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A Survey on the Existence of Price Discrimination Behavior in Iran's Saffron Exporting Market by Using PTM Model

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Abstract

One of the most important effects of exchange rate movements is its effection the exporting price of different products. According to the new trade theories, market structure plays an important role in relating exchange rate depreciations to price declines. In Iran, exchange rate has increased in recent years. Inspired by this assumption, this paper attempts to investigate the impact of exchange rate movements on the exportprice of saffron (which is the most important non-oil export product after pistachio)in Iran over the period of 2001-2012. As shown by the results of the present study, the country effect (λi) for each destination is significant except for United States. In addition, the exchange rate's coefficient is significant for all countries in our sample. Accordingly, as also indicated by the related literature,the hypothesis of the existence of competitive market is rejected, and this lends support to the idea thatprice discrimination in saffron marketis regularly applied by Iranian exporters,whichsuggeststhat the government should try to support this strategic product by suitable policies.

Keywords:
exchange rate, price discrimination, PTM, saffron

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INTRODUCTION

"Price discrimination is sometimes defined as the practice of a firm selling a homogenous commodity at the same time to different purchasers at different prices". Therefore, firms sometimes sort their customers based on price sensitivity so as to price discriminate and raise their profits.

A lot of studies have focused on the relationship between exchange rate and the price of commodities. The empirical literature associated with this issue has mainly been extended around two similar subjects; the first known as ERPT (Exchange Rate Pass Through) and the other one PTM (Pricing to Market). For example, CaZorzi et al. (2007) studied exchange rate pass through in emerging markets whereas Choudhri and Hakuri (2012) surveyed the exchange rate pass through to import prices for a large number of countries. Some researchers have examined the PTM, for example, Atkeson and Burstein (2008) discussed how pricing-to-market depends on the presence of international trade. Penkova (2005) examined the existence of potential pricing- to-market for a wide range of export industries in selected transition economies. ERPT refers to the extent to which destination currency prices of traded commodities respond to exchange rates (Gil-Pareja, 2002). According to Krugman (1986), PTM refers to international price discrimination which is infused by exchange rate movements. The main reason for wide focus on pricing to market is that it presents evidence of the role of market structure in international trade. Furthermore, ERPT and PTM can be defined as follows: ERPT to export price reflects the percentage of change in the export price in terms of importing country's currency due to a 1% change in the exchange rate, and PTM is similarly defined as the percentage change in the export price in terms of exporting county's currency due to 1% change in the exchange rate (Ghosh & Rajan, 2007).

The bilateral exchange rate changes can affect the export pricing of firms through two main channels: (a) the effect thatthe exchange rates have on marginal cost, and (b) the impact exchange rates have on mark-ups of price over marginal cost (Penkova, 2005).

New trade theory became popular in the 1960s and 1670s. Paul Krugman won the Nobel Prize for his work on new Trade Theory in 2008. Unlike traditional international trade theories which focused on unlimited free trade and comparative advantage, this theory implied that countries which produce similar goods and services continue to trade with one another, while based on the traditional trade theory they don't gain any benefit from trade. To sum up, new trade theory suggeststhat comparative advantage isnotonly due to natural differences in resources or climate but it is also due toeconomies of scale and network effects that exist in key industries. Based on this theory, international trade is often described by imperfect competition and oligopolistic market structures. Under a situation like this, a profit- maximizing exporter may exert price discrimination as an optimal decision (Pall et al., 2013).

In recent years, Iran's exchange rate has experienced a lot of movements. Exchange rate has a lot of effectsoneconomy, especially on trade sector. For example, potential effects of exchange rate movements on the price of traded commodities and trade intensity is an important issue,especially for such important export goods like saffron,which is the most important non-oil export product after pistachio in Iran. Generally, in order to improve Iran's share in the saffron international market, it is necessary to know the main factors which influence the price of this product, and one of the most important factors is exchange rate fluctuations. This is a very important issue; however,it has not been much under scrutiny. To the present study, then, was an attempt to fill this gap and examine the pricing behavior in Iran's saffron exporting market through the PTM approach and using panel data over the period 2001-2012 among 12 destination market. In order to achieve this goal, the relationship between export price and exchange rate was analyzed.

Most researches exploring pricing behavior in response to exchange rate movements have been focused on examining the PTM phenomenon in the U.S., Japan and Germany. Anania et al. (1992)

indicated that there is no excess profit in the international wheat market and this claim is consistent with the FAO's survey in this area. Pallet al. (2013) employed the PTM model to probe the pricing behavior in Russian wheat export. They used quarterly data over the period 2002-2010 and 25 export destinations. They used Fixed Effects procedure to estimate the model. Their results showed that Russian wheat exporters exert PTM in a few importing countries. More precisely, the estimated parameter of model showed that Russian wheat exporters can exert PTM behavior for importing countries in which Russia has a large share in total import, arethe single suppliers or haveonly one competitor. Falk and Falk (1998) examined the degree of German exporters mark-up adjustment related to exchange rate changes by using data on bilateral export unit values. They investigated whether PTM is a product-specific or destination-specific phenomenon; therefore, two groups of panel data were used. The first one groups commodities by type and the second one models groups commodities by destinations. Finally, Falk and Falk (1998) concluded that mark-up adjustment and PTM behavior are mainly used in chemical products exporting rather than machinery products. Pick and Park (1991) explored the American wheat export market during 1978-1988 among 8 export destinations. They indicated that American exporters exert price discrimination among their destination. Rakotoarisoa and Shapouri (2001) investigated the market structure of American vanilla beans import market. Using Fixed Effects model for estimation, the results of this study support the PTM theory suggesting that because the US averagely imports over 50% of the supplied vanilla beans, it is able to exert market power and adjust prices along with exchange rate changes. The study of Rakotoarisoa and Shapouri (2001) indicated that incomplete Exchange rate pass through occurs and helps decreaseinternational prices on world markets for agricultural commodities like vanilla, where firms in the importing country have market power. Knetter (1995) organized a theoretical framework to examine export price adjustment to different destination markets in response to exchange rate changes. This method will be comprehensively emphasized in the next section. By introducing this method, Knetter (1995) measured outside and inside competition in export destination markets for German and US linerboard. Warmedinger (2004) have argued that from a monetary policy perspective, for price stabilities, it is important to know the extent to which domestic prices are influenced by foreign price developments and exchange rate movements. He investigated PTM behavior in the Euro area from the importing country's perspective. He concluded that PTM behavior is supported for Germany, France, Italy, and Spain, but not for Netherlands. In addition, he used OLS_CUSUM test to test the stability of the residuals. Generally, there are many studies which support the hypothesis. From among national researchers so farnone has yet explored the role of PTM behavior in saffron export market. Most studies are about relative advantage of Iran in saffron'sproductionandexport. Aghayi and Rezagholizadeh (2011) analyzed Iran's relative advantage in producing saffron in 2008. Using Policy Analyses Matrix (PAM), they concluded that Iran has a high relative advantage in producing saffron in this year. In addition, Iran has competitive power in the world market of saffron. Karbasi and Rastegaripoor (2014) investigated relative advantage of TorbateHeidariyehTownship in saffron producing by using DRC index and PAM matrix and also examinedrelative advantage of this township in saffron exportby using RCA and RSCA. The result of this paper provides convincing evidence forthe existence of relative advantage for saffron productionand saffron export.

MATERIALS AND METHODS

Empirical studies about the ERPT show that in the case of partial or incomplete ERPT, import prices wouldnot respond proportionally to exchange rate changes. Moreover, researchon PTM revealedthat exporters usually use their profit margins to gain from exchange rate movements (Gil-Pareja, 2002).

The theoretical framework used in the current paper is based on whatproposed by

Knetter (1992, 1995). This is derived from the first- order condition of a monopolist selling to different export destination. From this point of view, the optimal export price of the firm to each destination in any period depends on the common marginal cost and the markup of price over marginal cost (which may be common or destination- specific).

As previously mentioned, the optimal response of a firm's export price to changes in currency values depends on different factors. These factors can mainly operate through two mechanisms: (a) the effects the exchange rates have on marginal cost and (b) the impacts exchange rates have on the mark- ups of price over marginal cost.

Price discrimination is usually defined as selling different units of production in different prices. Economists have presented three kinds of price discrimination: First- degree price discrimination, second- degree price discrimination (nonlinear pricing), and third degree price discrimination. Summarily, under first- degree (perfect) price discrimination, the monopolist sells different units of output for different prices and these prices may differ from person to person. Second- degree price discrimination implies the situation in which the monopolist sells different units of output for different prices; however, every person who purchases the same amount of goods pays the same price. Thus, prices differ across the units of goods but not across customers. Finally, third-degree price discrimination occurs when the monopolist sells output to different people for different prices; nevertheless, every unit of output sold to a given person sells for the same price (Varian, 2010).

Krugman (1986) introduced a kind ofthird-degreeprice discrimination which is entitled pricing to market (PTM). "PTM is exchange rate- induced price discrimination and occurs when a change in bilateral exchange rates between an exporter and several buyers changes the ratio of prices paid by the buyer" (Pall et al., 2013). Kurgan (1986) argues that during the depreciation of US dollar, the import prices do not always increase proportionately, and consequently, international relative prices change. This supports imperfect competition; if the exchange rate pass-through is not complete, prices cannot always be equal to marginal cost. This causes the export price to include a destination-specific markup over marginal cost. In other words,exporter determines the price of their products based on the demand features of different importing countries.

The model employed in thisstudy,which has beenfirstly introduced by Knetter (1995), can identify demand parameters without imposing a restrictive assumption about the functional form of cost or demand. This method imposes symmetric response of export prices to marginal cost and exchange rate movements.

This analysis is a partial equilibrium in which producer's action has no effect on the exchange rate. In addition, we supposethat marginal cost of production alters proportionally for exports to each destination.

In the first step, consider a firm which produces commodities for sale in n different destination markets, indicated by i, so the real profit of this firm can be shown as follows:

$$\pi(p_1,\ldots,p_n)=\sum_{i=1}^{n} p_i\, q_t(e_i p_i)-C\Big(\sum_{i=1}^{n} q_i(e_i p_i),w\Big) \quad (1)$$

where denotes the real export price (deflated by the exporter's domestic price level), q is quantity demanded which is a function of relative price in units of the buyer's currency, e is the exchange rate, w indicates the real input price and c (q, w) C (q, w) illustrates the cost function of the firm.

According to the first order condition (f.o.c), for maximizing the seller's profit, the marginal revenue in each market should be equal to the common marginal cost. Thus we have:

$$p_i = C_q\left(\frac{-\eta_i}{-\eta_i+1}\right), \forall i \quad (2)$$

In the above equation, the arguments of C_q are suppressed and η demonstrates the absolute value of the demand's elasticity in the foreign market with respect to changes in price.

Taking the log of (2) and totally differentiating the result with respect to export prices, input prices and exchange rates are obtained as follows:

$$\frac{dp_i}{p_i} = \frac{Cqq\left(\sum q'_j\left(p_j de_j + e_j dp_j\right)\right) + C_{qw} d_w}{C_q} + \frac{\eta_i' e_i p_i}{\eta_i\left(-\eta_i + 1\right)}\left(\frac{dp_i}{p_i} + \frac{de_i}{e_i}\right), \forall i \quad (3)$$

where*=ep displays the price in buyer's currency and suppose (dC_q / C_q) is equal to the total Differential of the logarithm of marginal cost, sothe equation (3) will simplify as follows:

$$\frac{dp_i}{p_i} = (1+\beta_i)\frac{dC_q}{C_q} + \beta_i \frac{de_i}{e_i}, \forall i \quad (4)$$

$$\beta_i = \left(\frac{\frac{\partial \ln \eta_i}{\partial \ln p_i^*}}{(-\eta_i + 1) - \frac{\partial \ln \eta_i}{\partial \ln p^*_i}}\right) \quad (5)$$

we can rewrite the equation (4) the following way:

$$\Delta \ln p_{it} = \gamma_i \Delta \ln c_t + \beta_i \Delta \ln e_{it} \quad (6)$$

where i and t denotes N destination market and T time periods, respectively. Moreover, C_t represents marginal cost. The elasticity of export price with respect to marginal cost is $(1+\gamma)$ and β is elasticity of export price with respect to the exchange rate net of the effect of changes in marginal cost.

In addition, according to Knetter (1995), time dummies can be used with coefficient Θ_t; therefore,this explanation transform the model to a model like this:

$$\Delta \ln p_{it} = (1+\beta_i)\theta_t + \beta_i \Delta \ln e_{it} + u_{it} \quad (7)$$

Itis notable that the term Θt interacts with $(1+\beta i)$ and illustrate the elasticity of export price with respect to marginal cost.

There are several types of models based on the main model of PTM. Not with standing, due to unbalanced data,the linear form of the aforementioned model is used as the most flexible model introduced by Knetter (1995):

$$\ln p_{it} = \beta_i \ln e_{it} + \lambda_i + \theta_t + u_{it} \quad \forall i = 1,\ldots,N \quad t = 1,\ldots,T \quad (8)$$

where:

P_{it}: saffron export price in Iranian IRRto importing country iin period t.

e_{it}: the destination- specific exchange rate expressed as units of the domestic currency in Iranian IRR.

λ_i: Country effect.

Θ_t: illustrates the time effect.

u_{it}: represents the error term.

Due to the logarithmic form of the model, the parameter β_i measures the elasticity of the local currency export price with respect to the exchange rate.

In sum, Knetter (1995) argued that in the competitive market, structure changes in the bilateral exchange rate have no impact on bilateral export price. In other words, export prices are the same across all destinations and there is no price discrimination. i.e. λ_i=0 and β_i= 0, this scenario also refers to the imperfect competition if price includes a common markup over marginal cost (Pall et al., 2013). To sum up, imperfect competition and price discrimination will exist if the estimated parameters (β and λ) are statistically different from zero.

The different scenarios of the relationship between estimated parameters and market structure are shown in Table 1.

Due tothe structure of the PTM model,cause to use panel data is used to estimate the proposed model. In this study, the existence of price discrimination in Iranian saffron export market is analyzed during 2001-2012 and across 12 destination importing countries including: Argentina, Bahrain, Canada, India, Oman, Saudi Arabia, Singapore, Sweden, Switzerland, United Arab Emirates, United Kingdom, and the United States.

The exchange rate data for the sample countries have been derived from World Bank and the export price of saffron taken from Tehran chamber of commerce and industries and mines.The model is estimated by using Fixed Effects model. Due to the lack of data, our data set covers 12 years.

Table1
Different Scenarios Relating To the Estimated Parameters

λ	β	Market structure
non-significant	non-significant	Perfect competition, imperfect competition with common markup
Significant	non-significant	Constant elasticity of demand> constant markup, which can differ across countries
non-significant/ significant	Significant	Carrying elasticity of demand > varying markup, which can differ across countries
	Positive	Amplification of exchange rate effects
	Negative	Local currency price stability (LCPS)> PTM

.Adapted from Pall et al., 2013, p: 181.

Model Estimation

In this section, unit root tests are carried out for the variables studied. These results are shown in Table 2 below. As shown by the table, it can

Table 2
The Results of Unit Root Tests

Unit root tests/ vaiable	Ln p	Ln e
Levin, Lin and chu	-11.524	-8.041
	0.006	0.000
Im, Pesaran and Shin	-8.555	-5.081
	0.000	0.002
ADF- Fisher	105.151	66.098
	0.003	0.000
PP- Fisher	104.624	77.038
	0.000	0.000

Table 3
The Results of Model Estimation

	λi	iβ
Argentina	-581.86*	*-093.10*
	(-331.6)	(-519.7-)
Bahrain	-530.28*	-889.4*
	(-103.4)	(-410.6)
Canada	-325.24*	-427.4*
	(-023/4)	(-686.6)
India	-433.69*	-407.8*
	(-088.5)	(-263.6)
Oman	-617.63*	-052.10*
	(-000.6)	(-480.7)
Saudi Arabia	-644.23*	-461.4*
	(-746.3)	(-523.6)
Singapore	-021.26*	-800.5*
	(-747.3)	(-060.6)
Sweden	-946.61*	-461.8*
	(-010.5)	(-303.6)
Switzerland	-856.65*	-407.8*
	(-065.4)	(-054.5)
United Arab Emirates	-015.51*	-464.8*
	(-805.4)	(-306.6)
United Kingdom	-986.42*	-994.10*
	(-423.4)	(-073.6)
United States	-815.0	045.1*
	(-350.0)	(221.7)

* denote statistical significance at the 1% levels

be concluded that both variables are stationary.

The results of the model estimation are summarized in Table 3 below. As can be seen, the country effect (λ_i) for each destination is significant except for the United States. Furthermore, the exchange rate coefficient is significant for all countries in the sample studied. Therefore, according to the statistics reported in Table1, it is obvious that the hypothesis of the existence of competitive market is rejected, and this provides solid evidence for the view that price discrimination is already applied by Iranian exporters when it comes to saffron market. Nevertheless, the parameter λ_i is not significant for the United States, but because the parameter β_i is significant, it is believed it had no effect on the results.

In addition, for all importing countries, the exchange rate coefficient is negative, implying that saffron exporters stabilize local currency price.

These results are consistent with the fact that Iran is the greatest producer of saffron in the world (Trade Promotion Organization of Iran, 2013).

Indeed, because Iran has market power in saffron market and has a major share of the world saffron export market, it is rational to argue that price discrimination is to be applied across importing countries.

CONCLUSION

One of the most important actions taken to reduce dependenceon oil revenue is to promote non-oil exportsand their revenues. Recently agricultural and traditional products have had the major share of non- oil export. (The Islamic Republic of Iran Customs Administration, 2013).

On the other hand, over the past decades, Iran's exchange rate has had many fluctuations and these fluctuations that exchange rate movements are believed to affect both macro and micro variables. For instance, these changes can effect export price of different products. Since Iran is the greatest producer of saffron, it seems necessary to analyze pricing behavior in Iran's saffron export market. Accordingly, the PTM model was employed to reach this goal. The notion of PTM implies that sellers reduce markup for those buyers whose currency value decreases against the exporters 'currency value.

This study has investigated the pricing behavior in saffron export market across 12 destination markets over the period 2001-2012. Using Fixed Effects model, the results of current study suggest that Iranian saffron exporters exert price discrimination so as to increase their profit.

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