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Article

The rice market in Mexico: what factors determine it?

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Abstract

Rice is a basic cereal in the diet of Mexicans; currently, Mexico imports large quantities to meet domestic demand. This work aimed to analyze the factors affecting the rice market in Mexico, as well as to measure the effect of different price levels. A simultaneous equation model consisting of a supply equation, a demand equation, and three price transmission equations and an identity of foreign trade balance was estimated for the period from 1999 to 2021. The results indicate that the supply and demand of rice respond inelastically to its price. The factors that most affected supply were temperature, the real rural average price of corn, and the availability of water for irrigation, with elasticities of 1.57, -1 and 0.24, respectively; likewise, the factors that affected demand were per capita income, real consumer prices of eggs and beans, with elasticities of 0.98, -0.48 and -0.37. An inelastic elasticity coefficient of 0.06 was found between the real import price and the real wholesale price; the latter modified the average rural price by 0.24 and the real consumer price by 0.7. For this reason, it is recommended to allocate complementary support to the agricultural sector, such as the programs of fertilizers, sowing life, technical advice, credit and irrigation infrastructure supports, among others; this measure will increase domestic production and gradually reduce rice imports.

Keywords:

demand, elasticity, simultaneous equations, supply.

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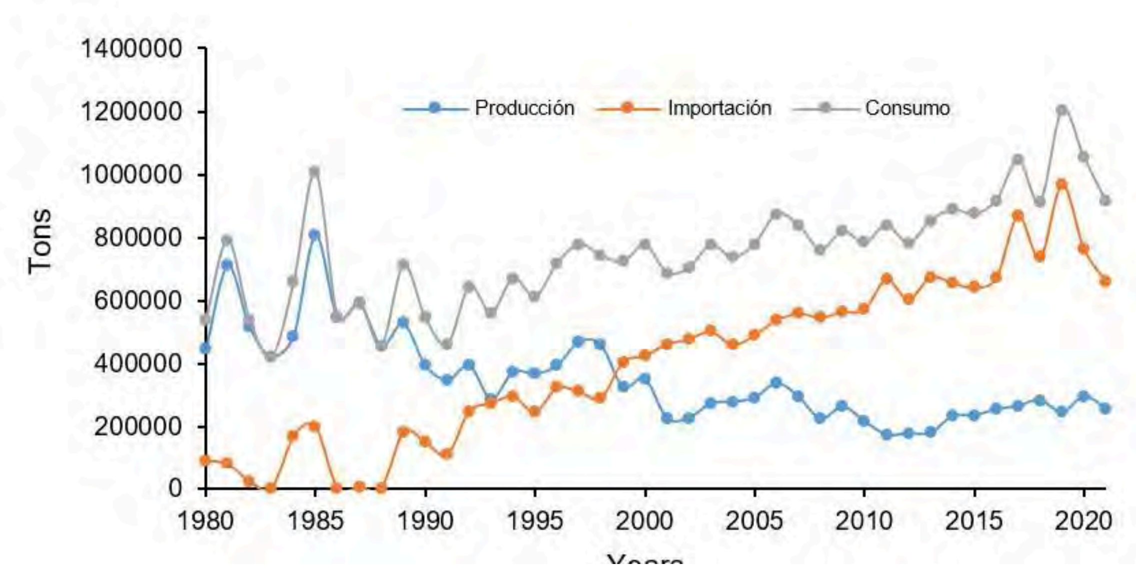
Introduction

Rice is considered one of the staple crops in the Sustainable Rural Development Law (LDDRS), for its acronym in Spanish due to its importance in the diet of Mexicans (consumption of 8.5 kg per capita per year). Cereals represent the second highest expenditure item for Mexican families (13.8% of total expenditure on food, beverages, and tobacco, which is $15 059.00 pesos per quarter) (Sagarpa, 2017; Inegi, 2023). In 2022, rice crops in Mexico generated a production value of 1 476 million pesos (Siacon, 2023).

According to data from Siacon (2023), total rice production exceeded 246 thousand tons in 2022; of this total, the participation of the largest producing states is as follows: Nayarit 29.9%, Campeche 18.8%, Michoacán 13.6%, Veracruz 12.5%, and Jalisco 8.7%, together they exceeded more than 80% of total production. Until 1988, Mexico was self-sufficient in rice production. There is currently a dependence on imports of this grain.

In 2022, national production was 246 thousand tons, while consumption was 1.2 million tons, which means that only 20.5% of national consumption was covered, so 954 thousand tons were imported, mainly from the United States of America and Uruguay; this trend will continue, it is estimated that by 2030, imports will have exceeded 1 000 t (Sagarpa, 2017). Given the above, the following questions arise: what has happened to domestic rice production in Mexico? why has rice consumption increased? and what are the factors that determine the behavior of the rice market in Mexico? Figure 1 shows the trend in rice production, consumption and imports in Mexico.

Figure 1. Production, import and consumption of rice in Mexico from 1980 to 2021. (SIACON, 2023; FAOSTAT, 2023).



It was observed that the main problem is the drastic drop in rice production in Mexico, going from 445 000 t in 1980 to 246 000 t in 2022; in percentage terms, it represents a 45% decrease. According to Ibarra (2016); Ireta *et al*. (2016), the main causes of this collapse in production are low international prices compared to domestic prices, which caused an increase in imports, decrease in the planted area, the decapitalization of the countryside, the abandonment of technical assistance, the dismantling of credit, low productivity and high production costs, and entry into the North American Free Trade Agreement (NAFTA), among others.

For their part, Pureco and García (2017) indicate that the decrease in rice production is due to a passive role of the State, the reform of Article 27 of the Constitution, and the signing of NAFTA. Steffen (2017) mentions that the causes of the collapse of rice production were the implementation

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of neoliberal policies, such as trade liberalization, elimination of tariffs and import permits, and elimination of the support price.

Similarly, an accelerated increase in rice consumption can be noted, going from 538 000 t in 1980 to 915 000 t in 2021, which is equivalent to 70%. The main causes of the increase in demand are low import prices and the growing population, which implies that imports are used to supply domestic rice consumption due to the low production of this grain (Ibarra, 2016; SIACON, 2023).

Based on the above, it can be seen that, until before 1988, imports were less than 200 000 t, even in the years 1982, 1983, 1986, 1987, 1988, low imports of 21 675, 236, 999, 2 207 and 855 t, respectively, were reported. After these years, it was seen how imports rose rapidly, going from 855 t in 1988 to 661 000 t in 2021; this was because domestic rice production was unable to supply consumption.

The analysis of the market for rice and other agricultural grains in Mexico has been the subject of several studies, the following are cited to mention a few: Molina *et al*. (2012); Vázquez and Martínez (2015); Guzmán *et al*. (2019); Bautista *et al*. (2019); Reyes *et al*. (2022); these studies are relevant for two reasons: to compare results with the present research work and because they use the same methodology.

Due to an increasing consumption of rice, a high amount of imports, and a collapse in the production of this grain, the idea arises to carry out this paper that aims to analyze the factors affecting the rice market in Mexico, as well as to measure the effect of the different price levels; the findings will allow us to make public policy recommendations that help the agents immersed in this market to make better decisions that contribute to food sovereignty; that is, to increase production and import less. As a hypothesis, it was proposed that a lower price of fertilizer and an increase in the import price causes an increase in domestic production and a decrease in imports of this grain, which is so important in the diet of Mexicans.

Materials and methods

Model formulation

A simultaneous equation model was used, which consisted of a supply equation, a demand equation, three price transmission equations, and a foreign trade balance identity. The model contemplated aspects of economic theory and empirical evidence on the rice market in Mexico. Considering that the system of simultaneous equations presents over-identified equations and probable simultaneity (exogenous variables that are also endogenous), it is possible that they are correlated with the error term; due to the above and according to Gujarati and Porter (2010), the best way to estimate the parameters is through the two-stage ordinary least squares (2SLS) method.

The estimation process was carried out with the help of the statistical analysis system (SAS, 2013). Likewise, the functional form of double logarithm was used to avoid heteroskedasticity problems (Greene, 2012) and because the results are already the elasticities. The mathematical form of the model is as follows:

$$\ln(QPR_t)=\beta_{11}+\beta_{12}\ln(RAPR_{t-1})+\beta_{13}\ln(RAPC_{t-1})+\beta_{14}\ln(FERP_{t-2})+\beta_{15}\ln(T_t)+\beta_{16}\ln(AWI_t)+\varepsilon_{1t}$$

1).

$$\ln(QDR_t)=\beta_{21}+\beta_{22}\ln(RCPR_{t-2})+\beta_{23}\ln(RCPB_{t-1})+\beta_{24}\ln(RCPE_{t-1})+\beta_{25}\ln(PINC_{t-2})+\varepsilon_{2t}$$

2).

$$\ln(RAPR_t)=\beta_{31}+\beta_{32}\ln(RWPR_t)+\varepsilon_{3t}$$

3).

$$\ln(RWPR_t)=\beta_{31}+\beta_{32}\ln(RIPR_t)+\beta_{33}\ln(RWPR_{t-1})+\varepsilon_{4t}$$

4).

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$\ln(RCPR_t)=\beta_{41}+\beta_{42}\ln(RWPR_t)+\beta_{43}\ln(RCPR_{t-1})+\varepsilon_{5t}$

5).

$\ln(BFTR_t)=\ln(QDR_t)-\ln(QPR_t)$

6).

Where: In = natural logarithm; QPR_t = quantity of rice produced in Mexico (t) in year t; $RAPR_t$ and $RAPR_{t-1}$ = real rural average price of rice ($/t) in year t and with a one-year lag; $RAPC_{t-1}$= real rural average price of corn ($/t) with a one-year lag; FERP $_{t-2}$ = real fertilizer price ($/t) with a two-year lag;$T_t$ = average annual temperature (°C); AWI_t = availability of water for irrigation (thousands of m^3) in rice.

QDE_t = quantity of rice demanded (t) in year t; $RCPR_t$, $RCPR_{t-1}$ and $RCPR_{t-2}$ = real consumer price of rice ($/t) in year t, with one-year and two-year lags; $RCPR_{t-1}$ = real consumer price of beans ($/t) with a one-year lag; $RCPE_{t-1}$= real consumer price of eggs ($/t) with a one-year lag; $PINC_{t-2}$ = real per capita income ($) with a two-year lag.

$RWPR_t$ and $RWPR_{t-1}$ = real wholesale price of rice ($/t) in year t and with a one-year lag; $RIPR_t$ = real import price of rice ($/t) in year t; $BFTR_t$ = balance of foreign trade of rice in Mexico (t) in year t. The simultaneous equation model can be expressed in matrix form as follows (Gujarati and Porter, 2010):

$\Gamma Y_t+\beta X_t= E_t$

Where: Y_t is the vector of endogenous or dependent variables of the model; X_t is the vector of exogenous variables of the model plus the intercept; Γ is the matrix of structural parameters associated with endogenous variables; β is the matrix of structural parameters associated with exogenous variables; E_t are the terms of random error. The vectors Y_t and E_t are of order m x 1, where m is the number of endogenous variables of the model, Γ is a square matrix of m x m, and β is a matrix of k+1 x m. Where: k = the number of lagged exogenous and endogenous variables of the model plus the intercept; in general, k may or may not equal m.

For the system to be complete, there must be the inverse of Γ; that is, Γ must be a non-singular matrix of order m, to derive the reduced model of the system as follows: $Y_t = \pi X_t + V_t$. Where: π is equal to $\Gamma^{-1}\beta$ and is the parameter matrix of the reduced form; V_t is equal to $\Gamma^{-1}E_t$, it is the matrix of the error terms in the reduced form.

The supply of a product is determined by the price received by the producer, the price of competitive goods or associated with production, the price of productive factors or inputs, technology, taxes or subsidies, the climate, the producer's expectation (future quantity and price) and the number of competitors (Barkley and Barkley, 2013; Atucha and Gualdoni, 2018). Therefore, equation 1, function of rice supply in Mexico, depends on the real rural average price of rice; according to the law of supply, a direct or positive functional relationship is expected since when the price increases, the supply increases and vice versa.

On the contrary, a negative or inverse relationship with the price of corn is expected because empirically, it is considered a competitive good in production with rice. An inverse relationship is expected in the case of the price of fertilizer as it is an input in production; if the price of fertilizer increases, less fertilizer will be demanded, consequently, by not fertilizing, less rice will be produced. Finally, a direct relationship with temperature and the availability of water for irrigation is expected; that is, favorable climates could contribute to the biological growth of the crop and vice versa.

The determinants of demand for a product are a function of the price to the consumer, the price of substitute or complementary goods, population, income, consumer expectations (future quantity and price), tastes, and preferences (Barkley and Barkley, 2013). Considering the above, the factors that determine the quantity demanded of rice are the consumer prices of rice, beans, and eggs; a negative relationship between demand and prices is expected. With respect to per capita income, if a positive sign is obtained, it is a normal good, but if it is negative, it is an inferior good.

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Equations 3, 4, and 5 model the transmission effect that the wholesale price of rice in Mexico has on the average rural price and the consumer price. Similarly, changes in international prices affect a country's domestic prices (producer, wholesale, and consumer) (Calderón *et al*., 2004; Jaramillo and Benítez, 2016). Finally, equation 6 of identity, which establishes the balance of foreign trade in rice in Mexico, was obtained by the difference between the quantity demanded and produced.

Because agricultural products take a while to produce (gestation period), the prices of the previous year play an important role because producers are influenced by the price prevailing the previous year (Gujarati and Porter, 2010). For this reason, in the proposed model, some of the exogenous variables are influenced by one- and two-year lags.

Data

Annual data from 1999 to 2021 were used. The apparent national consumption of rice in Mexico is the result of the sum of the quantity produced plus the quantity imported minus the quantity exported; the information was obtained from SIACON (2023); FAOSTAT (2023). Consumer prices of rice, beans, and eggs were obtained from Profeco (Orozco Pers. Commun., 2023). The wholesale price of rice came from Sniim (2023). Per capita income was estimated as follows: gross domestic product (GDP) was divided by the population of Mexico; GDP was obtained from INEGI (2023) and population from INEGI (2023).

Finally, the import price per tonne in dollars was multiplied by the exchange rate to obtain it in pesos; the import price information came from FAOSTAT (2023) and the exchange rate from BANXICO (2023). Rice production and rural average prices were obtained from (2023). The price of fertilizer (urea) was obtained from SNIIM (2023). The temperature was taken from the SMN (2023) and the availability of water for irrigation from CONAGUA (2023). The monetary data were deflated with the national consumer price index (INPC, for its acronym in Spanish) and the national producer price index (INPP, for its acronym in Spanish), which were obtained from INEGI (2023); 2021 was considered as the base year (2021= 100).

Results and discussion

Statistical analysis

In the five equations of the model, it can be seen that the coefficient of determination (R^2) varies between 0.2 and 0.92, which indicates an acceptable goodness of fit between the data predicted by the model and the observed data. The value of the F test (global significance) of each equation was significant at a level of 10%; ie., at least one of the parameters is non-zero. The Student's t-test (t) indicates the individual significance of the value of the parameters; it can be perceived that most of the coefficients are significant because they exceed the unit in absolute terms and their signs were congruent with microeconomic theory.

The Durbin-Watson (DW) statistic indicated little or no first-order autocorrelation in the time series used because the coefficients ranged between 1.08 and 2.13. The Shapiro-Wilk (SW) value ranged from 0.88 to 0.93, implying that the residuals of each equation have a normal distribution and the Breusch-Pagan (BP) value ranged from 0.63 to 2.67, indicating that there are no heteroskedasticity problems between the time series (Table 1).

Table 1. Results of the structural form of the model of the rice market in Mexico, 1999-2021.

Exogenous variables	Endogenous variable QPR_t				
	Coefficient	Standard error	t-value	Prob t	
Intercept	13.0736	4.980122	2.63	0.0276	R^2= 0.67
$RAPR_{t-1}$	0.137355	0.21788	0.63	0.5441	Fc= 6.79
$RAPC_{t-1}$	-1.00135	0.263231	-3.8	0.0042	Prob> F= 0.0069

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Exogenous variables	Endogenous variable QPR_t				
	Coefficient	**Standard error**	**t-value**	**Prob t**	
$FERP_{t-2}$	-0.20632	0.149459	-1.38	0.2008	SW= 0.93
T_{t-1}	1.570355	1.136082	1.38	0.2002	BP= 0.63
AWI_{t-1}	0.246407	0.080867	3.05	0.0139	DW= 2.13
Exogenous variables			Endogenous variable QDR_t		
Coefficient	Standard error	t-value	Prob t	R^2= 0.33	
Intercept	8.996313	5.761143	1.56	0.1495	Fc= 2.7
$RCPR_{t-2}$	-0.09362	0.343736	-0.27	0.7909	Prob>F= 0.0925
$RCPB_{t-1}$	-0.3715	0.224639	-1.65	0.1292	SW= 0.91
$RCPE_{t-1}$	-0.48874	0.255243	-1.91	0.0845	BP= 0.73
$PINC_{t-2}$	0.981696	0.561158	1.75	0.1108	DW= 1.79
Exogenous variables			Endogenous variable $RAPR_t$		
Coefficient	Standard error	t-value	Prob t	R^2= 0.2	
Intercept	6.25735	1.131145	5.53	0.0001	Fc= 4.4
$RWPR_t$	0.240314	0.114623	2.1	0.0562	Prob> F= 0.0562
					SW= 0.91
					BP= 0.95
					DW= 1.08
Exogenous variables			Endogenous variable $RWPR_t$		
Coefficient	Standard error	t-value	Prob t	R^2= 0.65	
Intercept	1.495086	1.595468	0.94	0.3672	Fc= 14.22
$RIPR_t$	0.065464	0.077925	0.84	0.4173	Prob>F= 0.0007
$PWPR_{t-1}$	0.784413	0.181673	4.32	0.001	SW= 0.93
					BP= 2.67
					DW= 2
Exogenous variables			Endogenous variable $RCPR_t$		
Coefficient	Standard error	t-value	Prob t	R^2= 0.92	
Intercept	1.773259	0.808558	2.19	0.0487	Fc= 82.68
$RWPR_t$	0.708987	0.103298	6.86	0.0001	Prob>F= 0.0001
$RCPR_{t-1}$	0.128691	0.134848	0.95	0.3587	SW= 0.88
					BP= 1.22
					DW= 1.53

Economic analysis

An inelastic price elasticity coefficient of 0.13 was found in supply, which means that, if the RAPR increases by 10%, the QPR will increase by 0.13% and vice versa (Table 1). The following authors find a similar coefficient: Anaya *et al*. (2021) obtained a supply price elasticity of 0.31 for the rice market in Colombia. Bautista *et al*. (2019) reported an elasticity value of 0.1 for the corn market in Mexico. Abdulsalam *et al*. (2021) estimated a price elasticity value of 0.2 for the rice market in Nigeria.

In supply, an inelastic price elasticity implies that the price must increase a lot for the supply to increase considerably; in our case, the price must increase 100% for the supply of rice to increase 9%. It is worth mentioning that the current government of Mexico, with the support price program, wants to promote the production of staple crops, such as rice, corn, and beans; nevertheless, the elasticity found showed that little can be done in this way; however, due to the large quantities of rice that is imported, it is well worth the effort to increase production and reduce these imports.

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Production would have a positive impact if complementary support were offered, such as the programs of fertilizers, sowing life, young people building the future, technical advice, credit, and irrigation infrastructure support, among others. The elasticity coefficient that relates the supply of rice to the RAPC was -1. Therefore, if a 10% increase in this price is considered, the supply will fall by 10%. Given this coefficient of cross-elasticity, corn is considered a competitive good to rice.

The fertilizer elasticity coefficient was -0.2; that is, if a 10% increase in FERP is considered, rice production decreases by 2%. Guzmán *et al*. (2019) found a fertilizer price elasticity that is related to bean production of -0.34. Bautista *et al*. (2019); Reyes *et al*. (2022) estimated the elasticity coefficient that relates the price of fertilizer to corn production, of -0.2 and -0.35, respectively.

The results make sense because fertilizer is an input to production; if the price of fertilizer decreases, demand will grow and consequently, rice production is expected to increase. In this regard, the government of Mexico has implemented the program of fertilizers for welfare, which aims to increase the production of staple crops; thus, according to the results, this measure of the government could work because by subsidizing fertilizer to producers, it is as if the price of this input decreases, which gives the producer the possibility of fertilizing a larger area sown with rice and therefore increase production; it would be recommended that the support be more timely and with greater coverage.

Favorable climatic conditions help the growth of this crop; the elasticity coefficient that relates rice supply with the T and the AWI was 1.57 and 0.24, respectively; if these variables increase by 10%, the supply will increase by 15.7 and 2.4%, respectively. Reyes *et al*. (2022) found a coefficient of elasticity of 3.83, which relates corn supply to temperature. Molina *et al*. (2012) found an elasticity that relates the amount of corn and sorghum produced with the availability of water for irrigation, of 0.3 and 0.44, respectively.

These variables cannot be influenced as they are stochastic, and coupled with the effects of climate change that will possibly cause the temperature to increase and precipitation to decrease in Mexico (Montero *et al*., 2013), it will cause rice production to be variable. In the face of climate change, what can be done is to plan adaptation measures (changes in sowing dates in annual crops, availability of varieties that are resistant and tolerant to pests, diseases, and droughts, creation of agricultural insurance systems, water storage tanks or dams and the use of efficient irrigation systems, among others) so that agricultural production is not so damaged (Martínez *et al*., 2017).

In Mexico, rice production in times of the Covid-19 pandemic was mainly affected by the limited mobilization of personnel and transport (restrictions imposed for the control of the pandemic); this caused a low availability of labor (delay in harvest) and production inputs, such as certified seed and machinery (Urioste *et al*., 2020).

When taking stock, the factors that most affect rice production in Mexico are T, RAPC, and AWI; in contrast, RAPR caused a smaller effect on rice production. For demand, an inelastic price elasticity coefficient of -0.09 was found, which means that in the face of a 10% increase in the RCPR, the demand for rice decreased by 0.9% (Table 1). This result coincides with Vázquez and Martínez (2015), who found a price elasticity of -0.08. Abdulsalam *et al*. (2021) found a price elasticity of -0.32 for the rice market in Nigeria.

The result is congruent since a good such as rice has inelastic price elasticity, which means that, although its price increases, demand changes very little compared to the change in price. In contrast, Anaya *et al*. (2021) obtain a coefficient of -1.83 for the rice market in Colombia, which differs from the one found in this work; this may be due to the study period (1970 to 2013) and the methodology used (multiple linear regression).

The elasticity coefficient that relates demand to RCPB and RCPE was -0.37 and -0.48, respectively, which indicates that in the face of a 10% increase in the prices of beans and eggs, the demand for rice decreases by 3.7 and 4.8%, respectively. These results reveal that beans and eggs are complementary goods to rice, as indicated by Guzmán *et al*. (2019), when they relate beans (another basic good such as rice) to eggs.

The income elasticity of rice demand was 0.98; a 10% increase in the PINC increases rice demand by 9.8%. The result coincides with Abdulsalam *et al*. (2021), who found an income elasticity of 0.95

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and mention that this behavior is characteristic of a necessary good. It is worth mentioning that, in times of the Covid-19 pandemic, the demand for rice in Mexico in 2020 experienced an abrupt growth caused by the confinement of people, which caused the inventory of this cereal to decrease, which, coupled with an irregular supply of rice via imports, caused the price to increase; fortunately, this uncertainty lasted a short time since it was decided that the agricultural sector would be exempt from some restrictions implemented to control the pandemic, such as the mobility of people and transportation (Urioste *et al*., 2020).

In summary, the factors that most influence rice demand are the PINC, RCPE, and RCPB. Regarding the real price transmission elasticity coefficients of the rice market, values of 0.24 and 0.7 were found, which relate the RWPR with the RAPR and the RCPR, respectively; therefore, a 10% increase in the RWPR causes the RAPR to increase by 2.4% and the RCPR to increase by 7%.

Similarly, an increase in the $RCPR_{t-1}$ will cause a 1.28% increase in the $RCPR_t$. The transmission elasticity of the RPIR on the RWPR was 0.06, a 10% growth in the RPIR causes the RWPR to increase by 0.6%. Similarly, an increase in the $RWPR_{t-1}$ will cause the $RWPR_t$ to increase by 7.8%. Therefore, it can be observed that the RPIR affects the supply and demand of rice in Mexico through the transmission of prices.

Authors who studied other basic grains, such as beans and corn, reported the following elasticity coefficients: Guzmán *et al*. (2019) indicated that, in the bean market, the elasticity coefficient that relate the wholesale price to the producer price was 0.51 and to the consumer price was 0.62. The elasticity of the import price over the wholesale price of beans was 0.27. Reyes *et al*. (2022) mention that, in the corn market, the wholesale price between the producer and consumer prices was 0.6 and 0.37, respectively.

The value of the import price over the wholesale price was 0.87. The results vary in value, but they are inelastic. The reduced form of the model presents information on the merely exogenous variables that determine the endogenous variables; this allowed us to observe how the import price of rice affects the different levels of domestic prices (average rural, wholesale, and consumer prices); likewise, the factors that affect the balance of foreign trade can be observed; this information is contained in Table 2.

Table 2. Results of the reduced form of the model.

Exogenous variables	Endogenous variables					
	QPR_t	QDR_t	$RAPR_t$	$RWPR_t$	$RCPR_t$	$BFTR_t$
Intercept	13.0736	8.996313	6.61664	1.495086	2.833255	-4.07729
$RAPR_{t-1}$	0.137355					-0.13735
$RAPC_{t-1}$	-1.00135					1.00135
$FERP_{t-2}$	-0.20632					0.206323
T_{t-1}	1.570355					-1.57035
AWI_{t-1}	0.246407					-0.24641
$RCPR_{t-2}$		-0.09362				-0.09362
$RCPB_{t-1}$		-0.3715				-0.3715
$RCPE_{t-1}$		-0.48874				-0.48874
$PINC_{t-2}$		0.981696				0.981696
$RPIR_t$			0.015732	0.065464	0.046413	
$RWPR_{t-1}$			0.188506	0.784413	0.556139	
$RCPR_{t-1}$					0.128691	

As the effects of price transmission have already been described above, only the factors that affect the balance of foreign trade of rice in Mexico were highlighted; those that have the greatest impact due to the magnitude of the coefficients of the elasticities are the T, $RAPC_{t-1}$, and $PINC^{t-2}$; the values

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of these coefficients are -1.57, 1 and 0.98, which means that, if these variables increase by 10%, the BFTR will decrease by 15.7%, increase by 10%, and 9.8%, respectively.

T favors the increase in domestic production, which is why it negatively affects the BFTR; in the case of the RAPC, being a competitive good with rice, when the price increases, the supply of corn is expected to increase and the supply of rice to decrease; these effects cause the trade balance to be positive because imports would grow; the same happens with the PINC, in the face of a higher income of consumers, demand will increase and imports too since the internal supply is not able to supply that increase in demand.

Conclusions

The main factors that determine the supply of rice were the temperature, the real rural average price of corn, and the availability of water for irrigation; likewise, the supply reacted inelastically to its price. The model indicates that the factors that determine the demand for rice in Mexico were per capita income, classifying rice as a normal good, consumer price of eggs and the price of beans; the demand was inelastic to its price.

The price transmission equations show that the wholesale price affects both the rural average price and the consumer price; according to the magnitude of the elasticity coefficients, the consumer price is affected to a greater extent. The hypothesis raised was fulfilled since a decrease in the price of fertilizer causes the domestic supply to grow. Finally, this research gives rise to future research on the transport costs of rice in Mexico.

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