An Analysis of Aflatoxin Food Safety Concerns and other Factors Affecting Iran's Pistachio Exports to European Countries, Australia and Japan

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Abstract:

In this paper, we examine the impact of food safety concerns on Iran's pistachio export demand. We use panel data to obtain export function of Iran's pistachio to European countries, Japan and Australia for the period of 1997-2006. This paper applies panel cointegration analysis to examine the relationship between effective factors on Iran's pistachio export demand. Our empirical results indicate that food safety shocks have a statistically significant negative impact on the import demands of those countries. Base on the results, Iran needs to have a more certain and clearer planning in production, marketing, and more importantly observation of health principles in order to maintain its export market shares in the world.

Key words: food safety, pistachio, Iran's export demand, panel cointegration, European countries, Japan and Australia.

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Introduction:

The main countries dealing with pistachio exportation in the world are Iran, the U.S., Turkey, Syria, China, Greece and Italy. Iran is known all over the world for its produced pistachio. Pistachio production has a long history in this country. Iran was the biggest producer and exporter of pistachio in the world; it didn't have any serious rival until 1982. From 1980 to 1990 the U.S. had a significant growth in pistachio production yield and export and became Iran's great rival (figure 1).

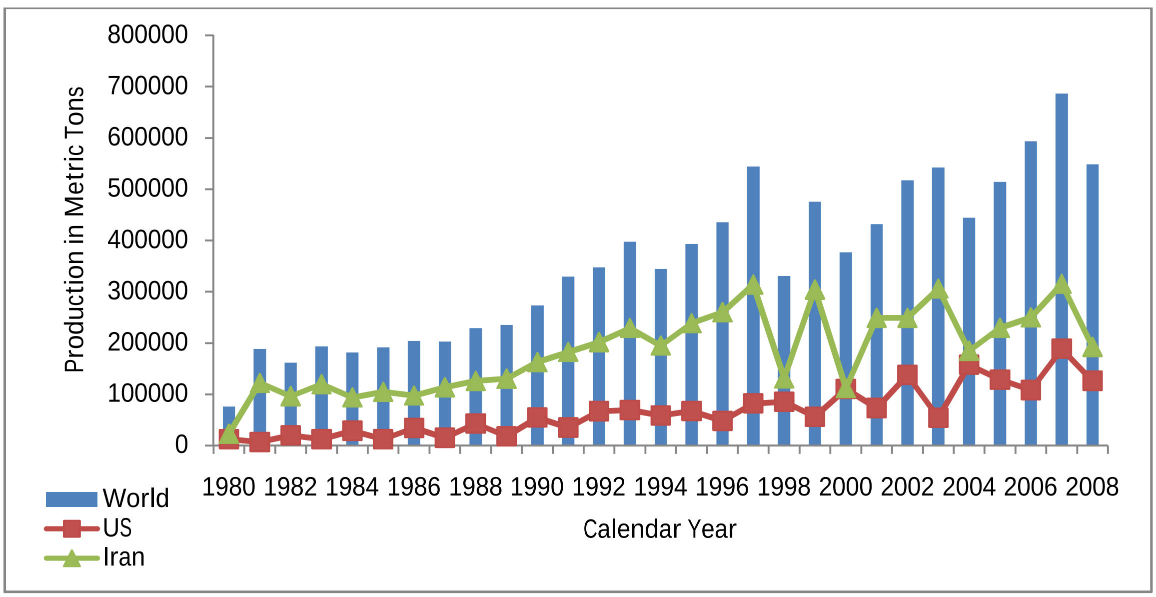

Figure 1: Iran, the US, and World Pistachio Production Situation, 1980-2008 (Data Source: FAO Production Indices.

Pistachio nuts play a major role in Iran's non-oil exports. Now the U.S. ranks first in production of pistachio nuts in the world and generates significant revenues from these exports.

Iran's pistachio has three different markets. The first group includes European countries, Japan, Australia and Canada which persists on healthiness and its quality. The second group wants a crop with delicious taste and good shape such as; Arabic countries and the third one contain East Asia wants pistachio with low price. Nowadays the most of pistachio exportations are belong to Arabic countries and East Asia.

Pistachio exports accounted for the highest share of non-oil export revenue during the last two decades valuing more than 1 billion US dollars in 2007 (Iranian Custom Organization, 2007.) While Pistachio export expansion is supported by the government, Iranian pistachio exports have had a declining trend (figure 2) in terms of value, both nominal and real prices, and volume since 1990 (FAO, 2007). This decline is mostly due to the discovery of high aflatoxin levels in pistachios, a major food safety concern, and the emergence of new competitors on international markets, such as the U.S.

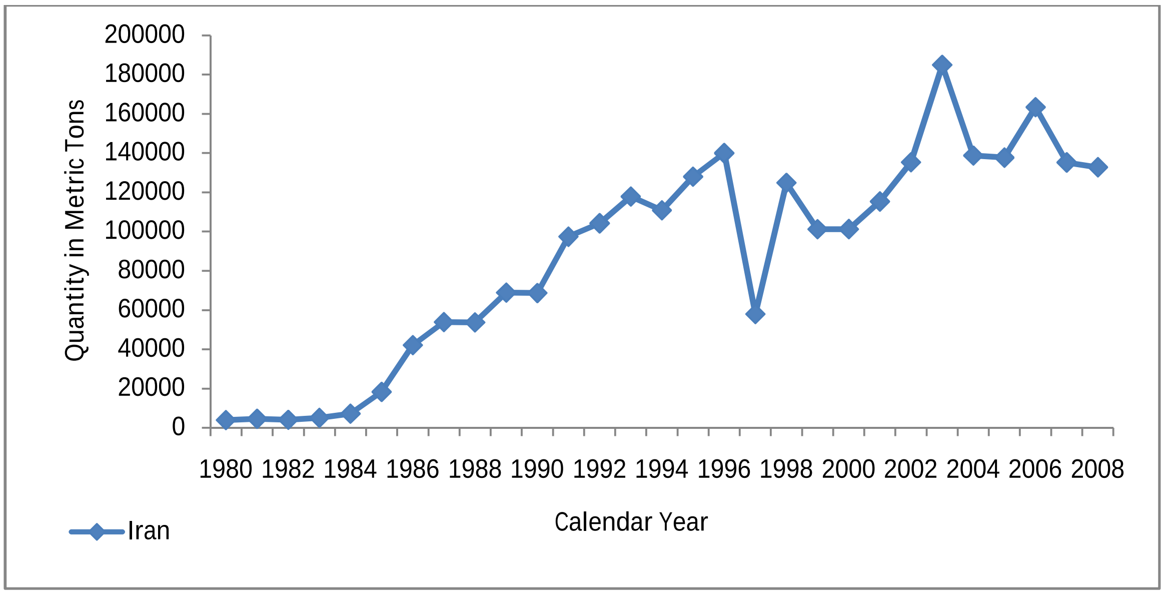

Figure2: Pistachio Export in Iran, 1980-2009 (Data Source: FAO TradeSTAT).

Aflatoxin is a kind of toxin which is splattering from a group of molds. The toxins which produced from these molds are remaining on food products for a long time. Increasing levels of aflatoxin in food may have serious consequences for human and animal health. Aflatoxins, are probably the most studied and generally known mycotoxins, that were first noted in the early 1960s.

Food safety is an important factor that affects individual consumer's health and the public's belief that a product can damage their health and cause a decrease in demand. In the last decade, aflatoxin levels have been especially a concern for the exports intended for the European Union (EU) and Japan, as an increasing number of consignments have been rejected. A high aflatoxin level threatens the health of consumers, and has resulted in severe losses to producers. Governments often attempt to aid food safety by mandating standards and inspection of food products to supplement the efforts by private firms and industries. Following a brief 1997 ban on exports to the EU, efforts have been made to improve the screening of export shipments to the EU. However, it appears that infectivity levels increase during shipment, and a particularly alarming number of containers have been rejected since the 2003 crop came on the market.

Another part of this declining trend is attributed to emerging new producers and exporters. The emergence of the US and China in pistachio world trade, for instance, resulted in the lowering of Iran's market share of world exports (figure 3). The US joined the exporter countries in 1982 and since has become Iran's major rival and competitor in the international markets.

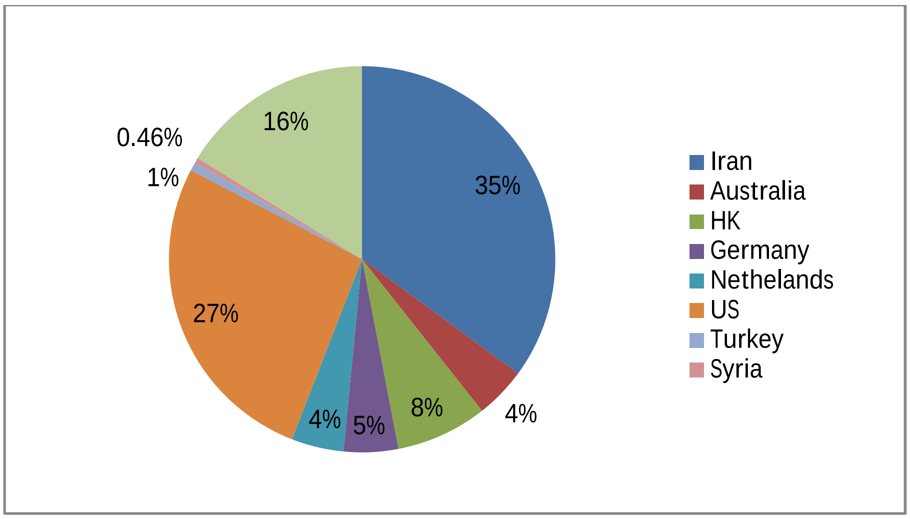

Figure 3: World Pistachio Export Shares, 2008 (Data Source: USDA ERS GATS.)

The main objective of this study is to evaluate the effective factors on Iran's pistachio exports and how food safety concerns affect Iran's export demand for pistachio nuts. In order to shed more light on how food safety concerns affect Iran's export demand, we focus on important factors beside food safety that have significant impact on demand.

Here, we will list three steps to evaluate the impact of food safety on Iran's export demand of pistachio. First, we should examine the stability of regression coefficients (export price, exchange rate and gross domestic product) by applying non-stationary panel data analysis. In the second step, panel analysis based on cointegrating relationships is used and at last each variable impact on Iran's export demand is evaluated.

Konandreas and et al. (1978) estimated Export demand functions for U.S. wheat; their major finding indicated that exchange rate changes have had a substantial impact on U.S. wheat exports. Arize (2001) assessed the stability of export demand function in Singapore over the period 1973-1997, and found cointegrating relationship when structural changes were taken into account. Erdogan Cosar (2002) calculated price and income elasticities of export demand for Turkey. The paper presented some panel unit root and cointegration tests. Estimated results showed that, the real exchange rate elasticity of total export demand was less than one, whereas the income elasticity was found to be greater than one. Straub (2002), after investigating the stability of export functions for the US, Canada, and Germany for the years 1975-2000, found that cointegrating relationships existed for each country. Sharzeyi and Ghanbari (2005) analyzed the factors effect on pistachio demand and supply. The results showed that the demand and cost variables have positive and meaningful effect on supply and demand of pistachio. Tayebi and Ghanbari (2008) evaluated the main determinants of saffron export market through a model specification. They estimated both export demand and supply of saffron by 3SLS over 1976-2004. The results implied that the role of WTO had a significant effect on Iran's saffron export promotion. Hamori and Matsubayashi (2009) used panel data to empirically analyze the stability of the export functions of LDCs for the period 1980-2004; they found that the use of panel data for the region of the LDC supports a cointegrating relationship. Wang (2010) provided the empirical evidence of determinants of food security by using panel data analysis over 1985-2007 in China. The results indicated that the climate change had significant effect on food security in the current year, but food price had no influence on food security in China.

This paper unfolds as following: In the next section, we describe the model and econometric approach. In Section 3, we report the empirical estimation results. Finally, we conclude the paper in Section 4.

Model and data:

We treat the demand for pistachio exports as a function of gross domestic production of each importing country, exchange rates of all destinations, relative prices of each country and food safety as a dummy variable.

1) $EX_{it} = f(RP_{it}, GDP_{it}, EXR_{it}, FS)$

Where EX_{it} is real pistachio imports of each country from Iran, RP_{it} is the relative price (Iran export price divided by the U.S. export price of pistachio), GDP_{it} is gross domestic price, EXR_{it} is exchange rate at the U.S. dollar and FS is food safety as a dummy variable. We set one for the years that Iran's pistachios have high aflatoxin levels. Subscripts i and t indicate the country of the destination and time, respectively.

For our empirical study, we specify the pistachio export demand Function as follows:

2) $Ln(EX_{it}) = \alpha_0 + \alpha_1 RP_{it} + \alpha_2 GDP_{it} + \alpha_3 EXR_{it} + \alpha_4 FS + u_{it}$

We select four different formats of pistachio export demand function; a) All variables in logarithmic form. b) Left part of the demand function in logarithmic form. c) Right part of the demand function in logarithmic form. d) All variables in normal form.

For choosing the optimal model we use Chow (1960) test for each group. Above model was chosen as the optimal model.

This paper analyses the pistachio export demand function over the period from 1997 to 2006 (annual data) for 9 European countries, Japan and Australia selected on the basis of the availability of the data. These countries are Australia, France, Germany, Spain, Italy, Poland, Romania, Switzerland and Japan. The data for real pistachio export and pistachio export prices are obtained from Food and Agriculture Organization (FAO) and the other data are from World Development Indicators (World Bank).The relative export price is obtained as the ratio of Iran export price to the U.S. export price of pistachio.

Panel method:

We use panel method for estimating pistachio export demand. Panel data estimation is often considered to be an efficient analytical method in handling econometric data. Panel data analysis became popular among social scientist because it allows the inclusion of data for N cross-sections (e.g., countries, households, firms, individuals, etc.) and T time periods (e.g., years, quarters, months, etc.) the combined panel data matrix set consist of a time series for each cross-sectional member in the data set, and offers a variety of estimation methods. In this case the number of observations available increase by including developments over time.

The question of whether to pool the data or not naturally arises with panel data. The restricted model is the pooled model representing a behavioral equation with the same parameters over time and across regions. The unrestricted model, however, is the same behavioral equation but with different parameters across time or across regions (Baltagi 2005, 53).

Generally, most economic applications tend to be of the first type, i.e. with a large number of observations on individuals, firms, economic sectors, regions, industries and countries but only over a few time periods. Thus, we use the tests for the poolability of the data for the case of pooling across regions keeping in mind that the other case of pooling over time can be obtained in a similar fashion.

Test for poolability:

For testing the poolability of data we should use Chow test presented by Chow (1960) extended to the case of N linear regressions:

$$3)\ F_{obs} = \frac{(e'e - e_1' e_1 - e_2' e_2 - \cdots - e_N' e_N)/(N-1)K'}{(e_1' e_1 + e_2' e_2 + \cdots + e_N' e_N)/N(T-K')}$$

Under H_0, F_{obs} is distributed as an $F((N-1)K', N(T-K'))$. Hence the critical region for this test is defined as:

$$\{F_{obs} > F\ ((N-1)\ K', NT - NK'; \alpha_0)\}$$

Where α_0 denotes the level of significance of the test.

For our data Chow's test for poolability across countries gives an observed F-statistic of 0.04387 and is distributed as F(40,45) under $H_0 : \delta i = \delta$ for $i = 1, \ldots, N$. The RRSS = 9.868541 is obtained from pooled OLS, and the URSS = 9.498099 is obtained from summing the RSS from 9 individual country OLS regressions, one for each country. There are 40 restrictions and the test does not reject poolability across countries for all coefficients.

Panel unit root tests:

Both DF and ADF unit root tests are extended to panel data estimations, to consider cases that possibly exhibit the presence of unit roots. Most of the panel unit root tests are based on an extension of the ADF test by incorporating it as a component in regression equations. However, when dealing with panel data, the estimation procedure is more complex than that used in time series.

There are a variety of panel unit root tests which include Breitung (2000), Hadri (2000), Choi (2001), Levin et al. (2002) and Im et al. (2003) among others. Consider the following autoregressive specification:

4) $\mathbf{Y}_{it} = \rho_i y_{it-1} + \delta_i X_{it} + \varepsilon_{it}$

Where i = 1,…,N for each country in the panel; t = 1,…,T refers to the time period; X_{it} represents the exogenous variables in the model including fixed effects or individual time trend; ρ_i are the autoregressive coefficients; and ε_{it} are the stationary error terms. If $\rho_i<1$, y_{it} is considered weakly trend stationary whereas if $\rho_i= 1$, then y_{it} contains a unit root. Where i =1,…, N for each country in the panel; t =1,…,T refers to the time period; X_{it} represents the exogenous variables in the model including fixed effects or individual time trend; ρ_i are the autoregressive coefficients; and ε_{it} are the stationary error terms. If $\rho_i<1$, y_{it} is considered weakly trend stationary whereas if $\rho_i=1$, then y_{it} contains a unit root.

5) $Y_{it} = \rho_{it} y_{it-1} + \sum_{j=1}^{p_i} u_{ij}\, e_{it-j} + \delta_i X_{it} + u_{it}$

Where p_i represents the number of lags in the ADF regression. The null hypothesis is that each series in the panel contains a unit root (H_0: ρ_i =1). The alternative hypothesis is that at least one of the individual series in the panel is stationary (H_0: ρ_i <1).

For our empirical model we find that the null hypothesis of a unit root is accepted for the level of each variable. (Table 1)Thus, our empirical results for the unit root tests are found to be robust to the choice of sample period.

Table 1: panel unit root test.

Variables	**Log(EX_{it})**	**RP_{it}**	**GDP_{it}**	**EXR_{it}**
difference	**Level**	**Level**	**Level**	**Level**
Breitung t-stat	-0.9505	1.2639	4.1289	0.5394
P-value	0.1709	0.8969	1.000	0.7652
Im,pesaran &shin w-stat	-1.1395	-0.005	0.79223	0.4905
P-value	0.1272	0.4982	0.7859	0.6881
ADF-Fisher chi-square	32.0193	20.7786	10.5996	11.5103
P-value	0.0219	0.2907	0.9106	0.8715
PP-Fisher chi-square	36.4344	41.3537	19.6806	16.5103
P-value	0.0062	0.0014	0.3511	0.5461

Panel cointegration tests:

The motivation toward testing for cointegration is preliminary linked with the provision of investigating the problem of spurious regressions, which exists only in the presence of non-stationarity.

Given the presence of heterogeneity in both dynamics and error variances in the panel, the heterogeneous panel cointegration test advanced by Pedroni (1999, 2004), which allows for cross-section interdependence with different individual effects, is employed as follows:

6) $Y_{it} = \alpha_{it} + \delta_i t + \gamma_{1t} E_{it} + \gamma_{2t} L_{it} + \gamma_{3t} K_{it} + \varepsilon_{it}$

Where i =1,…, N for each country in the panel and t =1,…,T refers to the time period. The parameters α_{it} and δ_i allow for the possibility of country-specific fixed effects and deterministic trends, respectively. ε_{it} denote the estimated residuals which represent deviations from the long-run relationship. Since all variables are expressed in natural logarithms, the γs parameters of the model can be interpreted as elasticities. To test the null hypothesis of no cointegration, $\rho_i = 1$, the following unit root test is conducted on the residuals as follows:

7) $\varepsilon_{it} = \rho_i \varepsilon_{it-1} + w_{it}$

Pedroni (1999, 2004) proposes two sets of tests for cointegration. The panel tests are based on the within dimension approach (i.e. panel cointegration statistics) which includes four statistics: panel ν-statistic, panel ρ-statistic, panel PP-statistic, and panel ADF-statistic. These statistics essentially pool the autoregressive coefficients across different countries for the unit root tests on the estimated residuals. These statistics take into account common time factors and heterogeneity across countries. The group tests are based on the between dimension approach (i.e. group mean panel cointegration statistics) which includes three statistics: group ρ-statistic, group PP-statistic, and group ADF-statistic. These statistics are based on averages of the individual autoregressive coefficients associated with the unit root tests of the residuals for each country in the panel. All seven tests are distributed asymptotically as standard normal. Of the seven tests, the panel ν-statistic is a one-sided test where large positive values reject the null hypothesis of no cointegration whereas large negative values for the remaining test statistics reject the null hypothesis of no cointegration.

We perform cointegration tests for the export volume, gross domestic production of each importing country, exchange rates of all destinations, and relative prices of each country. Here we consider seven tests: the Panel ν-test, Panel ρ-test, Panel PP-test, Panel ADF test, Group ρ test, Group PP test, and Group ADF-test. In the null hypothesis, the residuals are considered to be non-stationary (i.e., there is no cointegrating relationship). In the alternative hypothesis, the residuals are considered to be stationary (i.e., there is a cointegrating relationship).

Table 2 shows the results of panel cointegration tests. Thus, it can be said that export volume, gross domestic production, exchange rates, and relative prices have a cointegrating relation.

Having found that the existence of the cointegrating relationship is supported, we go on to estimate the export demand function.

Table 2: panel cointegration test.

Within dimension		**Between dimension**	
Test statistics		Test statistics	
Panel ν-statistic	-2.19184 (0.0361)	**Group ρ-statistic**	3.790277 (0.0003)
Panel ρ-statistic	2.624790 (0.0127)	**Group PP-statistic**	-26.39093 (0.0000)
Panel PP-statistic	-28.35757 (0.0000)	**Group ADF-statistic**	-8.010806 (0.0000)
Panel ADF-statistic	-4.566898 (0.0000)		

Note: probability value is reported in parenthesis.

Model estimation:

We can estimate our model in different panel methods; they are explained in below.

Different methods of estimation:

In general, simple linear panel data models can be estimated using three different methods: (a) with a common constant as in equation, (b) allowing for fixed effects, and (c) allowing for random effects.

The fixed effects method:

In the fixed effects method the constant is treated as group (section)-specific. This means that the model allows different constants for each group (section).

The fixed effects estimator is also known as the least-squares dummy variables (LSDV) estimator because in order to allow for different constants for each group, it includes a dummy variable for each group. To understand this better consider the following model:

8) $Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + u_{it}$

The fixed effects (FE) model has the following properties:

1 .FE essentially captures all effects which are specific to a particular individual and which do not vary over time. So if we had a panel of countries the fixed effects would take full account o f things such as geographical factors, natural endowments and any other of the many basic factors which vary between countries but not over time. Of course this means that we cannot add extra variables which also do not vary over time, such as country size for example, as this variable will be perfectly co -linear with the fixed effect.

2. In some cases FE may involve a very large number of dummy constants as some Panels may have many thousand individual members, for example large survey panels. In this case the fixed effect model would use up N degrees of freedom. This is not in itself a problem as there will always be many more data points than *N*. However computationally it may be impossible to actually calculate many thousand different constants. In this case many researchers would transform the model by differencing all the variables or be taking deviations from the mean for each variable ,Which has the effect of removing the dummy constants and avoids the problem of estimating so many parameters. However differencing the model, in particular may be undesirable as it may distort the parameter values and can certainly remove any long run effects.

The random effects method:

An alternative method of estimating a model is the random effects model. The difference between the fixed effects and the random effects method is that the latter handles the constants for each section not as fixed, but as random parameters. The random effects model therefore takes the following form:

$$9) Y_{it} = (\alpha + \nu_i) + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + u_{it}$$

$$10) Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \beta_k X_{kit} + (\nu_i + u_{it})$$

One obvious disadvantage of the random effects approach is that we need to make specific assumptions about the distribution of the random component. Also, if the unobserved group-specific effects are correlated with the explanatory variables, then the estimates will be biased and in consistent. However, the random effects model has the following advantages:

1. It has fewer parameters to estimate compared to the fixed effects method.
2. It allows for additional explanatory variables that have equal value for all observations within a group (i.e. it allows us to use dummies).

The Hausman test:

The Hausman test is formulated to assist in making a choice between the fixed effects and random effects approaches. Hausman (1978) adapted a test based on the idea that under the hypothesis of no correlation, both OLs and GLs are consistent but OLs is inefficient, while under the alternative OLS is consistent but *GIs* is not. For the panel data the appropriate choice between the fixed effects and the random effects methods investigates whether the regressors are correlated with the individual (unobserved in most cases) effect. The advantage of the use of the fixed effects estimator is that it is consistent even when the estimators are correlated with the individual effect. The Hausman test uses the following test statistic:

$$11) H = (\hat{\beta}^{FE} - \hat{\beta}^{RE})'[Var(\hat{\beta}^{FE}) - Var(\hat{\beta}^{RE})]^{-1}(\hat{\beta}^{FE} - \hat{\beta}^{RE}) \sim \chi^2(k)$$

If the value of the statistic is large, then the difference between the estimates is significant, so we reject the null hypothesis that the random effects model is consistent and we use the fixed effects estimators. In contrast, a small value of the Hausman statistic implies that the random effects estimator is more appropriate.

With our data, the resulting Hausman test statistic is 14.8694 which is significant at the 1% level and we reject the null hypothesis of no correlation between the individual effects and the X_{it}. first we tested for estimation of the model with fixed effect using Chow type test for testing fixed-effect developed by Baltagi (2008). The test did not reject the hypothesis of fixed-effect. Since the selected countries are the main importing ones, existence of fixed effect is expected.
For testing panel with fixed effects, we estimate the model with fixed effects then testing redundancy of fixed effects, the F statistic became significant with 0.0043 probability values.

Results:

In the previous section, long run relationships between variables are supported.
Table 3 illustrates the results of the demand function estimation. All the coefficients have the expected signs but only exchange rate has inverse sign. The results (table 3) show that none of the variables have high significant effect on Iran's pistachio demand so we separate exchange rate and estimate it for each country as a specific variable. Results of this change are shown in table 4.

Table 3: panel results (Fixed Effects (WITHIN) Regressions Results)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
intercept	5.338125	0.762636	6.999573	0.0000
EXR	0.076614	0.036163	2.118591	0.0379
GDP	7.36E-13	4.22E-13	1.745339	0.0856
RP	-0.275273	0.283281	-0.971732	0.3347
FS	-0.162387	0.091979	-1.765481	0.0867
Weighted Statistics				
R-squared	0.951969	Mean dependent var		8.353118
Adjusted R-squared	0.941781	S.D. dependent var		5.704296
S.E. of regression	0.712506	Sum squared resid		33.50591
F-statistic	93.43718	Durbin-Watson stat		1.877122
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.916940	Mean dependent var		6.320300
Sum squared resid	35.37951	Durbin-Watson stat		1.729220

Results (table 4) show that GDP as a major factor affecting the pistachio market shares has a positive effect on the pistachio demand of each country; it means that by increasing in gross domestic production of a country, The country demand for Iranian pistachio would be increased. For assessing the effects of exchange rate on Iran's pistachio export demand, we select exchange rate as a specific factor for each country.

Results (table 4) show that exchange rate has a negative effect on demand of some countries such as Switzerland, Australia, Spain, France, Italy and Poland. While the coefficient of exchange rate is negative, presenting potential of an expected pistachio trade market behavior, its low significance cast some doubts on the importance of the behavior. In other words, the changes in exchange rates completely are reflected in export prices.

Table 4: panel results (with specific exchange rate).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
intercept	7.114347	0.947936	7.505091	0.0000
GDP	6.92E-13	3.97E-13	1.745675	0.0862
RP	-0.338228	0.157299	-2.150230	0.0357
FS	-0.294058	0.101926	-2.885017	0.0055
EXR_SWiT	-4.959396	0.906917	-5.468411	0.0000
EXR_AUS	-2.014298	0.408914	-4.925963	0.0000
EXR_SPA	-0.402584	0.777736	-0.517636	0.6067
EXR_FRA	-3.670595	1.503520	-2.441335	0.0177
EXR_GER	0.113587	0.922927	0.123073	0.9025
EXR_JPN	0.086647	0.027238	3.181148	0.0024
EXR_ITA	-0.452006	1.417090	-0.318968	0.7509
EXR_POL	-0.389500	0.223923	-1.739434	0.0873
EXR_ROM	1.243627	0.371204	3.350253	0.0014
		Weighted Statistics		
R-squared	0.970665	Mean dependent var		9.239660
Adjusted R-squared	0.959537	S.D. dependent var		7.951366
S.E. of regression	0.691341	Sum squared resid		27.72123
F-statistic	87.23333	Durbin-Watson stat		2.009140
Prob(F-statistic)	0.000000			
		Unweighted Statistics		
R-squared	0.928818	Mean dependent var		6.320300
Sum squared resid	30.32015	Durbin-Watson stat		1.589219

Exchange rate for Spain, Italy and Germany does not have significant effect on their pistachio demand but it becomes positive and significant for Japan and Romania, exchange rate coefficient is expected to have negative sign, however, a positive coefficient as also emphasized by Yang (1998), means that exporter(s) try to strengthen the exchange rate fluctuations by increasing the export price when its value rise. The same results are noticed in Yang (1998). Knetter (1989) discuses that positive coefficient of exchange rate is an optimizing behavior when exporters perceive demand to be less elastic as price increases. The explanation developed by Knetter (1989) may be appropriate for our empirical condition.

Results (table 4) for Iran's pistachio export demand indicate that pistachio food safety shocks have a negative and high significant impact on Iran's pistachio export demand. The Food and Agricultural Organization (FAO) illustrates data showing that the pistachio imports into the European Union was dropped 42 percent in 1998, and since 1997, Japan had been reducing Iranian pistachios imports, ending importing completely in 2006. So Japan was one of Iran's pistachio markets that was lost.

Relative export price (Iran export price divided by The U.S. export price of pistachio) as shown in the table 4 has a negative sign, which means that by increasing Iran's pistachio price or decreasing the U.S. pistachio price, Iran's pistachio export demand decreases.

Conclusion:

This study analyses the factors that affect the export demand for Iran's pistachio. The empirical results show that the parameter of the export demand model are statistically significant at high significant levels and have good explanatory power.

Results show that the most important factor is the food safety concerns. Food safety scares could affect the health of consumers. Depending on the nature of the scare and the affected product, consumer trust in the product and demand for the product both fall affecting producers and consumers' well-being. Governments regulate food production and marketing by imposing standards and inspection requirements. An aflatoxin-related food safety event could impose serious costs on the pistachio industry. Base on the results, Iran needs to have a more certain and clearer planning in production, marketing, and more importantly observation of health principles in order to maintain its export market shares in the world. Industries should undertake voluntary actions, which determine standards or similar measures for a product because the conditions of Iran and the market facts call for such a move.

After investigating the effect of food safety on pistachio exportation we should present some strategies to solve this problem. Some important strategies are mentioned as follows:

Allocating appropriate financial support to the research division, considering the rapid growth of competing products and their quality, using new technology to accelerate the international trade, learning ways to reduce Aflatoxin contamination of pistachio which other producers run, paying more attention to the customers' requirements and recognizing competitors' pricing methods in foreign markets.

The policies should be concentrated to increase yields and to achieve higher quality standards which are essential to sustain a suitable profitability level of production on one side and to maintain the country's share in the international markets on the other side.

Policy makers and private sectors need to perform strategic perspective on standards, particularly in developing countries which are standards takers. In agricultural exports, the following parameters play an important role in determining food safety strategies:

1) Market access: the most understandable measure of the success of effort for developing standards is accessing new markets for agricultural and food products.

2) Benefits exceeding costs: there has to be some criteria to generate benefits that clearly exceed the associated costs—direct and indirect.

3) Spillover effects: reaching agri- food standards in external markets can have both positive and negative spillovers for domestic consumers and producers. These may include impacts on food safety and agricultural productivity.

To maintain Iran's export share in global market and achieve new markets the following measures should be done:

1) One of the proposed debates in food safety of pistachio is packing. By packing this product we could have a higher control on safety and maintaining the standards of pistachio.

2) Government should regulate for investment in packing and also other requirements of pistachio Orchardists, in order to provide financial credits for banks.

3) To ensure food safety in pistachio some rules should be imposed in line with international laws and regulations. These rules must be informed to the production units permanently and systematically.

4) For observing pistachio production standards such as their healthiness, some research centers and NGOs should be formed.

5) Government controls the exchange rate fluctuations in Iran. If the government lets the exchange rate to float, it will cause a decrease in export prices and an increase in the volume of Iran's export; following all of these, the prices will become real.

Every article has its own limitations and shortcomings; this paper isn't separated from the rest. Along the time of collecting required information and data, lack of them made a great limitation in choosing our desired countries. So we had to select some European countries that import pistachios from both Iran and the U.S. simultaneously. Next time we can use some factors with high availability of data that have the same effect that our factors have on pistachio export demand. Also, we can use quality of product as a variable to evaluate the effect of Iran's pistachio quality on importer demand. For this paper we can use a simultaneous equations model to estimate Iran's pistachio export demand. The other model we can use at a macroeconomics level is a general equilibrium that can show the effect of food safety on each sector. All this may improve the paper and make it more constructive.

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