811	117 230	4%	0.096
Thailand	8332793	122,574.8	1%	0.100

Source: FAO site: www.fao.org

Market Penetration Rate in Saudi Arabia Imports of Rice

Whenever the rate of market penetration increase indicates market expansion, easy of entry and vice versa. A result from Table 8 showing a rise in the Saudi Arabia market penetration of both India and Pakistan. It had reached a maximum value of this indicator for India, reaching 0.66 and minimum rate for Egypt, where it was about 0.013.

Market Share in Saudi Arabia imports for each type of rice:

India, Pakistan, Thailand, the United States, Egypt, and Australia, are the leading rice exporters to Saudi Arabia. India ranked at the forefront in the supply of all types of rice acquisition of (Husk 73%, Brown 65%, Simi-milled or wholly milled 70%, Broken 45%) in comparison with the six other largest exporting countries of rice to Saudi Arabia. Also, it followed by the USA in rice type of Husk 13%, Brown 22% and Broken 39%. However, Pakistan is competitive with India in the preferred type of rice in Saudi Arabia that is Simi-milled or wholly milled rice by the acquisition of 11%, in the average period 2012-2014 (Table 9).

Table 9: Market share in Saudi Arabia imports for each type of rice, during the period (2012 - 2014), in percentage.

Country	Rice in the husk (paddy or rough)		Husked (brown) rice		Simi-milled or wholly milled rice whether or not polished or glaze		Broken rice	
	Import Quantity	Import Value	Import Quantity	Import Value	Import Quantity	Import Value	Import Quantity	Import Value
Pakistan	3%	2%	6%	6%	11%	9%	9%	6%
India	73%	77%	65%	66%	70%	75%	45%	47%
Thailand	5%	5%	3%	2%	6%	5%	3%	2%
U.S.A	13%	10%	22%	22%	9%	8%	39%	41%
Egypt	6%	5%	0%	0%	0%	0%	4%	4%
Australia	0%	0%	0%	0%	2%	2%	0%	0%
Other Countries	1%	1%	4%	4%	1%	1%	1%	1%

Source: compiled and calculated by:
USDA(FAS) Website: http://apps.fas.usda.gov/gats/ExpressQuery1.aspx
UKComtrade Website: http://comtrade.un.org/data/

The inverse residual demand estimation:

Because of the lack of data, the study tried to reach the best estimates of the residual demand model of rice exporting countries to Saudi Arabia.

However, since the objective of this study is to examine the market power of the rice exporter to Saudi Arabia, inverse residual demand was estimated to determine which countries have market power.

Table (10) display the estimated parameters of rice imports of the residual demand model from the leading exporting countries to Saudi Arabia in the double logarithmic during the period 1993-2014.

We applied instrumental variable estimations because IV is used to cut correlation between the error term and independent variables.

We also included the total of Pakistan and the U.S.A rice export to the world as instrumental variables for Australia and Thailand. In the case of India, we included the total of Pakistan and US rice export to the world. In the case of Pakistan and the US, we included the total US rice production as an instrument.

As can be seen in Table (10), We tested for whether variable Q is endogenous by using the Hausman test, the result showed that we failed to reject the null hypothesis for exporter countries at the 5% level of significance, except the India model. So, the OLS estimation applied to estimate the residual demand equation for all exporting rice countries to Saudi Arabia except India, we also applied the two-stage least squares 2SLS. We used the two-stage least square (2SLS) in India model rather than OLS (Q correlated with ε_t and $E(\hat{\beta}) \neq \beta$ bias estimate) because of endogeneity problem.

According to the result in the table (10) that shows that the estimated residual model for each exporter was significant at 1% level for India, Pakistan, and the USA, and significant at 5% level for Australia and Thailand.

In all inverse residual demand model, R-square indicates the percentage of the dependent variable (rice import price) as explained by independent variables. Moreover, F statistic tests are significant at the 1% significance level (F-stat - below .01 for 99% confidence in the ability of the model to explain the dependent variable).

After we tested for whether India model is over identification using Sargan test (Interments> endogenous regressor), we failed to reject the null hypothesis; then we had a good instrumentals variable.

In all models, we did not find any problem with heteroskedastic or autocorrelation.

It is clear the estimates from the table (10) and through the negative sign of the quantity coefficient. It reflects the elasticity of the residual demand match with the economic logic and the existence of market power for Australia, India, and Pakistan on the Saudi rice market, reaching of -0.14, -0.66, -0.23, respectively, and are statistically significant at the level of 0.01, 0.05, 0.05, respectively.

The estimated import quantity from Thailand and the US were significant but had a positive sign which is against economic logic and demonstrates no market power of the rice imported.

This result corresponds to Al-Rwais study in 2004, which addressed the demand Saudi rice imported of analysis pattern from India was an inelastic price. As well as Ismail and Al-Rwais study in 2009, which showed that each of India and Pakistan had market power in the rice export to Saudi Arabia. The elasticity of the residual demand in both countries - 0.13, and were statistically significant at the 0.05 level, while the US, Australia, Thailand, and Egypt face a perfectly elastic demand.

Table 9: the residual demand model

	Australia	India	Pakistan	Thailand	USA
Intercept	0.66 (0.27)	1.83 (0.46)	-8.70 (-3.10)**	-2.67 (-1.45)	-6.31 (-2.65)**
Import Quantity	-0.14 (-3.57)**	-0.66 (-1.97)*	-0.23 (-1.86)*	0.28 (2.91)**	0.34 (2.51)**
ExgAUS	-0.52 (-2.31)**	--	--	--	1.13 (2.36)**
ExgIND	2.36 (3.27)**	--	2.17 (4.45)**	1.74 (3.59)**	0.64 (3.17)**
ExgPAK	-0.87 (-1.78)*	1.14 (2.41)**		-0.79 (-2.28)**	
PPIAU	-0.37 (-2.17)**	0.49 (1.68)	0.85 (3.96)**		0.64 (3.17)**
PPIIN	--	-0.18 (-0.53)	--	--	--
PPITH	--	-0.03 (-0.08)	--	--	--
PPIUS	--	--	--	0.45 (4.94)**	--
IPC	0.48 (2.38)**	0.53 (1.11)	0.87 (4.33)**	0.43 (2.57)**	0.71 (4.33)**
Time	--	--	-0.60 (-4.02)**	--	-0.37 (2.57)**
F-test	28.02**	5.68**	13.21**	63.20**	13.83**
R^2	0.92	0.71	0.81	0.95	0.81
Huasman test[1]	0.19	0.05*	0.86	0.899	0.92
Sargan Test Overidentfication[2]	--	7.56*	---	--	--
Test for Hetro[1]	0.61	0.41	0.71	0.73	0.40
Test for Auto	1.64	1.07	1.85	2.04	1.39

1 p-value
2 Chi-sq=N*R2=21*0.36=7.56 (IV=3)
t-statistics are in parentheses * Significant at 5% level ** Significant at 1% level

Summary and Conclusion:

The Saudi Arabia rice imports increased annually by 14 thousand ton of rice. Saudi rice imports are concentrated in six rice exporting countries of India, Pakistan, the US, Thailand, Australia, and Egypt, and it accounted for about 66%, 12%, 10%, 9%, 1% and 1% of the total Saudi rice imports respectively from the period 2010 to 2014. Saudi rice imports is concentrated in 4 main rice varieties, Rice in the husk (paddy or rough), Husked (brown) rice, Simi-milled or wholly milled rice and Broken Rice.

The objective of the Study is to analyze the intensity of competition among the main rice exporting countries to Saudi Arabia.

To achieve the objective of this study the structure and trends of Saudi rice imports were measured. Market share and penetration were analyzed. Finally, the inverse residual demand rice imports from competitive rice exporters to the Saudi were estimated to indicate the extent of market power.

The inverse residual model was estimated using the annual data from 1993 to 2014. Data imported quantity from different countries and import price were collected from various sources such as National Economy and Finance ministries, other official authorities in Saudi Arabia, USDA, UN Comtrade Database from United Nations Statistics Division and Food and Agriculture Organization of the United Nations-Statistics Division websites 1993-2014. Nominal disposable income and CPI will be based on available secondary data from The Statistical, Economic and Social Research and Training Centre for Islamic Countries (SESRIC), as well as, World Development Indicators- World Data Bank. However, Exchange rates will be from the World Development Indicators.

The value of Saudi Arabia rice import represents about 7% of the value of agriculture imports over the average period of 2009-2013. The study result shows that India received the highest increase rate among competitive countries in quantity, value, and import price.

The largest market share of the exporter countries to Saudi Arabia was India by 13% then Australia, Egypt, Pakistan, US and Thailand on the average period from 2009-2013. There was a rise in market penetration of both India and Pakistan due to the type of Basmati rice that is prefer preferred to by the Saudi consumers.

When we study the market share of the four types of rice, the result shows that India still has the largest impact comparing when compared to another other exporters.

The results of the residual- demand models for rice exporters to the Saudi Arabia, specifically the estimated inverse residual demand elasticities of all competitive rice exporters to Saudi Arabia, approximates the markup of price over marginal cost or Lerner index, indicate that Australia, India, and Pakistan enjoy market power in Saudi rice importing market. The inverse residual demand for countries was estimated and amounted to -0.14, -0.66 and -0.23 respectively, and statistically significant at the 0.05 level. However, Thailand and the US face a perfectly elastic demand.

Based on of the above, the study recommends doing another study on importing companies to anticipate the possibility of the existence of agreements for joint optimization of the monopolistic profits. As well as diversifying the base countries that Saudi import from, in order to reduce the concentration of imports in certain countries.

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