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Measuring the Market Power of the Banana Import Market in Turkey

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Abstract: Banana production in Turkey represents a small fraction of that required to meet domestic consumption. Domestic consumption totaled 188,000 t in 2000, whereas production amounted to just 64,000 t, or 34% of consumption. The gap between consumption and production is made up by imports and 5 multinational firms control the flow of more than 80% of the global banana trade. Given this firm dominance in the world trade of bananas, oligopoly theory would suggest the presence of underlying structural forces that could facilitate price-enhancing market power. As such, this study develops an integrated trade and new empirical industrial organization (NEIO) model of the banana trade and this model is estimated econometrically to derive the degree of market power in the Turkish market for banana imports. The 1984-2000 data period is used and the model's results yield a market power parameter of 0.19. This result shows that the banana import market in Turkey is not perfectly competitive, but that the behavior of firms is much closer to price-taking than to collusion.

Key Words: market power, banana import market, new empirical industrial organization, international trade, Turkey

Türkiye Muz İthalatında Pazar Gücünün Belirlenmesi

Özet: Türkiye'nin muz üretimi iç tüketimin küçük bir oranını karşılamaktadır. 2000 değerleriyle tüketim 188,000 t civarında iken üretim 64,000 t olarak gerçekleşerek toplam tüketimin ancak % 34'ü karşılanmıştır. Tüketim ve üretim arasındaki bu fark ithalat yoluyla karşılanmakta olup uluslararası beş firma dünya muz ticaretinin % 80'ini kontrol etmektedir. Bu firmaların dünya muz ticaretindeki etkinliği dikkate alındığında, oligopol teorisi belli başlı yapısal güçlerin varlığının pazar gücünü artırıcı etki yapabileceğini ileri sürmektedir. Bu çalışmada, muz ticareti için dış ticaret ve Yeni Endüstriyel Organizasyonu bütün olarak dikkate alan bir model geliştirilmiştir. Bu model ile Türkiye muz ithalatı pazarındaki pazar gücü derecesi ekonometrik olarak hesaplanmıştır. 1984-2000 dönemi verileri kullanılmış ve araştırma dönemi için pazar gücü katsayısı 0.19 olarak bulunmuştur. Bu sonuç, Türkiye muz ithalatının tam rekabet koşullarında gerçekleşmediğini ancak firmaların davranışlarının tam rekabet koşullarına, monopolden daha yakın olduğunu ortaya koymaktadır.

Anahtar Sözcükler: pazar gücü, muz ithal pazarı, yeni endüstriyel organizasyon, uluslararası ticaret, Türkiye

Introduction

Bananas are the fifth largest agricultural commodity in world trade; they are exceeded only by cereals, sugar, coffee and cocoa. Bananas are produced in more than 120 countries, but just 6 of these countries -- India, Brazil, Ecuador, Philippines, China and Indonesia -- account for 63% of total production. Despite this high concentration of production, just 21% of the annual 68 million t of bananas and plantains are traded on the world market. Most of this trade originates from Latin America and the Caribbean, as banana exports provide a crucial source of income for these countries. More specifically, Ecuador, Costa Rica and Colombia account for more than 55% of total banana exports. On the import side, the United States, the European Union (EU) and Japan represent the largest import markets. Respectively, these

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countries account for 29, 23 and 7% of all imports (FAO, 2001).

In addition to a high concentration of banana trade among a few countries, this trade is also highly concentrated among a few multinational firms. United Brands (Chiquita) and Standard Fruit (Dole) account for roughly 50% of world trade in bananas, and a third firm, Del Monte, accounts for another 15%. Two other companies with relatively large market shares are Noboa and Fyffes, controlling about 18% of the banana trade. Given the positive relationship economists generally posit between concentration and market influence, the aforementioned banana firms are expected to exhibit some market power in both exporting and importing countries. Based on economic theory, these firms are likely to have some influence on the extent to which producer countries compete with each other, the extent to which governments accept tax impositions and tariff preferences, the ease or difficulty with which loans are extended, and the extent to which policy initiatives are developed for social and environmental deregulation (Dixit, 1984; Brander and Spencer, 1985).

Multinational firms are also likely to have some influence on the implementation of food and trade policies. Chiquita, for instance, filed a complaint against the banana import regime of the EU, and the United States was instrumental in directing this case to the World Trade Organization. Much of the success of multinational banana firms is undoubtedly related to their organizational structure. These firms are integrated vertically up the chain, either owning or contracting with plantations. Furthermore, these firms own sea transport and distribution networks in importing countries (Chambron, 1999). This type of organizational structure is typically associated with economies of scale in production and the firms involved are likely to face an environment that is conducive to the exercise of market power in the banana trade.

Market competitiveness for banana imports in Turkey is an interesting area of study because banana production has shown extraordinary growth over the past 2 decades. From 1984 to 2000, banana production in Turkey significantly increased, rising from 35,000 to 64,000 t -- an increase of nearly 83% (SIS, 2000). Even though Turkey has experienced a substantial increase in banana production, it is still far below domestic consumption. As an illustration of the growing gap between domestic production and total banana consumption, banana imports have risen from $22,000 in 1984 to $49 million in 2000. These rising imports have not resulted just from population growth, as per-capita consumption of bananas has risen during this same period from 0.6 to 2.0 kg (FAO, 2001). Since Turkey has suitable climatic conditions for banana production in the Mediterranean region, the Turkish government has been implementing policies to protect producers. For example, the government increased import taxes for bananas during 2002 from 119% to 149% (EXPCT, 2002).

This study seeks to extend trade analysis work by providing an empirical estimate of market competitiveness for banana imports in Turkey. Some related work on the banana trade includes a study by Borrell (1994) in which he analyzed the EU banana import regime and derived welfare changes under different policy scenarios. Read (1994) studied the importation of bananas into the German market and he concluded that the market is dominated by a few multinational firms that enjoy scale economies in refrigerated shipping and distribution. Deodhar and Sheldon (1995) derived an empirical estimate of market power in the German banana import market and they concluded that the market is imperfectly competitive.

The main objective of this study is to develop and estimate a structural econometric model of market power in the banana import market of Turkey. Once estimated, the model is expected to yield price, income and production elasticities for bananas as well as a set of results that can be used to determine the impact of import prices on retail prices. Given the high concentration of the world banana trade and the rising value of banana imports in Turkey, these results are likely to be of interest for at least 2 reasons. First, this paper applies the new empirical industrial organization (NEIO) methodology, a methodology that has gained acceptance for market power studies, and therefore the results derived will provide further empirical verification of the methodology as well as shed insight on the behavior of multinational firms engaged in Turkey's banana trade. Second, the results derived are likely to prove crucial for assessing the degree of competitiveness of banana imports and for determining the feasibility of existing trade and agricultural policies.

Material and Model Development

Dixit (1984) has provided a theoretical framework for trade under an imperfectly competitive market structure and several economists have used this framework to derive empirical estimates of market power in trade (Lopez and You, 1993; Buschena and Perloff, 1991; Karp and Perloff, 1989; Deodhar and Sheldon, 1995). A fundamental characteristic of these studies is their application of the partial equilibrium framework from NEIO theory to trade analyses. Interestingly, Dixit's theoretical analyses provided a foundation for the integration of trade theory with industrial organizational theory. Given imperfectly competitive markets, Dixit argued that factors such as economies of scale and scope, entry barriers, marginal cost differences, product differentiation and strategic interaction become just as relevant for trade analyses as they are for industry analyses. Indeed several economists have developed theoretical models of trade that analyze the effects of one or more of these factors (Brander and Krugman, 1980; Brander and Spencer, 1982; Krugman, 1982; Krishna, 1983). A major contribution of these models has been their ability to show the feasibility of trade under conditions unrelated to comparative advantage.

Although NEIO methodology is employed in this study, it is of interest to note that this approach emanated from concerns about the methodological soundness of an earlier approach, known as the structure-conduct-performance (SCP) method. Much of the improvement in methodology is related to the fact that NEIO focuses on a single industry or market, whereas SCP focused on cross-section studies of many industries or markets. Further, the methodological roots of SCP called for marginal cost data, but practical applications of the approach required the substitution of proxy measures for marginal cost and other performance measures. Some of these measures included average cost, accounting profits, price-cost-margins and Tobin's Q. Regardless of the measure used, a fundamental weakness of SCP studies was their attempt to establish a linkage between structure and performance with cross-sectional data. Economic theory, however, suggests that causality between structure and performance can be established only with time series data (Bresnahan and Schmalensee, 1987).

As developed by Bresnahan (1982), the NEIO approach allows one to analyze the extent of market power in a market within a demand and supply framework. Typically, a demand equation, a marginal cost equation, and an optimality equation representing the equilibrium of marginal revenue and marginal cost are specified and estimated as a simultaneous system. Market power is identified by examining the change in the price-cost relationship from one equilibrium position to another. Critical to the determination of the market power parameter is the statistical significance of the variable, which rotates either the demand function or cost schedule. Profit maximization is an underlying assumption of the model, although the estimated market power parameter measures the amount of market power exercised by firms (Perloff, 1991). In a nutshell, the NEIO approach uses firm or aggregate level data, integrates microeconomic theory with structural econometric models, and develops measures of market power based on the price and quantity decisions of firms.

Although alternative specifications have been used to measure market power or other market structure relationships over the past 2 decades, this study extends the approach of Bresnahan (1982). Market demand in an industry is considered to be one in which n firms produce a homogeneous product (q_1, q_2,...q_n) and industry output is

$$Q = \sum_{i=1}^{n} q_i .$$

With industry as the unit of analysis, the market demand equation is given by the implicit function

$$Q_t = Q(P_t, Z_t), \qquad (1)$$

where Q_t is the total quantity demanded, P_t is the price of output, Z_t represents all exogenous variables affecting demand such as income and prices for substitute products, and t is a time subscript. Due to simultaneity between P_t and Q_t, the inverse demand function can be expressed as $P_t = P(Q_t, Z_t)$. Industry revenue is defined as $R_t = P_t * Q_t$ and, thus, perceived marginal revenue $\{MR_t(\lambda)\}$ can be written as

$$MR_t(\lambda) = P_t + \lambda Q_t [dP_t/dQ_t], \qquad (2)$$

where λ is defined as an index of the degree of market power -- the gap between market price and industry marginal cost. Bresnahan (1982) and Perloff (1991) argue that λ will range from 0 for perfect competition to 1 for monopoly. Alternatively, the market power parameter, λ, can be interpreted as a conjectural variation that describes how firm 1 conjectures that other firms will vary their output choices when firm 1 makes a

small change in its output. In equilibrium, marginal revenue will equal marginal cost and this relationship can be written as

$$P_t + \lambda Q_t[dP_t/dQ_t] = MC. \quad (3)$$

If λ is estimated to equal zero, equation 3 becomes the profit-maximizing condition that price must equal MC and MR. Thus, firms in this industry would be characterized as exhibiting either Bertrand-Nash or competitive behavior. If firms demonstrate perfectly collusive behavior in an industry, λ would take on a value of 1.

We use the aforementioned concepts to estimate the degree of imperfection in the Turkish banana import market. To estimate the market power parameter, λ, an optimality equation that represents the equilibrium of marginal revenue and marginal cost is specified. To continue with the estimation procedures, a functional form for industry demand and aggregate marginal cost is selected. For banana imports, the demand function is assumed to be linear and it is expressed as

$$IMPQ_t = \beta_0 + \beta_1 P_{rt} + \beta_2 I_t + \beta_3 PCB_t + \beta_4 Q_t + \beta_5 LIMPQ_{t-1} + e_{lt} \quad (4)$$

where $IMPQ_t$ is the total quantity of bananas imported into Turkey (tons year^{-1}); P_{rt} is the retail price of bananas (TL tons^{-1} year^{-1}); I_t is the annual per-capita income ($); PCB_t is per-capita consumption of bananas (kg year^{-1}); Q_t is the banana production of Turkey (tons year^{-1}); $LIMPQ_{t-1}$ is the lag quantity of bananas imported (tons year^{-1}); and e_{1t} is the error term that is normally distributed with mean μ and variance σ^2. The marginal cost (MC_t) equation is specified as

$$MC_t = \alpha_0 + \alpha_1 P_{it} + \alpha_2 T, \quad (5)$$

where P_{it} is the import price of bananas, representing a proxy for the cost of bananas to retailers; and T is a time trend variable expressed as 1,2,3,...n. This variable is included in the marginal cost equation to try and capture changes in marginal costs that may arise from technological advances in transportation, storage, etc. A similar functional form of marginal cost was also used by Deodhar and Sheldon (1995). Substituting the marginal cost function (5) into equation (3) and making the necessary substitution of $IMPQ_t$ for Q_t and P_{rt} for P_t, we get the optimality equation

$$P_{rt} = \alpha_0 + \alpha_1 P_{it} + \alpha_2 T + \alpha_3 IMPQ_t + e_{2t} \quad (6)$$

As expressed, $\alpha_3 = -\lambda\,[dP_{rt} / dIMPQ_t]$ and e_{2t} is N (μ, σ^2). Rewriting equation (4) in inverse form and taking the derivative of this equation with respect to $IMPQ_t$, we derive $[dP_{rt} / dIMPQ_t] = 1/\beta_1$. Further, substituting $1/\beta_1$ for $[dP_{rt} / dIMPQ_t]$ in the α_3 expression, we derive $\lambda = -\beta_1 * \alpha_3$.

To derive the market power statistic of interest (λ), regression equations (4) and (6) are estimated with annual data over the period 1984-2000. These data were collected from several sources. Retail price data for bananas were obtained from the SIS Retail Price Statistics (SIS, 2001a). Data related to the aggregate quantities of bananas imported into Turkey, the import price of bananas, per-capita banana consumption and banana production for Turkey were collected from the Food and Agriculture Organization (FAO, 2001). Data on per-capita income are taken from the SIS Basic Economic Indicators (SIS, 2001b). All nominal variables involving prices and income were deflated by the consumer price index and a gross national product deflator, respectively.

Results and Discussion

To measure the degree of imperfection in the Turkish banana import market, equations (4) and (6) are estimated based on annual data for the period 1984-2000. Since these equations represent a simultaneous equations system with $IMPQ_t$ and P_{rt} being determined simultaneously, we estimated the system of equations using two-stage least squares (2SLS), where the exogenous variables used were import price, per-capita banana consumption, banana production, lag quantity of banana import, per-capita income and time trend. In addition, we employed three-stage least squares (3SLS) estimation; however, no significant improvement over the 2SLS results was observed. All estimations were carried out using Shazam 8.0 software. The parameter estimates, their t-ratios and other statistics are given in Table 1.

The overall model is plausible in terms of R^2, the standard error of estimates and the statistical significance of individual parameters. The R^2 values of demand and optimality equations are 0.96 and 0.82, respectively. Looking at the demand equation, the Durbin-h statistics of 1.44 lies within ±1.96 at the 5% significance level. Hence, the null hypothesis of no first-order autocorrelation cannot be rejected. However, the Durbin-Watson ratio lies in an inconclusive range for detecting

Table 1. Two-stage least squares estimation results.

Demand Equation	Coefficient	t- Ratio	Elasticity
Intercept	20255	0.90	
Retail price of bananas (P_{rt})	-498	-2.02*	-0.31
Per-capita income (I_t)	17.97	1.99*	0.54
Per-capita banana consumption (PCB_t)	44852	5.62*	0.66
Banana production (Q_t)	-0.99	-1.69**	-0.42
Lag quantity of banana imports ($LIMPQ_{t-1}$)	0.29	2.89*	0.26
R-Square	0.96		
Durbin-h	1.44		
Optimality Equation			
Intercept	20.63	2.81*	
Import price (P_{it})	1294	3.64*	0.41
Import quantity ($IMPQ_t$)	0.39E-03	4.15*	0.62
Time trend (T)	3.05	3.17*	0.76
R – Square	0.82		
Durbin-Watson	2.32		
System R – Square	0.99		

Note: * Indicates significance at 5% level. ** Indicates significance at 10% level.

the existence of autocorrelation. For this reason, a nonparametric runs test was applied to test autocorrelation in the optimality equation (Gujarati, 1995). The runs test results showed that there is no first-order autocorrelation at the 95% confidence level.

As shown in Table 1, all the parameters have the expected signs, and they are statistically significant. The price elasticity for the retail price of bananas is –0.31, implying that a given change in price will result in a less than proportionate change in quantity imported. One of the determinants of banana imports, per-capita income, was statistically significant with an elasticity of 0.54. This elasticity measure suggests that banana imports into Turkey increase at a rate less than proportionate to income changes. The results also show that increased per-capita banana consumption leads to increased banana imports; this is expected since banana production is insufficient to meet domestic demand. Another important variable that affects banana imports is domestic banana production. Economic theory suggests that increased banana production should lead to a reduction in banana imports. Empirical results support this theoretical construct as shown by the production elasticity of -0.42, implying that a 10% increase in banana production would lead to a 4.2% decrease in banana imports. Lagged quantity of banana import was included in the demand equation to capture import dependency within Turkey. The coefficient of this variable has a positive sign and it is statistically significant, suggesting that the import dependency for bananas increased for the relevant period. Because a large percentage of Turkey's banana consumption is imported, it was hypothesized that the retail price would be directly related to changes in the import price, and this relationship is confirmed by the positive sign and statistical significance of this parameter in the optimality equation. In addition to its positive sign and statistical significance, this parameter has an elasticity of 0.41, indicating a change in the retail price smaller than the change in the import price. The positive sign for the trend variable in the optimality equation shows an upward movement of the retail price of bananas during the 1984-2000 period.

Although the aforementioned discussion of the empirical results is insightful, a key component of any market power study involves the market power parameter, λ. An earlier discussion showed that this parameter involved both β_1 and α_3, and these values are shown in Table 1 to be β_1 = -498 and α_3 = 0.39E-03. Critical to the determination of λ, of course, is the statistical significance of these parameters, as shown in Table 1. With $\lambda = -\beta_1 * \alpha_3$, the market power parameter for this market is λ = -(-498)*(0.39E-03) = 0.19. On a

continuum from competition to monopoly, the results suggest that the banana import market in Turkey is closer to competition than to monopoly. This was somewhat unexpected, given the fact that the banana world market is dominated by a few large international firms. Stated differently, increased concentration of banana exports among a few companies has not resulted in an excessive amount of monopoly power. This result might stem partly from recent actions by the Turkish government to impose high import taxes to protect domestic producers. Indeed, higher import taxes have led to a decline in the value of banana imports from $49 million in 2000, to roughly $16 million in 2001. Moreover, this protection of domestic producers through taxes has led to an increase in banana production. Over the past 3 years (1999-2002), banana production in Turkey has more than doubled, from 34,000 to 70,000 t. All these factors have undoubtedly played a role in reducing the market power of multinational banana firms in the Turkish banana market.

Another factor that may have influenced the empirical results is improved cost efficiency for the firms involved in banana exports. All of the banana firms involved in exports are vertically integrated along the many stages of the banana marketing chain, and, given the imperfect competitiveness along this marketing chain, it is quite conceivable that these firms gained some cost efficiency. Indeed, a study by Read (1994) points to significant gains in economies of scale for banana export firms at the refrigerated shipping and distribution channel. Of course, a factor that could have significantly enhanced the exercise of market power is product differentiation, but insufficient data did not allow us to capture this aspect of the banana trade. Nevertheless, the estimated λ value suggests that the import price of bananas is higher than would normally exist and this means that consumers are paying higher prices because of imperfect competition in this market. These results are consistent with prior studies. Deodhar and Sheldon (1995) reached a similar conclusion in their study of the German banana import market.

Conclusions

Banana consumption in Turkey is highly dependent on imports, and imports have experienced significant growth over the past 2 decades. These imports come from a concentrated market that is controlled by a few multinational firms. To try and gain an understanding of the impact of this high concentration on banana prices, this study has applied the NEIO paradigm to the Turkish banana market. The empirical results were derived with data for the 1984-2000 period and, while these results show less than perfectly competitive pricing behavior, the observed pricing behavior is closer to competition than to collusion. Furthermore, the findings of this study show several variables to have a significant impact on import quantity. Included among these variables are the retail price of bananas, banana production and per-capita income. The implication of these findings for the Turkish banana market is that the import price of bananas is higher than what would exist if the market operated under perfectly competitive conditions. To sumup, the banana exporting firms are exercising some market power, but not in proportion to their control over market supplies.

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