

FACTORS AFFECTING THE IMPORT DEMAND OF WHEAT IN TURKEY

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Abstract

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This study analyzed the factors affecting import demand for wheat during the period 1984-2006 by using double logarithmic-linear function. Turkey's import demand for wheat was specified as a function of domestic prices, gross national product per capita, Turkish lira-US dollar exchange rate, and lagged import, production value of wheat, domestic demand and trend factor. Data covering 1984-2006 periods were used to carry out to the study. The results have been shown that a change of domestic wheat prices is strongly affective on the wheat import demand and Turkish consumers would rather purchase domestic wheat than import wheat gradually.

Key words: Import demand, wheat, using double logarithmic-linear function, Turkey

Introduction

Wheat is an important commodity and is consumed by households in almost all countries in several forms (bread, pasta, breakfast cereals, chapati, and bakery products) (Gómez-Plana and Devadoss, 2004). World wheat consumption in 2007 was about 609 million metric tons (IGC, 2008). Wheat is also widely produced across the world. Total world wheat production was 603,7 million tons in 2006. China (104,47 million tons) was the largest producer of wheat in 2006, followed by the EU-27 (126,12 million tons) and the United States (57,3 million tons). Other major wheat-producing countries are India, Russia Federation, Canada, Pakistan and Turkey (FAO, 2007).

In 2007, about 110 million tons wheat was traded in the world wheat market (IGC, 2008). Because of the concentration of wheat production in a few countries, a large volume of wheat is traded in the world market (Koo and Taylor, 2008). Major exporting countries are the United States, Canada, the EU-27, Australia, and Argentina. Major importing countries are North Africa countries, Middle East, North East Asian countries (FAO, 2007).

Wheat is considered to be the principal agricultural crop in Turkey. Total cultivated area in Turkey is 22.13 million ha and 78.81% of it is cultivated field area (17.44 million ha) (TURKSTAT, 2008). Wheat is grown on 9.3 million ha in Turkey. Total production of wheat is 20.01 million metric tons and the yield is

2151.61 kg/ha (FAO, 2006). Besides, in the last years, domestic wheat faced many production and marketing problems because of increasing demand, fluctuating supplies, small scale inefficient farm structure, low productivity and quality of wheat.

Turkey joined the WTO with developing country status and established high bound-tariff rates. In addition to tariffs, Turkey employs non-tariff barriers including import licensing (seasonal bans on imports by failing to issue licenses), and the implementation of restrictive phytosanitary regulations to protect domestic grain producers. While Turkey agrees with the U.S. WTO position on reductions to domestic support and export subsidies, Turkey does not support reductions in market access (tariffs). Turkey feels that high tariffs are the only means available to protect and support its domestic agricultural sector. The Turkish Grain Board (TMO) remains active in the domestic grain market, and plays an important role in efforts to limit competitive imports – especially for wheat, barley, corn and rice (USDA, 2004). Cereal prices in Turkey are supported by an intervention price system, tariffs, and export subsidies. Intervention prices vary from year to year according to the political situation and the phase of the election cycle (Grethe, 2004). The TMO acts as a market regulator and announces annual procurement prices for all grains. TMO will buy grains at these prices from producers who are not able to obtain higher prices on the commercial market. TMO uses its position to monopolize imports of certain commodities in order to help control domestic prices (USDA, 2004).

Import demand analysis was studied in earlier studies. Lee et al. (1994) tried to determine Japanese import demand for wheat differentiated by type and country of origin and to evaluate implications for U.S. wheat exports. The AIDS model was used to estimate Japanese wheat import demands. Tanyeri-Abur and Rosson (1998) analyzed the impacts of factors on import demand for dairy products in Mexico. They used to estimate import demand function real income, real exchange rate, lagged imports of products and time trend. The most important findings of the study were not predicted future import quantities, but the

elasticity of income and real exchange rate elasticity were similar. Veeman et al. (2004) focused on the demand for meat and the market vulnerabilities that apply to four selected Asian markets (Japan, South Korea, Indonesia and Singapore) that are of potential importance to meat exporters.

Mao et al. (1997) studied wheat import demand in the Japanese Flour Milling Industry. Translog cost function was used to analyze import demand for wheat. Results indicated that US wheat strong competition in the Japanese wheat market, but its multiple classes and end-use characteristics enable the US to preserve the largest market share in Japan. Njonou et al. (2002) used a corrected likelihood ratio to verify weak separability between the three common wheat classes or qualities in import demand on French market using two popular demand models that are AIDS and Rotterdam. According to the results, a specific price or tariff policy can be apply to the hard red wheat quality without having a direct impact on the demand of other wheat qualities. Ramirez et al. (2003) focused on estimating import demand in the Mexican cheese market. Andino and Kennedy (2004) studied an import demand analysis of Honduran Coffee. They found out a significant response of Honduran coffee sales to changes in importers' incomes and import prices.

In Turkey, few studies carried out import demand analysis for various agricultural products. Goktolga (2006) studied import demand for meat and products, Kizilaslan and Kizilaslan (2006) focused on import demand for vegetable oil and products industry; Karkacier (2000) analyzed factors affecting import demand for dairy products, Hatirli et al. (2002) examined import demand for sunflower and soybean oil, Thomakos and Ulubasoglu (2002) studied on econometric estimates of import demand elasticity's for Turkey for the period 1970-1995 using disaggregated. To capture most of the variation of the explanatory variables (import prices, domestic prices and expenditures) with the instruments, they selected the exogenous variables from the three largest trading partners of Turkey for each product group (aluminum, coal, wheat). Grethe (2004) analyzed quantitatively the inclusion of all agricultural products in the CU between

Turkey and the EU. In order to analyze the impact of such price changes on production, consumption, trade, and welfare, a partial equilibrium model of the Turkish agricultural sector, he developed TURKSIM (Turkish Simulation Model).

In this study it was aimed that were to determine the factors affecting import demand for wheat in Turkey during the period 1984-2006.

The study is presented in four parts. Section I presents an introduction. Section II covers data sources and methodology. Section III is empirical results and discussion. And section IV includes the conclusion.

Materials and Methods

In this study, data covering 1984-2006 periods were used to carry out to the study.

Until the early 1980s Turkey was a fairly closed economy. At that time – as part of more wide-ranging economic reforms – the trade policy of protection and import substitution was replaced by a much more open trade regime (Togan, 2005). Policy changes in 1984 re-structured the economy and increased the outward-orientation further in Turkey. The country experienced a fundamental structural change and rapid economic growth during the period 1984-1991. This stage of major policy changes started with additional reforms in the trade and balance of payments regime. The January 1984 import program established lists containing a large number of importable goods: specifically, Turkey switched to a negative list in 1984 as compared to the positive list that prevailed before, meaning, the new lists specified those non-importable goods whereas previous lists only had importable commodities. This step towards openness was supplemented with lower tariff rates and import duties as well as with simpler import procedures (Thomakos and Ulubasoglu, 2002). Because of this major policy changes, time series period was taken 1984-2006.

Data of import value were collected Food and Agriculture Organization (FAO, 2007). Gross national product per capita was obtained from the Basic Economic and Social Charts of State Planning Organiza-

tion (SPO, 2007). Data of domestic prices, domestic production and demand were obtained from Turkish Statistical Institute (TURKSTAT, 2007a; 2007b). Data of Turkish YTL-US \$ exchange rate were obtained from Central Bank of the Republic of Turkey (CBRT, 2007). In the study, real domestic prices of wheat were calculated by using wholesale price index (1987=100).

Import demand functions have traditionally included a relative price variable, real income, and dummy variables to account for unusual periods such as devaluations or policy changes. The relative price measure is often the ratio of the import price to the domestic price index for the commodity adjusted for the exchange rate, which gives a measure of the real exchange rate (Tanyeri-Abur and Rosson, 1998).

Turkey's import demand for wheat was specified as a function of domestic prices, gross national product per capita, Turkish lira-US dollar exchange rate, and lagged import, production value of wheat, domestic demand and trend factor.

The response model is expressed in general form as:

$$ID_t = f(PW_t, GNP_t, EX_t, ID_{t-1}, PV_t, DD_t, T) \quad (1)$$

The variables in the empirical model of equation were defined in Table 1.

In the study, a Turkey import demand model was specified, the parameters were estimated, results were presented and conclusions were drawn. Time series data were used in the regression analysis. In estimating import demand schedules of agricultural products, most works have followed a regression analysis by using double logarithmic-linear function (Goktolga, 2006; Kizilaslan and Kizilaslan, 2006; Karkacier, 2000; Tanyeri-Abur and Rosson, 1998; Othman et al., 1995).

A commonly used form of regression model is the double logarithmic-linear model as in equation 2 and 3 (Greene, 2000; Gujarati, 1995):

$$\ln y_t = \ln \alpha + \sum_t \beta_t \ln x_t + \varepsilon \quad (2)$$

or

$$\ln y_t = \alpha_1 + \alpha_2 \ln x_{t2} + \alpha_3 \ln x_{t3} + \dots + \alpha_k \ln x_{tk} + \varepsilon_t \quad (3)$$

One important feature of the double log-linear model, which has made it popular in applied work, is that the slope coefficient α_1 measure the elasticity of y with respect to x_1 , that is percentage change in y for given (small) percentage change in x_1 (Judge, 1996; Gujarati, 1995).

The functional form was preferred double log-linear as specified in equation 4:

$$\ln ID_t = \alpha_1 + \alpha_2 \ln PW_t + \alpha_3 \ln GNP_t + \alpha_4 \ln EX_t + \alpha_5 \ln ID_{t-1} + \alpha_6 \ln PV_t + \alpha_7 \ln DD_t + \alpha_8 \ln T + \varepsilon_t \quad (4)$$

represent elasticity since the double-log linear function was used in estimation. Since equation (4) is expressed in terms of natural logs of the variables, estimates for the parameters result in direct elasticity.

The real domestic prices of wheat (PW_t), the gross national product per capita (GNP_t), Turkish lira-US dollar exchange rate (EX_t), the production value of wheat (PV_t), the domestic demand value of wheat (DD_t), the trend factor (T) were found statistically significant at the level of 1%. The lagged import variable for wheat (ID_{t-1}) was not statistically significant.

Table 1
Definitions of model variables for Turkey's import demand of wheat

| Variable name | Variable definition |
|---------------|---|
| ID_t | The value for the amount of import demand for wheat (Thousand \$) |
| PW_t | The real domestic prices of wheat (1987=100 WPI was used for calculate real prices) |
| GNP_t | Gross national product per capita during t period (\$) |
| EX_t | Turkish lira-US dollar exchange rate during t period (TL/US\$) |
| ID_{t-1} | The value for the amount of lagged import for wheat (Thousand \$) |
| PV_t | The production value of wheat (Thousand \$) |
| DD_t | The domestic demand value of wheat (Thousand \$) |
| T | The trend factor (1, 2, 3, ...23), $n = 23$ |

Results and Discussion

Results of the estimation for wheat import are given in Table 2. As per Table 2, the equation has high R-square (R^2) (0.935). The value showed that 93.5% of variability in the import demand for wheat was explained by estimated model.

The Von Neumann (v) statistical test was used to check if there was autocorrelation in time serial, for the analyses of time serial and the use of lagged variable in the model antail testing the existence of the serial correlation (Judge, 1996). The Von Neumann value for wheat equation was 1,569 which also ruled out the existence of serial correlation at 1% significant level ($v_{value} = 1.569$, $k = 7$, $n = 23$; critical values; $v = 1.146$ $v^* = 3.04$ $v < v_{value} < v^*$).

The coefficients of variables in log form also rep-

One of the most important factors affecting the import demand for wheat in Turkey is its real domestic prices. The size of coefficient for PW_t was 3.476 ($e=3.476$), which indicates that an increase in real domestic prices of wheat by one unit would be associated with an increase of the value for the amount of imported wheat by 3.476 units. Cross-prices elasticity were greater than zero, suggesting that the import demand for wheat is sensitive to prices of domestic wheat. On the other words, Turkish consumers would rather purchase domestic wheat than import wheat gradually in Turkey, because import prices are more advantageous than domestic prices. Until the recent years, wheat price was mainly determined by the government. As a result of the agreement with World Trade Organization, government's effect on wheat price has been rapidly decreased for the last few years (Gul et

Table 2
Regression results of Turkey's import demand for wheat, double logs

| | Coefficient | t-ratio | p-value | SD |
|------------|-------------|---------|---------|-------|
| Constant | 14.860 | 2.25 | 0.04 | 6.600 |
| PW_t | 3.476 | 3 | 0.009 | 1.157 |
| GNP_t | 3.986 | 2.85 | 0.012 | 1.397 |
| EX_t | 0.198 | 2.77 | 0.014 | 0.071 |
| ID_{t-1} | 0.062 | 0.91 | 0.376 | 0.068 |
| PV_t | -20.223 | -10.34 | 0 | 1.956 |
| DD_t | 16.793 | 9.62 | 0 | 1.745 |
| T | -1.186 | -2.77 | 0.014 | 0.428 |
| R^2 | | | 93.5 | |
| Adj- R^2 | | | 90.4 | |
| F | | | 30.68 | |
| v | | | 1.569 | |

al., 2006). Free trade leads to price increases in eight countries: five exporting countries and also the United States, Russia, and the Rest of Eastern Europe. In China, Mexico, and Turkey, the price declines because more wheat is imported than is exported. The countries experiencing large price declines include Korea, Japan, the Rest of Western Europe, Poland, the Middle East, Algeria, Morocco, Iran, and Turkey. The price declines in the importing countries are the result of increased imports arising from tariff removal (Gomez-Plana and Devadoss, 2004).

Another important factor is the level of GNP per capita among the consumers in the market. When GNP per capita increases, consumption will increase and vice versa. Income elasticity for wheat was 3.986 (elastic). This indicates the value for the amount of imported wheat will increase more as incomes increase.

Real exchange rate has been an important factor in import demand. Real exchange rate was positive (0.198). The sign indicates that import value of wheat increase with the increase of TL/USD parities.

The elasticity coefficient of production value in the model was negative (-20.223). Therefore, the production value has a negative influence on import demand. This factor indicates that an increase in production value of wheat by one unit would be associ-

ated with a decrease of the value for the amount of imported wheat by 20.223 units. Besides, 1% changes on the value of total wheat demand increases at the rate of 16.793% on import wheat demand (Table 2).

A time trend variable is entered to show the effect of variables not explicit in the analysis through time. This factor reflects changes in consumers' tastes and preferences. Time trend coefficient was -1.186 which said that for the period in the analysis (from 1984 to 2006) there was a decrease in the value for the amount of import demand for wheat by 1.186 units (Thousand \$). The negative sign indicates that Turkish consumers would rather purchase domestic wheat than import wheat gradually.

Conclusion

This study analyzed the factors affecting import demand for wheat during the period 1984-2006. According to the results, the real domestic prices of wheat (PW_t), the gross national product per capita (GNP_t), Turkish lira-US dollar exchange rate (EX_t), the production value of wheat (PV_t), the domestic demand value of wheat (DD_t), the trend factor (T) was found significant at the level of 1%.

The results of estimation indicate that there are very

strong relationships between dependent variable (ID_t) and independent variables (PW_t , GNP_t , EX_t , PV_t , DD_t , T). The elasticity for the real domestic prices of wheat (PW_t), the gross national product per capita (GNP_t), Turkish lira-US dollar exchange rate (EX_t), the production value of wheat (PV_t), the domestic demand value of wheat (DD_t), the trend factor (T) were found as 3.476; 3.986; 0.198; -20.223; 16.793; -1.186 respectively.

The results have been shown that a change of domestic wheat prices is strongly affective on the wheat import demand and Turkish consumers would rather purchase domestic wheat than import wheat gradually in Turkey having small scale inefficient farm structure, fluctuating supplies, low productivity and quality of wheat and increasing wheat demand.

References

- Andino, J. and P. L. Kennedy**, 2004. A dynamic import demand analysis of Honduran coffee. Southern Agricultural Economics Association Annual Meeting, Tulsa, Oklahoma, February 18, 2004.
- CBRT**, 2007. Statistical Data, Exchanges Rates 1984-2006. Central Bank of the Republic of Turkey, Available in <http://www.tcmb.gov.tr/yeni/eng>, accessed 21 January 2007.
- FAO**, 2006. Statistical Databases, ProdSTAT, <http://faostat.fao.org>, accessed 30 January 2007.
- FAO**, 2007. Statistical Databases, TradeSTAT, <http://faostat.fao.org>, accessed 30 January 2007.
- Goktolga, Z. G.**, 2006. An analysis of import demand for meat and meat product in Turkey. *Journal of Agronomy*, **5** (1): 98-100.
- Gomez-Plana, A. G. and S. Devadoss**, 2004. A spatial equilibrium analysis of trade policy reforms on the world wheat market. *Applied Economics*, **36**: 1643-1648
- Greene, W. H.**, 2000. Econometric Analysis. Fourth Edition, Prentice Hall Int.Inc., USA.
- Grethe, H.**, 2004. Effects of Including Agricultural Products in the Customs Union between Turkey and the EU A Partial Equilibrium Analysis for Turkey. Published at <http://webdocsub.gwdg.de/diss/2004/grethe/index.htm>
- Gujarati, D. N.**, 1995. Basic Econometrics. 3th Edition, McGraw-Hill, Inc. International Edition, USA.
- Gul, A., C. Akbay and M. Direl**, 2006. Sunn pest control policies and effect of sunn pest damage on wheat quality and price in Turkey. *Quality & Quantity*, **40**: 469-480.
- Judge, G. G.**, 1996. Introduction to the Theory and Practice of Econometrics. *John Willey and Sons.*, Inc. USA.
- Hatirli, S. A., V. Demircan and A. R. Aktas**, 2002. Import demand analysis of sunflower and soybean oil. *Journal of Akdeniz University Faculty of Agriculture*, **15** (2): 71-79 (Tr).
- IGC**, 2008. International Grain Council, <http://www.igc.org.uk>
- Karkacier, O.**, 2000. An analysis of import demand for dairy products in Turkey. *Turkish Journal of Agricultural and Forestry*, **24**: 421-427.
- Kizilaslan, H. and N. Kizilaslan**, 2006. An analysis of import demand in vegetal oil and products industry in Turkey. *Journal of Applied Science*, **6** (4): 905-910.
- Koo, W. W. and R. D. Taylor**, 2008. 2008 Outlook of the U.S. and world wheat industries, 2007-2017. Agribusiness and Applied Economics Report No. 628, Center for Agricultural Policy and Trade Studies Department of Agribusiness and Applied Economics North Dakota State University Fargo, North Dakota, USA.
- Lee, J. H., W. W. Koo and M. A. Krause**, 1994. Japanese wheat import demand. Agricultural Economics Report No: 317, Department of Agricultural Economics Agricultural Experiment Station North Dakota State University Fargo, N. Dakota, USA.
- Mao, W., W. W. Koo, J. P. Suomala and T. Sakurai**, 1997. Wheat import demand in the Japanese flour milling industry: A production theory approach. AAEA Annual Meetings in Toronto, Canada.
- Njonou, R. Y., B. H. De Frahan and Y. Surry**, 2002. Testing separability for common wheat qualities in French import demand market using aids and Rotterdam demand models. Xth EAAE Congress

Exploring Diversity in the European Agri-Food System, Zaragoza (Spain), 28-31 August.

- Othman, J. B., E. Houston and G. C. W. Ames,** 1995. Noneconomic distortions in international agricultural trade: The case of palm oil in the US. *Journal of International Food and Agribusiness Marketing*, 7 (2): 79-89.
- Ramirez, M. A., K. M. Jones, F. Arellone and K. C. Raper,** 2003. Estimating import demand in the Mexican cheese market. Staff-Paper 03-23, Department of Agricultural Economics, Michigan State University, East Lansing, USA.
- SPO,** 2007. State Planning Organization. Basic Economic Indicators, January-2007. Available online <http://ekutup.dpt.gov.tr>, accessed 30 January 2007.
- Tanyeri-Abur, A. and P. Rosson,** 1998. Forecasting Mexican import demand for dairy Products. Department of Agricultural Economics, Texas AM University, T77843-2124, FP 97.5. November, USA.
- Thomakos, D. D. and M. A. Ulubasoglu,** 2002. The Impact of Trade Liberalization on Import Demand. *Journal of Economic and Social Research*, 4 (1): 1-26.
- Togan, S.,** 2005. Turkey: Trade Policy Review. *World Economy*, 28 (9): 1229-1262.
- TURKSTAT,** 2007a. Statistical Indicators 1923-2006. TURKSTAT Publications, No: 3114. <http://www.turkstat.gov.tr>, accessed 21 January 2007.
- TURKSTAT,** 2007b. Turkey's Statistical Yearbook 2006. TURKSTAT Publications No: 3063. <http://www.turkstat.gov.tr>, accessed 22 September 2007.
- TURKSTAT,** 2008. Turkey's Statistical Yearbook 2007. TURKSTAT Publications No: 3144. <http://www.turkstat.gov.tr>, accessed 12 February 2008.
- USDA,** 2004. Grain Trade Policy. Commodity & Marketing Programs, Foreign Agricultural Service, International Trade Report.
- Veeman, M. M., T. S. Veeman and S. Asilu,** 2004. Analysis of East Asian meat import demand: Market prospects for Alberta and Canada. Project Report 02-04, AARI Project No:990030, Department of Rural Economy, Faculty of Agriculture and Forestry and Home Economics University of Alberta Edmonton, Canada.

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