FAO COMMODITY AND TRADE POLICY
RESEARCH WORKING PAPER NO. 39

Food Safety Regulations and Export Responses of Developing Countries: The Case of Turkey's Fig and Hazelnut Exports

by

Cemal Atici[1]

Food and Agriculture Organization of the United Nations

[1] Economist, Trade and Markets Division. I would like to thank seminar participants at FAO-EST for their valuable comments and Pascal Liu for his useful review and suggestions. All remaining errors are mine.

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ABSTRACT

Food safety standards are gaining importance as trade regulations. These regulations affect exports in three main ways depending on the capacities of exporting countries: trade-impeding effects, neutral effects, and catalyst effects. Although previous studies confirm the trade impeding effect of regulations, recent studies show that strict regulations can stimulate developing countries through the scale effect as in the case of some African exporters. In addition, developing countries can benefit from extensive governmental guidance in terms of coping with standards. Harmonization of standards as a requirement of economic integration also leads to improvement in export performance. This study outlines the interaction between regulation and export responses by examining the change in export flow from Turkey to the EU partners after food safety regulations of the EU were put into effect, drawing policy implications in terms of food safety-export performance interaction. The empirical results show that the harmonization of EU food safety regulation in 2002 positively influenced hazelnuts exports, while the EU food safety regulation in 2007 reduced the volume of fig exports. The rise in export unit values indicates that Turkish primary food products responded to the EU food safety regulation with quality improvements accompanied by higher unit prices.

Keywords: Food Safety Standards, Trade, Agriculture, Developing Countries, Turkey, EU

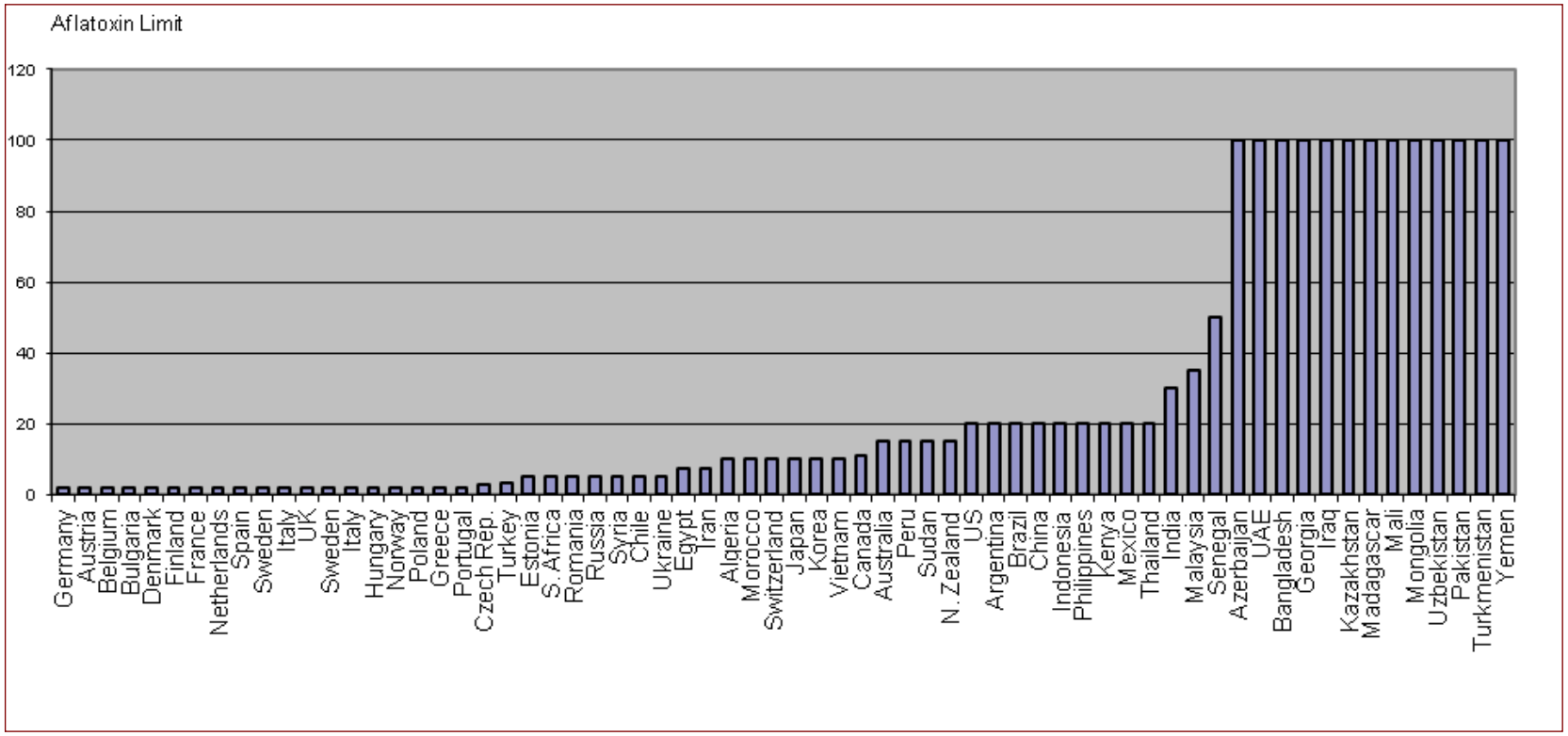
1. Introduction

Food safety regulations are gaining importance as trade instruments, and many industrialized countries are implementing restrictive limits on food safety standards that can prevent imports (FAO, 2004; WTO, 2013). As an obligation of the WTO (2012), conventional trade barriers are being reduced, but food safety regulations and standards are becoming considerable tools as alternative trade barriers. The EU set maximum limits on its aflatoxin within the Union in 1997 (EC-194/97) with some amendments in 1998 (98/53/EC) as an initiative for harmonization. The EU harmonized its regulations in 2001 (EC/466/2001); these became effective in 2002. Additional regulations (2002/80/EC and 2002/679/EC) that came into force in 2002 require a health certificate for dried fruits from Turkey (European Commission, 2012a). Another restrictive regulation that came into force in 2007 (2007/459/EC) requires exporting firms of figs and hazelnuts to obtain an aflatoxin certificate, in addition to previous regulations, from official laboratories before shipment, which adds extra processing costs. This certification provides information indicating that the related commodity is free of harmful toxins based on the specifications in the related regulation. Although a large variety of food safety regulations exist, the most prominent and internationally recognized one is aflatoxin limits for primary food products (FAO, 2004). Figure 1 presents the aflatoxin limits in selected countries. The aflatoxin standards are quite restrictive for EU members, less restrictive in the U.S, and least restrictive in many of the developing countries, with the exceptions of some such as Turkey, Chile, Egypt, and Vietnam.

The impact of food safety regulations on trade performance varies. Chen et al. (2008) found that food safety standards imposed by importing countries had a negative effect on China's agricultural exports. Similarly, it was shown that developed countries' food safety standards had a deterring impact on processed food exports of developing countries (Jongwanich, 2009). However, Maertens and Swinnen (2008) found that Senegal's vegetable exports grew significantly after food safety standards were adopted due to a shift of production from smallholders to large-scale production. Another study carried out by Anders and Caswell (2009) determined that the US standard (HACCP) has a negative impact on developing countries but a positive impact on developed countries for US seafood imports. This highlights the catalyst effect, which describes an exporting country's ability to cope with restrictive regulations. On the other hand, export performance is found to be positively related with standards certification (Masakure et al., 2009). In addition, some evidence demonstrates that some countries are utilizing high quality and safety standards to reposition themselves in global markets (Jaffee and Henson, 2004). However, for better understanding of the impacts of private standards on developing countries further research is necessary on particular industries and in specific countries (Dankers, 2007).

This study will outline the interaction between regulation and export responses based on the theory and research results. As a case study, this paper aims to examine the change in export flow from Turkey to the EU partners after the food safety regulations of the EU are put into effect, and draws policy implications in terms of food safety-export performance interaction.

Figure 1. Average aflatoxin limits for unprocessed food in selected countries, 2004 (mycotoxin b1, limit µg/kg)

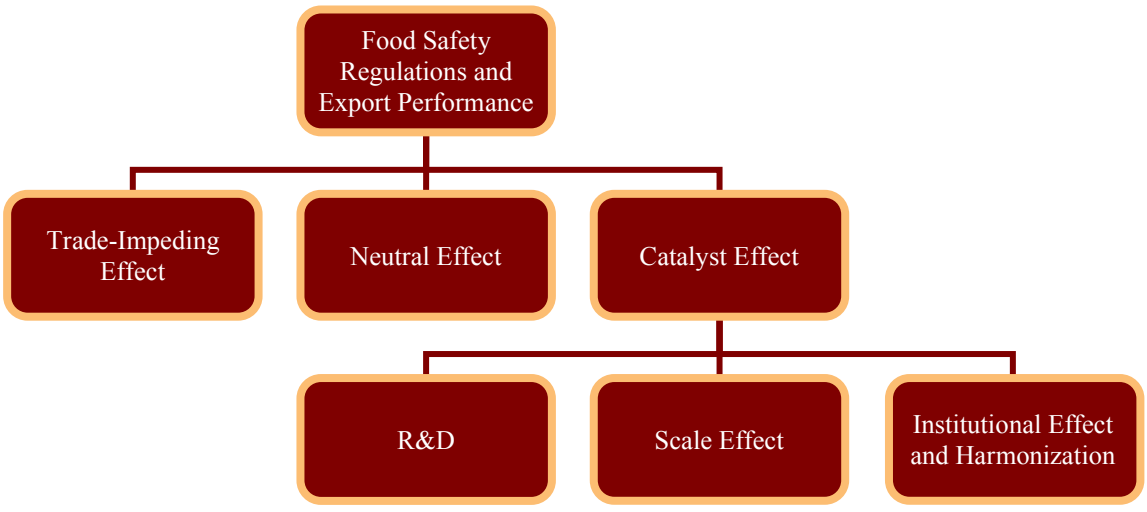


Source: Compiled from FAO, 2004

2. Food Safety Regulations and Export Performance

Food safety regulations have three main effects: the trade-impeding effect, the neutral effect, and the catalyst effect. The trade-impeding effect occurs due to the negative impact of regulations, which leads to trade distortion against the exporters of food products. The neutral effect mostly occurs in developed exporting countries, where they can comply with restrictive regulations because of their research and development expenditures and high level of standards. The catalyst effect occurs when regulations force exporting countries to invest more in a specific market and increase their share in world trade. Such an effect also occurs when developed countries replace the exports of negatively affected developing countries in world markets. The catalyst effect is composed of research and development (R&D), scale effect, institutional effect, and efforts for harmonization. Most of the R&D is observed in the markets of developed countries. The scale effect can be observed in emerging markets, where firm size is increased in an effort to comply with restrictive regulations. The institutional effect is caused by institutional governance and guidance aimed at domestic exporting firms providing market information and technical assistance. The harmonization effects occur when a candidate country aims to join an economic union and harmonizes its regulations according to the principles of the union (Figure 2).

Figure 2. Food Safety Regulation and Export Performance Interaction



3. Turkey's Export Performance in Fig and Hazelnut Exports

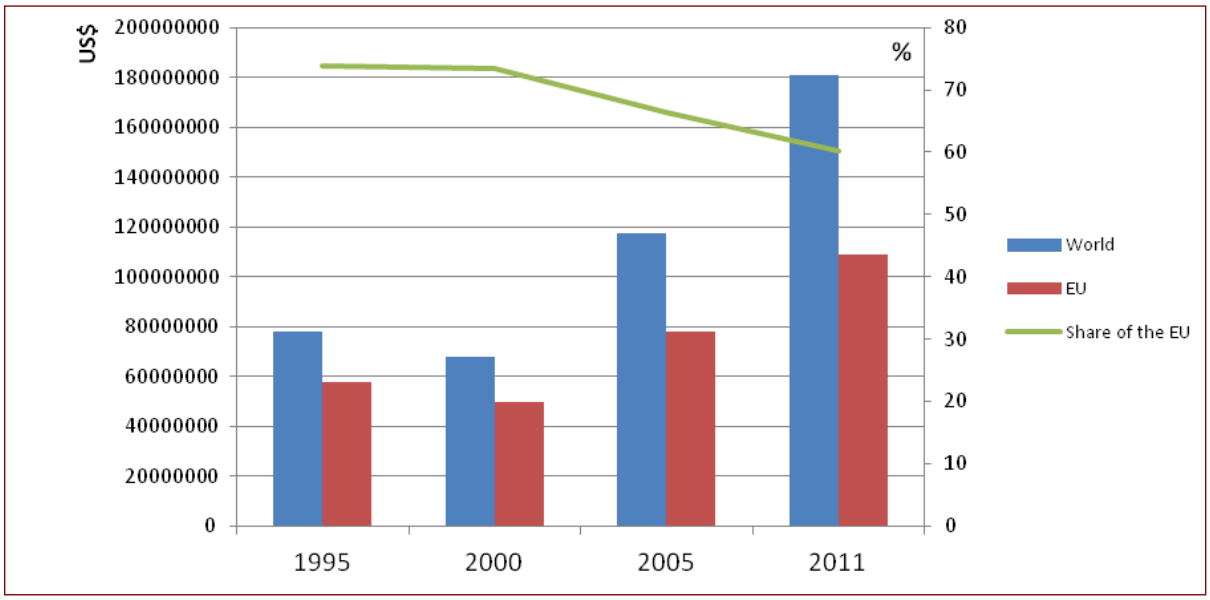
Aflatoxin standards are especially important for primary agricultural products such as dried fruit and nuts (FAO, 2004). Turkey is a major world producer and exporter of dried figs and hazelnuts (FAOSTAT, 2012; Comtrade, 2012). Turkey ranks number one in the world for figs production (254 838 MT, 24% of world production) and hazelnuts production (600 000 MT, 70% of world production) (FAOSTAT, 2012). In addition, Turkey ranks first in the export of dried figs (58 252 MT, 63 % of world export) and shelled hazelnuts (149 605 MT, 76 % of world export) in the world markets. The EU is a major market for Turkish food exports: Turkey exports 60% and 67% of figs and hazelnuts, respectively, to the EU market (Comtrade, 2012). Turkey's agricultural relationship with the EU is based on the Ankara Agreement, signed in 1963, and the Additional Protocol of 1970. In accordance with the Ankara Agreement, the EU made unilateral concessions in the form of tariff rate quotas and lower tariffs for some Turkish agricultural products (tobacco, raisins, figs, and nuts). The Additional Protocol established a bilateral preferential system that enables lower tariffs for agricultural products. The 1995 Customs Union agreement eliminated the industry share in processed agricultural products but kept the agricultural share (e.g., milk, sugar, and cereals), and the tariffs for unprocessed ones were kept bilaterally (European Commission, 2012b; MARA, 2009). In addition, the EU keeps some seasonal tariffs and non-tariff measures such as food safety standards (UPMFT, 2008). Seasonal variations in tariffs are among the tools of protection for fruit and vegetables. Ad valorem and specific duties as well as entry prices vary throughout the year, so customs duties are higher during the production period in the EU to protect domestic producers (Emlinger et al. 2008).

The change in Turkey's export values of figs and hazelnuts are presented in Figures 3 and 4. The total value of fig exports increased from US$ 78 million in 1995 to almost US$ 180 million in 2011. The value of fig exports decreased slightly in 2000 but increased after that due to higher prices. Total hazelnut exports increased from US$ 589 million to over US$ 1 billion in 2011. Although the values of exports of figs and hazelnuts to the EU increased over the years, the share of the EU in total exports decreased from 74% to 60% for figs and from 83% to 67% for hazelnuts in the same period.

The bilateral export data (Comtrade, 2012) reveal that the quantity exported to the EU was 21 000 MT and 153 000 MT in 1995 and 22.000 MT and 93 574 MT in 2011 for figs for hazelnuts, respectively (Figures 5-7). Although the volume of fig exports did not vary much, the value of exports to the EU increased by 89 % between 1995 and 2011. The hazelnut export volume to the EU decreased by 38% over the decade, but the total value of exports increased by 44%. This price increase stems from increase in unit export value.

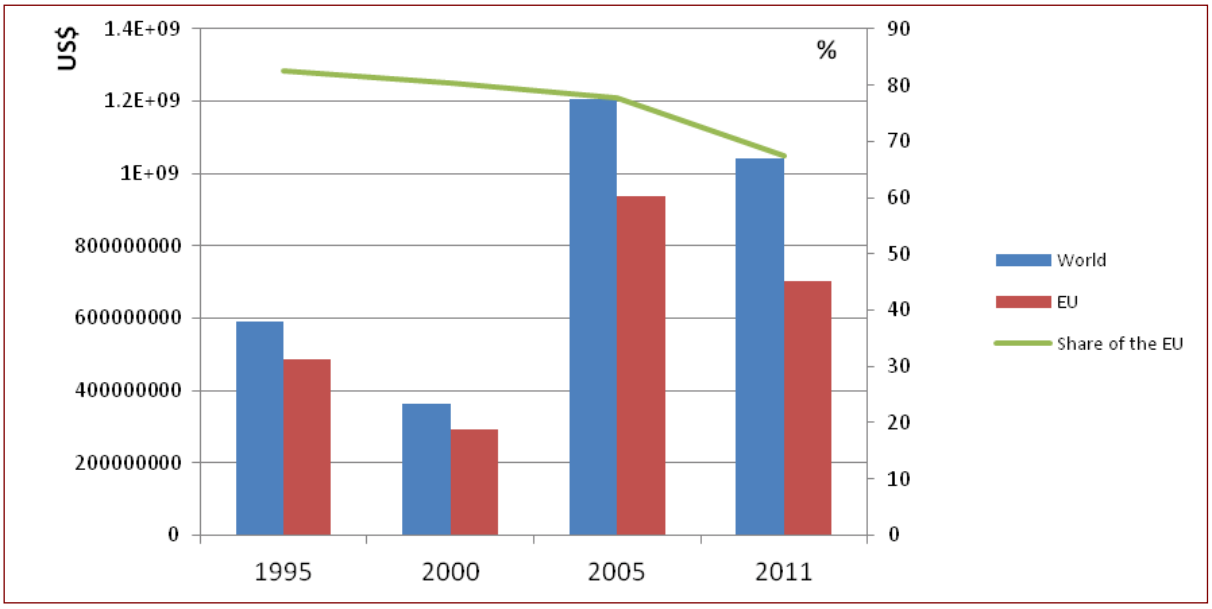
As shown in Figures 5 to 8, the unit export value of figs increased from around US$ 2000 per tonne to over US$ 3300 in 2011 (more than 50%). After 2002, export volume and value rose, unit export value were stable or slightly up. The volume fell in 2006-2007, but partly recovered in 2008-2010, and the unit export value almost doubled compared to pre-2007 average. On the other hand, the average unit prices for hazelnuts doubled, from US$ 3500 in 1995 to over US$ 7400 per tonne in 2011. After 2002, unit export value and export value rose strongly while volume remained relatively stable. After 2007 volume, value and unit export value remained relatively stable.

Figure 3. Turkey's Figs Export to the World and the EU, US$ and Share of the EU, %.



Source: Comtrade, 2012

Figure 4. Turkey's Hazelnuts Export to the World and the EU, US$ and Share of the EU, %.



Source: Comtrade, 2012

Figure 5. Change in Volume and Value of Figs Exports of Turkey to the EU

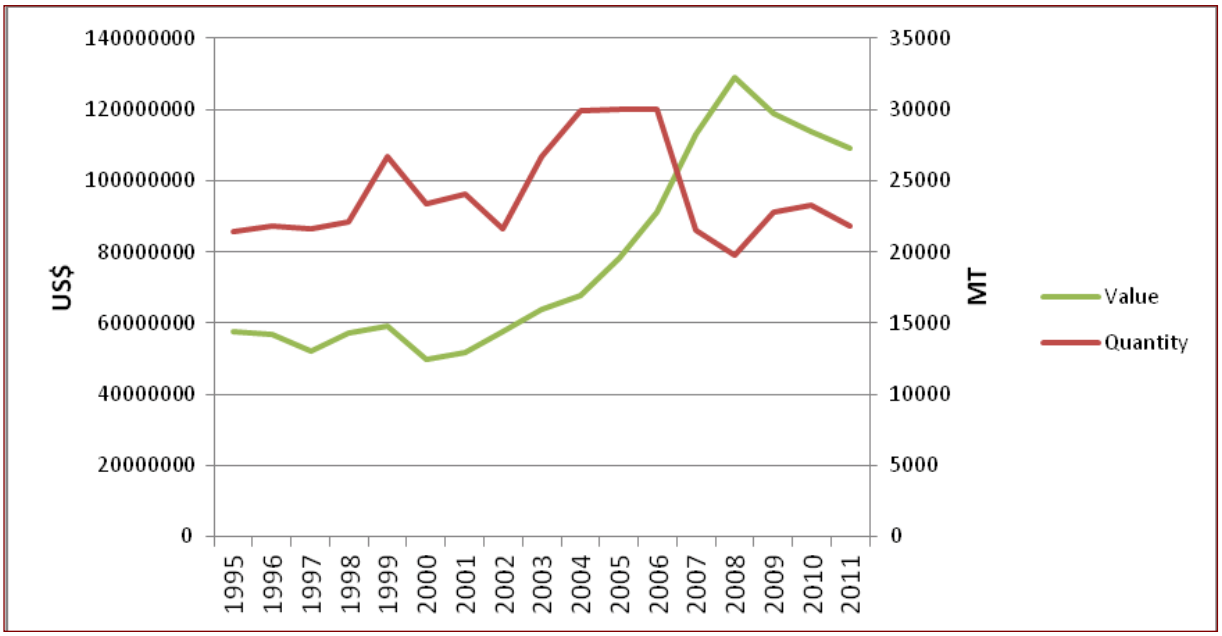


Figure 6. Unit Export Value of Turkey's Figs Export to the EU, US$/MT

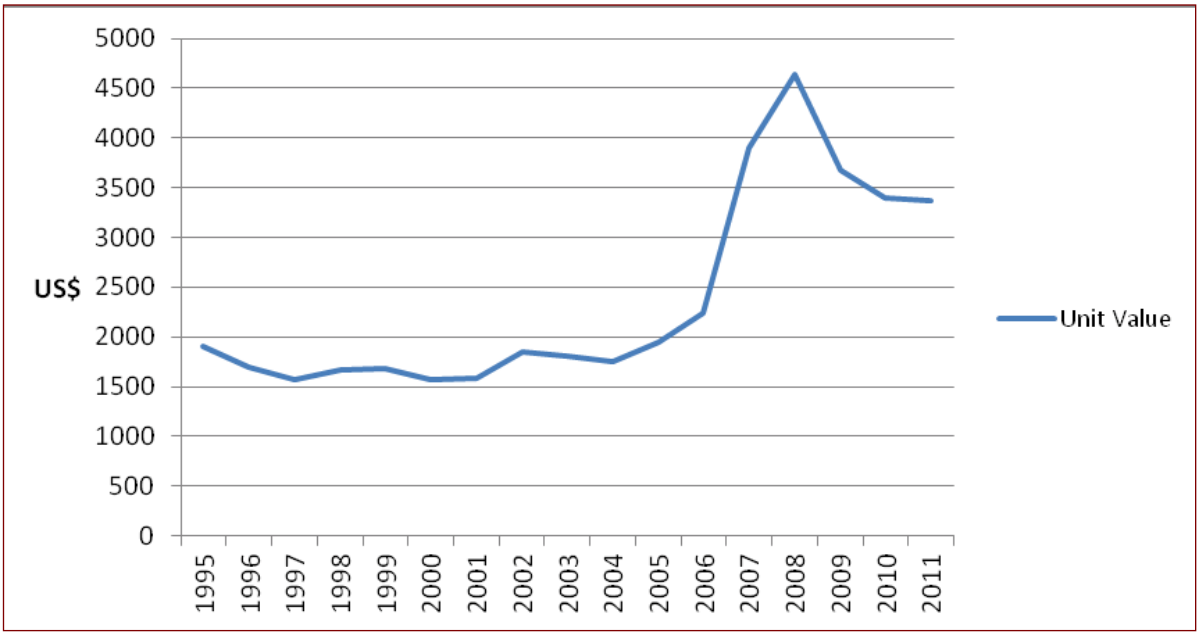


Figure 7. Change in Volume and Value of Hazelnuts Exports of Turkey to the EU

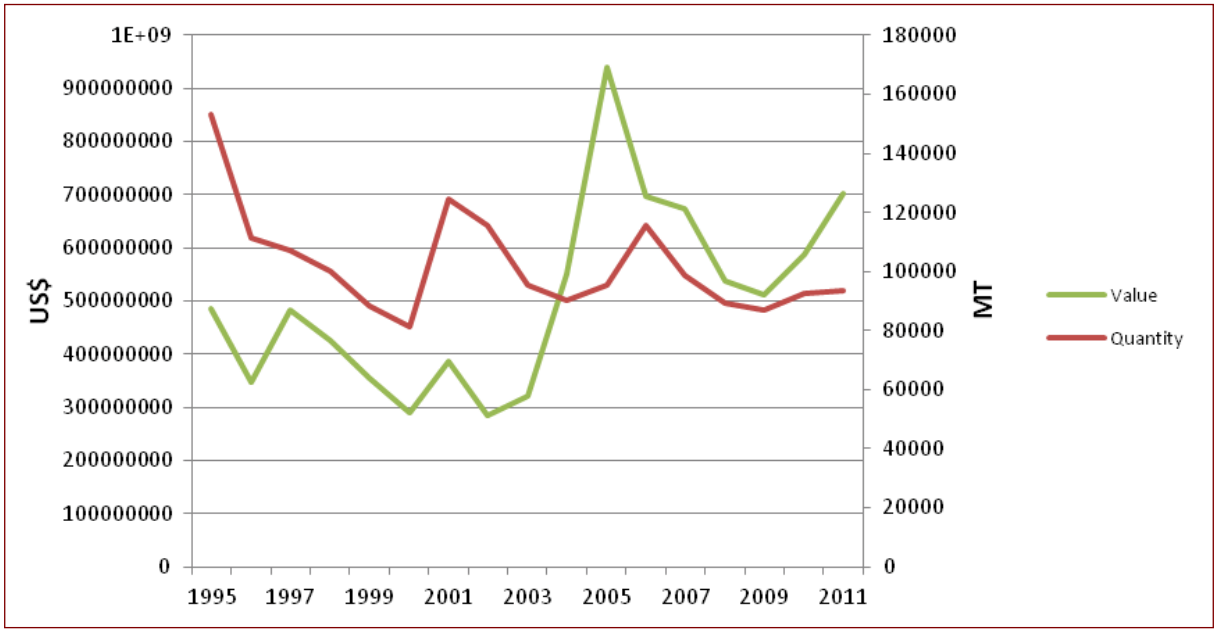
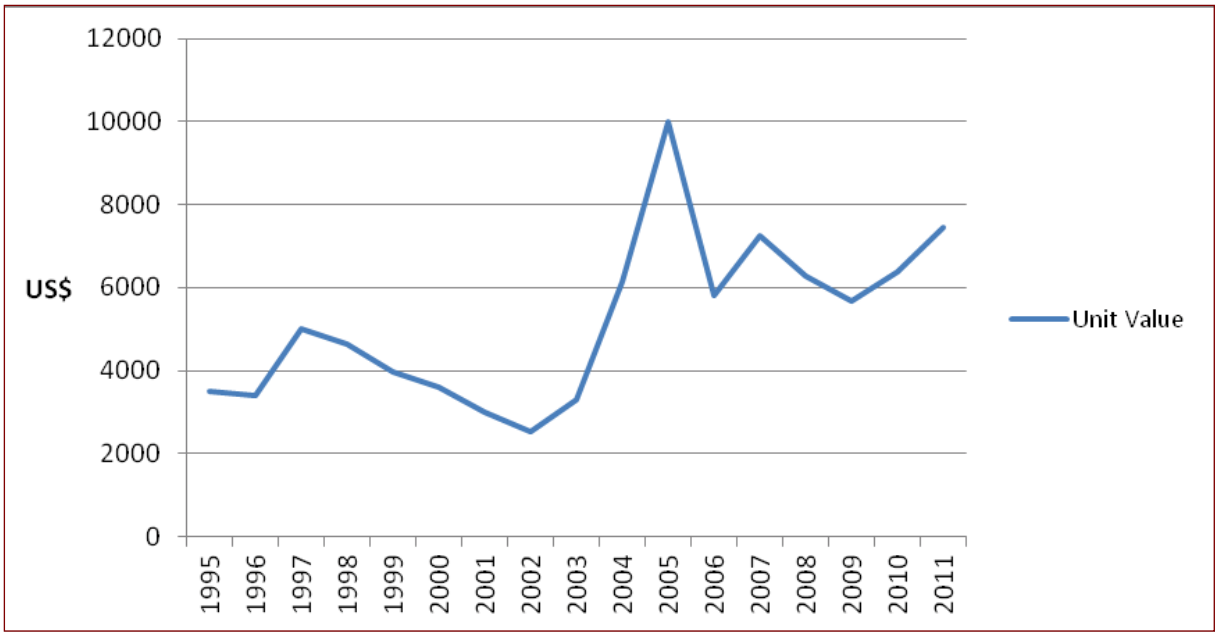


Figure 8. Unit Export Value of Turkey's Hazelnuts Export to the EU, US$/MT



The higher unit value of fig exports can be attributed to factors such as quality increase, while the increase in the unit value of hazelnut exports was caused by variations in production volume, lower stock, and higher market prices after policy changes toward more free market pricing (AEPDI, 2012). However, cost of quality improvements may also be an important factor that contributes to the value of exports.

4. Empirical Analysis and Data

In order to examine the impact of aflatoxin standards, an export flow model is employed utilizing the panel of unilateral export flow data between 1995 and 2011. Developing countries are more interested in the factors that determine their unilateral export flow in order to avoid balance of payment problems rather than the determinants of bilateral trade flow. Recently, however, some studies have utilized single-country models (Summary, 1989; Sohn, 2005; Lissovolik and Lissovolik, 2006).

In order to avoid the omitted variable bias (Matyas, 1997; Anderson and Van Wincoop, 2003) caused by unobservable multilateral resistances, importer effects were included in the model.

Thus the equations can be represented as

$$lnE_{TRjt} = \mu_j + \beta_1 lngdpc_{it-1} + \beta_2 lngdpc_{jt} + \beta_3 lnprod_{it} + \beta_4 lnexp-index_{ijt} + \beta_5 rexc_{it} + \beta_6 EUReg2002_{jt} + \beta_7 EUReg2007_{jt} + \varepsilon_{ijt} \quad (1)$$

$$EUReg2002_{jt} = \begin{cases} 0, before\ 2002, Harmonization\ of\ Aflatoxin\ Regulation \\ 1, otherwise \end{cases} \quad (2)$$

$$EUReg2007_{jt} = \begin{cases} 0, before\ 2007, \quad Aflatoxin\ Certification \\ 1, otherwise \end{cases}$$

$$lnE_{TRjt} = \mu_j + \beta_1 lngdpc_{ijt} + \beta_2 lnexp-index_{jt} + \lambda_{ijt} + \varepsilon_{ijt} \quad (3)$$

where E_{TRjt} is export flow in terms of volume from Turkey to partner EU countries; μ_j denotes importer-specific fixed effects λ_{ijt} denotes time effect; $gdpc_{it-1}$, $gdpc_{jt}$, $prod_{it}$, $exp\text{-}index_{jt}$, $rexc_{it}$, and $EUReg_{jt}$ denote home country's income per capita in previous year, partner countries' income per capita, domestic production level of specified commodities, export price index of specified commodities, real exchange rate of Turkey, and EU regulation dummies respectively. In time fixed effect estimation of the model multiplicative form of real incomes were utilized in order to avoid multicollinearity. Since the focus of this regression is the effectiveness of the EU's regulations, a regulation dummy is estimated such that a dummy variable (*EUReg2002*) representing harmonization of EU regulations in aflatoxins takes the value of 0 before 2002 and 1 otherwise. The *EUReg2007* aims to capture the effect of the additional regulation that requires the aflatoxin certificate in addition to the health certificate for imported nuts and

figs. In addition, a panel Chow test is performed to determine whether there is a structural change in export flow after 2002 and 2007.

The income variable impacts the economic capacity of trade; thus, the GDP's of partner countries positively impact trade flows. The effects of conventional trade flow variables such as *GDP's* of partner countries on trade flow were significant in most studies (Oguledo and Macphee, 1994). Regulations on aflatoxin limits may serve as a kind of technical barrier to trade and are expected to have a negative effect on export flow as found in some of the literature (Chen et al., 2008; Jongwanich, 2009). However, other researchers found non-negative impacts for some countries (Maertens and Swinnen, 2008; Anders and Caswell, 2009).

The study utilizes data over the period of 1995 to 2011. Based on the consistent data set and to exclude the new member bias that causes the rise in exports, the estimation includes 11 members for the fig regression (Austria, Denmark, Finland, France, Germany, Italy, Netherlands, Portugal, Spain, Sweden, and United Kingdom) and 12 members (11 partners plus Greece) for the hazelnut regression. The data used in the study for 12 partner countries come from various sources. Real GDPs and exchange rate data come from the World Bank (2012). The hazelnut and fig export data in terms of volume are from Comtrade (2012), based on HS classification. Production data are from FAOSTAT (2012). The descriptive statistics of the data used in this study are presented in Table 1.

Table 1. Descriptive Statistics of the Datra Used in the Study

	Mean	St Deviation	Min.	Max.
Figs Export (volume, MT) N=187	2976	3161	37	11499
GDP_i	3.05467E11	6.12E10	2.18E11	4.22E11
GDP_j	7.15E11	6.37E11	9.52E10	2.13E12
$Prod_i$	258415	26700	205067	300000
$Exp\text{-}index_{ij}$	123	52.66	71.49	297.26
$REXc_i$	0.20	0.24	0.08	0.81
EUReg2002	0.58	0.49	0	1
EUReg2007	0.29	0.45	0	1
Hazelnuts Export (volume, MT) N=204	8526	15175	5	87188
GDP_i	3.05467E11	6.12E10	2.18E11	4.22E11
GDP_j	6.67E11	6.30E11	9.52E10	2.13E12
Prod	529281	105499	350000	800791
$Exp\text{-}index_{ij}$	148	56.29	64.72	302.77
$REXc_i$	0.20	0.24	0.08	0.81
EU-Reg2002	0.58	0.49	0	1
EU-Reg2007	0.29	0.45	0	1

5. Results

The results of the panel regression are presented in Table 2. We cannot utilize the full set of time dummies here because of the inclusion of time variant but partner country-fixed regulation dummies. Considering the various control variables and model selection criteria, three models were estimated for each commodity. As shown, the lagged value of real GDP per capita of Turkey is positive and significant for figs but insignificant for hazelnuts. The findings indicate that a rise in real income in previous year positively affects the export capacity of the figs. The explanation for insignificant home income for the exports of hazelnut is twofold: first, the increase in real income in Turkey might lead to an increased level of domestic consumption of that commodity; second, increased real income leads to higher capacity for trade flow with non-EU partners. The partner country income is positive and significant in model 2 only for the volume of fig exports but negative for the volume of hazelnut exports. The explanation for negative partner income for the volume of hazelnut exports can be attributed to the relatively low level of growth in the EU members in the last decade. The domestic supply capacity of both commodities were found to be significant underlying the fact that export of these commodities are related to the domestic supply fluctuations, especially for the case of figs. Export price index is found to be negative and significant for both commodities implying that rise in real unit prices will deter export. The appreciation of Turkish Lira has no effect on the volume exports as reflected by the parameter value of the real exchange rate variable.

The impact of *EUReg2002* shows that Turkish hazelnut exports are higher by [exp (0.17)-1] = 18 % after the 2002 regulation. Although fig exports are lower after the harmonization in model 2, after controlling the year variables, the negative effect of harmonization becomes insignificant. The impact of *EUReg2007* shows that Turkish fig exports are deterred after 2007, but hazelnut exports are not affected significantly. When the findings are compared with the Figure 5, it is interesting to note that the volume of fig exports decreased slightly, immediately after the harmonization; however it performed well afterwards especially in 2003 and 2006 before decreasing again in 2007 (year of aflatoxin regulation). The positive impact of harmonization on hazelnuts might stem from a few factors. First, harmonization eliminated some very strict EU member countries' regulations and therefore helped Turkish exporters to benefit. Second, it might have caused the replacement of some inefficient exporters that could not comply with the regulations. On the other hand, it is clear that request for additional certification had a negative effect on the volume of fig exports. The insignificant panel Chow test statistics indicate that there is no structural change in Turkey's food export to partner EU countries in real terms after the food safety regulations came into effect. Based on the panel data estimates, food safety standards have had a significant deterring impact on the volume of Turkish fig exports but no negative effect on the volume of hazelnut exports.

The time effect estimation that utilizes the time dummies is presented in Table 3. This estimation includes only the multiplicative form of the GDP per capitas and export price index variables, because inclusion of full-year dummies does not allow for estimation of regulation dummies that are time-variant but fixed across countries. The year dummies show that export flow of figs decreased significantly after 2002 and 2007 compared to the base year. However, the same negative effect is not observed for the hazelnuts estimation. These results imply that hazelnut exports complied with the regulations and performed better compared to fig exports.

Table 2. Fixed Effects Panel Regression of Turkey's Figs and Hazelnuts Export to the EU

Variables	Figs			Hazelnuts		
	[1]	[2]	[3]	[1]	[2]	[3]
$lngdpc_{it-1}$	1.80 (3.71***)	-	-	-0.57 (-0.65)	-	-
$lngdpc_{jt}$	0.72 (1.13)	1.07 (2.60**)	0.86 (1.26)	-1.38 (-1.66*)	-1.83 (-3.24***)	-1.40 (-1.67*)
$lnprod_{it}$	0.53 (2.05**)	0.59 (2.30**)	0.47 (2.24**)	0.28 (1.40)	0.33 (1.99**)	-
$lnexp\text{-}index_{ijt}$	-0.43 (-3.01***)	-	-	-0.23 (-1.67*)	-0.29 (-3.01***)	-0.37 (-2.77**)
$lnrexc_{it}$	-0.007 (-0.02)	-	-	0.08 (1.65)	-	-
$EUReg2002_{jt}$	-	-0.20 (-2.70**)	-0.13 (-0.99)	-	0.17 (1.80*)	0.26 (1.70*)
$EUReg2007_{jt}$	-	-0.15 (-2.37**)	-0.34 (-2.29**)	-	-0.09 (-1.22)	0.22 (1.21)
Year2002	-	-	-0.15 (-1.60)	-	-	0.15 (-1.31)
Year2007	-	-	0.07 (1.17)	-	-	0.13 (1.76*)
Trend	0.03 (1.95*)		-	0.0001 (0.0048)	-	-
R^2	0.96	0.96	0.97	0.96	0.97	0.97
Chow Test (2002) Chow Test (2007)	F(15,157) 0.16 F(15,157) 0.02				F(16, 172) 0.06 F(16, 172) 0.02	
N	187				204	

Note *, **, *** denote 10, 5, 1 percent significance, respectively. Numbers in parentheses are t values. Country-specific fixed effects are not reported.
[1-3] denote the model without regulation dummies, with regulation dummies, and with regulation dummies controlled by year effect respectively.

Table 3. Time Fixed Effects Estimation of Turkey's Export Flow

Variables		Parameter Estimate		
	Figs	t value	Hazelnuts	t values
$lngdpc_t$	0.12	1.77*	-0.26	-2.80**
lnexp-index	-	-	-0.76	-1.79*
Year1996	-0.01	-0.14	-0.24	-1.39
Year1997	-0.12	-0.82	0.07	0.28
Year1998	-0.15	-0.86	0.26	0.95
Year1999	-0.05	-0.03	-0.02	-0.11
Year2000	-0.21	-1.02	0.12	0.42
Year2001	-0.20	-1.21	0.19	0.79
Year2002	-0.45	-2.25**	0.12	0.41
Year2003	-0.37	-1.67*	0.35	1.11
Year2004	-0.40	-1.41	0.98	2.04**
Year2005	-0.38	-1.14	1.44	2.13**
Year2006	-0.52	-1.34	1.32	2.20**
Year2007	-0.86	-2.03**	1.59	2.31**
Year2008	-0.96	-2.31**	1.43	2.19**
Year2009	-0.67	-1.96*	1.05	1.94*
Year2010	-0.83	-2.05**	1.47	2.30**
Year2011	-1.00	-2.19**	1.58	2.16**
R^2	0.97		0.97	
LM (time effects)	2214***		2207***	

6. Conclusions

This study aimed to examine the interaction between food safety regulations and export performance from the perspective of a developing country. Utilizing the panel data, this study analyzed the impact of EU food safety regulations on Turkey's fig and hazelnut exports to the EU. The results show that the 2002 regulation of aflatoxin harmonization positively affected the volume of hazelnut exports. The 2007 regulation that requires certification significantly deterred fig exports; however, hazelnut exports were not impeded after the regulations in terms of volume. Therefore, the impact of regulations varies depending on the characteristics of the products. On the other hand, the regulations require processing expenses, which are reflected in the unit prices as can be seen in trade statistics (Comtrade, 2012).

Increased food safety may lead to a catalyst effect for some countries, because certain developing countries react to new standards through new investments and research expenditures (Anders and Caswell, 2009). Alternatively, the response of exporting companies to these increased standards may result in consolidation and increased vertical coordination at different levels of the supply chain (Maertens and Swinnen, 2008). The strategic responses to food safety standards vary across countries, reflecting capacities and perspectives on emerging requirements (Henson and Jaffee, 2008). In the case of Turkey, the regulations in general have significantly deterred the volume of fig exports to the EU (impeding effect). In terms of hazelnut exports, the instituitional adjustments and harmonization attempts of food regulations with the EU may have had a trade facilitating catalyst effect given the restrictive food standards, but at least these standards do not have barrier effects for some commodities.

Related institutions such as the Ministry of Agriculture and Rural Affairs (MARA, 2009) and the Undersecretariat of Foreign Trade (UPMFT, 2012) provide guidance for exporting firms. As a candidate country for full membership with the EU, Turkey has been harmonizing its regulations in line with the accession negotiations (SGEUA, 2012). These types of institutional mechanisms may have a positive effect on exporting firms to comply with the food safety regulations in export markets. The question of why the institutional effect did not occur in the case of fig exports in the long run can be attributed to the comparatively higher level of production and export of hazelnuts in Turkey's agricultural food market. Therefore, higher levels of extension and guidance for the hazelnut sector are important factors in maintaining export earnings. Another explanation might be the differences in processing capacities of these two products in the marketing stages. Hazelnuts have a shell which protects them from chemical residues while this is not the case for figs. Thus, figs are more vulnerable to aflatoxin and only limited quantities of fungicides can be used to treat them, otherwise there are too many residues left in the fruit and it does not meet the regulation.

The value of exports to the EU performed well between 1995 and 2011 compared with the volume of exports. Although this finding can be used as an argument in favour of the export earnings, to what extent these gains are transferred to the producers is a major concern. Especially in the marketing of fruits and vegetables there are quite high marketing margins, and production and processing costs to comply with the regulations might add extra cost for producers. The EU regulations that require certificates for imported products are reflected as processing and managerial costs in export products. Therefore, it can be argued that the standards increased the price of export commodities, resulting in higher prices for EU consumers. On the other hand, given the fact that certain developed countries, such as the EU, have more restrictive limits on food products than those specified by the Codex Alimentarius (FAO, 2004) and different limits are set at country levels (MARA, 2012), the simplification and harmonization of regulations and more international collaboration are needed to further trade performance.

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