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IMPACTS OF AGRICULTURAL SUPPORTS ON EXPORTS OF INDIVIDUAL AGRICULTURAL PRODUCTS IN TURKEY[1]

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Abstract

Our paper empirically investigates the effects of agricultural supports on the exports of eighteen Turkish agricultural commodities to 72 countries over the 1965 - 2010 period. As we use PSE (Producer Support Estimate) and NRA (Nominal Rate of Assistance) as indicators of agricultural supports, our study considers not only agricultural subsidies but also all the efforts of government to support agriculture through both domestic and border measures. Our estimation results show that agricultural supports along with border measures have mixed effects on the export of Turkish agricultural commodities, and agricultural supports are as important as exchange rates in the determination of the export patterns of Turkish agricultural commodities. We also investigate the effects of real exchange rate and its volatility on the exports of Turkish agricultural commodities. Although they are generally positive, our estimated coefficients on real exchange rates in the analysis exhibit mixed results.

Keywords: agricultural support, agricultural commodity exports, panel data analysis

I. INTRODUCTION

Governments frequently intervene in agricultural sectors for many reasons. Some idiosyncratic characteristics of the agricultural sector lead governments to follow supportive or protective policies about the sector. The very dependency on natural conditions leads agricultural production to incorporate more risk and uncertainty than other sectors. Although technological

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advances provide opportunities to cope with some of the production uncertainties, some of them can still generate big losses in production. Moreover, it is harder for agricultural sector to increase production relative to non-agricultural one such as manufacturing. All these conditions are also reflected in agricultural prices which in turn determine farmers' income. While formation of prices is basically similar in different sectors or for most of commodities, the reflection of producers to prices or demand is not so similar due to the inelastic feature of agricultural production or storability of commodities. In addition, agricultural output is generally produced by a lot of farmers, who are also unaware from each other, and farmers can generally give response to price movements in the seeding period, not at any other time. (Oren, 1994; WTO, 2011).

After the World War II, agricultural sector and trade has received considerable attention in international agenda. In fact, international concerns about agricultural sector, especially trade, originated from high levels of protection in industrialized countries during the 1960s. These countries have also extensively supported their farmers and production, in turn, which leads domestic supply surpluses. These surpluses depress the world agricultural commodity prices. Developing countries suffer heavily from these developments since their exports relatively consist more of agricultural and primary products. On the one hand, they have experienced decreases in their export earnings due to lower prices, on the other hand they could not access freely to domestic markets of industrialized countries. Debates over agricultural trade and policy reforms aiming to reduce protection on agricultural commodities have begun to increase in 1980s. International trade rules have started to change in 1990s, especially through the Agreement on Agriculture (AoA) that was put into force with the establishment of the WTO in 1995 (Josling et al., 2010).

In order to measure and evaluate whether countries are adhering to negotiated rules or commitments, the WTO develops an indicator, namely Aggregate Measurement of Support (AMS), the WTO is not the only institution that develops an agricultural support measurement. Both the OECD and the World Bank compute such indicators, namely Producer Support Estimate (PSE) and Nominal Rate of Assistance (NRA), respectively. Although each of them has their own calculation techniques, PSE and NRA are more similar to each other relative to AMS which has much different purposes[2].

A large number of studies investigate the effects of agricultural supports on output, employment, export, consumption, income distribution, pattern of international agricultural trade, commodity prices, global welfare and global resource allocation. Although both PSE and NRA are used in the evaluation of agricultural supports in the literature, PSE is the most commonly used one

[2] OECD (2010) discusses these differences in detail.

since it is available for a longer period. However, these indicators are generally used in order to compare the efforts of governments for supporting agriculture across countries or to evaluate the efforts of any government for supporting agriculture in a historical context.

The main contributions of our paper are as follows. First, this study investigates the effects of agricultural supports on the exports of eighteen Turkish agricultural commodities to 72 countries over the 1962 - 2010 period. Although there are some studies in the literature to work with disaggregated data at commodity level, there is no study that considers so many commodities and trading partners for such a long period of time. Second, despite there are important studies in the literature investigating the effects of agricultural supports on international trade, they generally consider only export subsidies. Since we use both PSE and NRA as indicators of agricultural supports, our study considers not only export subsidies but all the efforts of government to support agriculture through both domestic and border measures. Lastly, as our study utilizes both PSE and NRA in the empirical investigation, it enables us to compare the results of these indicators. Since the calculation of the each indicator is somewhat different, it is thus important to compare them to reach finer results.

II. AGRICULTURAL PRODUCTION, TRADE, and SUPPORTS in TURKEY

Turkey has experienced the same trend as other developing countries regarding the share of agricultural production in GDP. The share of agricultural value added in GDP plummeted sharply to 10 percent from 50 percent during the last eighty years. Given that subsistence and semi-subsistence farming still plays an important role in Turkey, most farms generally have low productivity and they sell only a small proportion of their production and a quarter of total labor force is still working in the agriculture sector, all these means the much lower income for rural population (Web 2, 2011).

As can be seen from Table I, despite the steep drop in the share of agriculture in GDP, Turkey is still an important producer in many agricultural commodities in the world. For example, Turkey is a top producer of hazelnut and meets the 3/4 of world hazelnut demand. This is also true for dried figs and apricots. Raisin is also an important in Turkish agricultural exports and Turkish raisin exports meet nearly 30 percent of the world demand. Moreover, fruit and vegetables exports constitute nearly 40 percent of Turkish agricultural exports.

Table I: Ranking of Turkey in the World by Agricultural Commodity Production in 2011

Rank	Commodity
1	Apricots, Quinces, Hazelnuts, Figs, Cherries
2	Poppy seed, Sheep milk, Chestnuts, Leeks, other alliaceous veg, Sour cherries, Honey
3	Cucumbers and gherkins, Pistachios, Spices (nes), Other melons (inc. cantaloupes), Strawberries, Chillies and peppers (green), Watermelons
4	Apples, Vetches, Olives, Tomatoes, Spinach, Chick peas, Beans (green), Lentils, Walnuts, Beeswax
5	Eggplants (aubergines), Vanilla, Berries (nes), Sugar beet, Tangerines, mandarins, clem., Stone fruit (nes), Tea
6	Peaches and nectarines, Pears, Grapefruit (inc. Pomelos), Safflower seed, String beans, Grapes, Indigenous Sheep Meat, Cottonseed
7	Onions (dry), Almonds, Cotton lint, Sunflower seed, Lettuce and chicory, Lemons and limes, Plums and sloes

Source: Web 3, FAO

As noted above, although it consists of a very small part of overall production for most countries, agriculture sector is always subjected to the heavy dose of government intervention. Before 1980s, agricultural imports were substantially restricted in Turkey and the most of agricultural products were imported by State Economic Enterprises (SEE). Although a more transparent import regime was put into force in 1980, a quota system continued until 1984 in the import of some sensitive products such as wheat, sugar etc. and the imposition of several new taxes on agricultural imports started after the first half of 1980s. These taxes were used in the agricultural input (such as fertilizer) and export supports. At the beginning of 1990s, import restrictions on several agricultural products were ceased and import permits on sensitive products were annulled (Kiymaz, 2000). In the second half of the 1990s, Turkish agricultural trade policies have been arranged in accordance with international agreements, especially AoA. Turkey committed to reduce the tariff rates in each agricultural product by 10 percent and average tariff rate of all agricultural products by 24 percent in the 1994-2004 period. Since Turkey is a developing country, Turkey obtained the opportunity of using the base tariffication rate for the reduction commitments such as the highest tariffication rate would be used for primary and/or sensitive products (Turkey would determine the highest rate by its own) and the prevalent rate in 1986 would be used for other agricultural products (Cakmak and Akder, 1999). Currently, high tariffs are generally applied for meat, dairy products, sugar and some of the cereals. In sum, all of these policies imply that domestically supported products are also protected with border measures.

Although the exports of many agricultural products were subject to several restrictions such as licenses and registration requirements until 1980, after then, most of these restrictions were

ceased with the new export regime. However, export of some agricultural products was taxed at varying rates, and both the number of taxed products and the tax rate were reduced over time (Kiymaz, 2000). For example, export levies on angora wool, dried fruit and nuts were gradually abolished, and completely ceased in 1995 (Burrell and Kurzweil, 2007).

Export refund supports in agricultural products have been regulated within the framework of the WTO agreements (AoA) since 1994. Turkey was responsible to make reductions in export subsidies such that supported number of products should be reduced by 14 percent and the amount of support payment in budget expenses should be reduced by 24 percent in a ten-year period. Actually there was a circumvention in the countries' reduction commitments about export subsidies, which is called as front-loading mechanism. In this system, countries and similarly Turkey had the opportunity of making support reductions from the 1991-92 support levels if higher than the 1986-90 average. Thus, Turkey increased export subsidies from the 1986-90 levels and obtain the ability of beginning the reductions from a higher support level (Gorter et al., 2002). Besides, Turkey committed to not include any new agricultural product into the scope of export supports (Ay and Yapar, 2005). Although Turkey declared to the WTO to support 44 agricultural products by export refunds, the government generally has declared 16-18 items of agricultural products to support with varying support rates. The list of products subject to export refund supports has been issued in every year (DPT, 2004). Some of the supported products are fruits, vegetables, fruit juices, poultry meat, honey, processed fishes, macaroni and olive oil etc.

Apart from domestic regulations on agricultural policies, Turkey acceded to two important agreements about international trade in 1995 and 1996. One of them is the Customs Union (CU) and the other is AoA. Other than AoA, the most important evolution in the agricultural sector after the 2000s was arisen through Agricultural Reform Implementation Project (ARIP) that was funded from the World Bank loans and cost more than 600 million US dollar. The ARIP was implemented over 2001-2009 period. It was a pre-condition for getting support from the IMF and also was a tool for alignment of Turkish agricultural policy to the EU's Common Agricultural Policy (OECD, 2011).

When the structure of agricultural support system is analyzed quantitatively, important changes can easily be noticed. As can be seen from Table II, area based agricultural supports, DIS (Direct Income Support), deficiency payments and livestock farming supports are the most important items in the agricultural support system since 2002. In addition to DIS, area based

agricultural supports involve diesel support, fertilizer support and land-based income supports to hazelnut producers since 2003, 2005 and 2010, respectively.

Table II: Agricultural Supports by years in Turkey, (current TL)

Support Issue	Area-Based Agricultural Supports and DIS	Deficiency Payment Supports	Livestock Farming Supports	Services Related to the ARIP	Agricultural Insurance Services	Supports As Part of Compensatory Payments	Other Agricultural Supports	Supports Aimed at Rural Development	Drought Supports	Livestock Farming GAP-DAP Regions	Frost Disaster	GENERAL TOTAL
	Percentage share in Total Support Payments											000 TL
2002	83.37	9.96	4.45	0.00	0.00	2.22	0.00	0.00	0.00	0.00	0.00	1,868,856
2003	84.41	10.05	3.97	0.10	0.00	1.47	0.00	0.00	0.00	0.00	0.00	2,669,484
2004	80.13	11.48	8.19	0.05	0.00	0.15	0.00	0.00	0.00	0.00	0.00	3,049,376
2005	63.90	25.22	9.57	0.02	0.00	1.29	0.01	0.00	0.00	0.00	0.00	3,681,976
2006	56.10	27.20	14.31	0.03	0.04	1.54	0.78	0.00	0.00	0.00	0.00	4,743,707
2007	44.42	32.16	13.04	0.44	0.57	1.53	1.63	1.44	4.77	0.00	0.00	5,541,994
2008	33.38	28.14	22.74	0.58	0.94	1.38	1.59	1.87	9.38	0.00	0.00	5,850,506
2009	23.80	44.19	19.77	0.21	1.32	1.69	2.20	5.44	0.05	0.00	0.00	4,530,942
2010	31.60	35.22	20.28	0.00	1.38	1.30	2.11	4.83	0.00	0.08	2.17	5,881,068
2011	28.18	35.34	24.38	0.00	3.37	1.27	2.05	3.52	0.00	1.03	0.00	7,084,724

Although the share of area based agricultural supports and DIS payments were more than 80 percent in the total agricultural support in 2002, it was only 28 percent in 2011. DIS payments alone captured about 80 percent share of total supports in 2002, 19 percent (or 1.14 billion TRL) in 2008 and nearly zero (only 318.000 TRL) in 2011. Apart from the ending of the ARIP, this change is explained in the OECD report such that "Agricultural Strategy Paper and the 2006 Agriculture Law appeared to re-couple part of the DIS payment, and support linked to production was defined as a key instrument of agricultural policy" (OECD, 2011, p. 47). Results of this new strategy or the Law can also be considered in the increasing share of deficiency payments and livestock farming supports in total support payments, and also in the decreasing share of DIS. The payments of these two support items has been increased more than five and eight fold since 2002.

III. LITERATURE REVIEW

III.I. Agricultural Subsidies/Distortions and Agricultural Trade

A large number of studies investigate both the trend and the determinants of agricultural trade. Most of them are especially focus on the distorted international market conditions, agricultural trade policies and protectionism/liberalization in addition to volatility of agricultural production and food

prices. About the agricultural protectionism, Mccalla (1969) emphasizes the nationalistic policies and social objectives, and he claims that economically and politically dominant nations in international trade generally lead and shape the changes in international trade policies. Josling et al. (2010) shows that the pattern of agricultural trade changed over years by focusing on commodity prices, exchange rates, market structure, agricultural policies and the role of international organizations in trade. By evaluating the causes and the consequences of agricultural policies Sumner et al. (2010) claim that modeling problems and immeasurable policy-relevant relationships still cause unresolved and conflicting empirical issues in agricultural economics. Considering the increased globalization in the world, Anderson (2010) states that the most important factors in the changing structure of agricultural trade since 1960s are decline in the trade costs, growth in farm productivity and policies of national and/or international institutions that reduce the distortions on agricultural trade. However, the inability of developing countries to take an important role or share from the changing world agricultural trade pattern is presented in Aksoy and Ng (2010).

Although there is an important notion about the adverse effects of developed or industrialized countries' support policies on the Least Developed Countries or developing countries' export or other macro conditions, Panagariya (2005) is against this idea from some aspects. By advocating liberal agricultural regimes, he claims that developing countries have some more crucial problems with their own policies and developed countries don't hurt them via agricultural subsidies or protectionist border measures. Olper and Raimondi (2009) assert that trade liberalization can generate an increase in food exports, particularly of developing countries. Serrano and Pinilla (2010) argue that increased world income is the most significant factor in the growth of agricultural trade, while changes in the price of agricultural products and the exchange rate volatility are also significant, but less important. They claim that distance between trading countries and protectionist policies restrain the growth of agricultural trade. Although their analysis and assumptions have some complications, Liefert et al. (2012) show that alternative less-market distortive policy instruments would allow both domestic producers and consumers to gain more than compared to the situation under export bans. Mayrand et al. (2003) strongly emphasize that export subsidies along with the coupled payments to output or price can raise the production over the free market levels and with the other export supportive programs, this situation can generate a reduction in the commodity prices and distort the world market or trade flows.

The role and the importance of WTO on negotiations about the reduction of market-distortionary agricultural supports is generally criticized in the literature and the common idea of

these studies is that there is much more things for WTO to do (Anderson (2010) and Swain (2009)).[3]

Since the international agenda about agricultural trade and subsidies has increased the importance of direct support payments to farmers or decoupled payments, it has received a great deal of attention in the recent literature. However, we consider studies that investigate relationships between direct support payments and production or trade and also studies that investigate distortive effects of DISs. Dewbre et al. (2001) present the importance of the direct payments' effects on distortions to trade and income transfer efficiency by comparing them with market price supports. They argue that mostly distortive support policies in production or trade are also the least efficient ones in providing income benefits and vice versa. They stress that payments based on area are both most efficient and least distortive ones relative to the others studied, while the payments based on input use are most distortive and least efficient. However, Weber and Key (2011) emphasize that decoupled payments to farmers have little effect on the production and therefore these payments don't cause excess production in agriculture and distortions in world markets. Dogruel et al. (2003) assert that although replacing some special agricultural support instrument with DISs can generate modest welfare gains, it can also generate deflationary effects on the rural economy and GDP in Turkey. Nonetheless, Bayaner and Bor (2006) and Turkmen (2010) find that this support system is not as efficient as expected due to the structural and institutional failures in Turkey.

Furthermore, some studies evaluate the agricultural subsidies from the perspective of beneficiaries and politicians. Park and Jensen (2007) empirically investigate the relationship between electoral systems and agricultural support, and conclude that if the targeted part of constituencies is relatively small, the level of agricultural support will be high. Civan (2010) claims that although there is a non-linear relationship between the protection level and the sector size, the support or protection level could be reduced since the power of the sector could decrease due to the lack of coordination, freeloading, etc., after a sector has reached an optimum level. He also asserts that as long as a country becomes wealthier and election time gets closer, agricultural sector becomes more protected.

By utilizing data about corn producers, Rejesus et al. (2009) investigate factors, especially usage of crop insurance programs that influence producers' attitudes toward government support

[3] Besides these general or trade/market related critics on agricultural subsidies, another important issue in the literature on agricultural subsidies is about their welfare effects (Bale and Lutz (1981), Anderson et al. (2006), Hoekman et al. (2002), Tokarick (2003 and 2005), Koo and Kennedy (2006)). In addition to the welfare effects of agricultural subsidies, their effects on macro variables such as output, employment, export, consumption, income distribution and also inflation are also investigated in the literature (Spittler et al. (2011) Hertel (1989a) Koo et al. (1994) ,Bakay and Huang (2010) ,Torayeh (2011), Whitaker (2009) , Abay et al. (2001)).

programs. They find that producers with lower age, larger farmland, higher business risk, no farm animal production, no off-farm income and the producers that are using crop insurance products give more importance to government support programs. Therefore, the authors suggest that the crop insurance programs and the direct government support programs are seen as complementary tools rather than substituting each other.

The literature about the agricultural support policies and the changing structure of them from past to present in Turkey is very rich and most of them find agricultural support policies, support instruments and/or the way by which support payments transferred unsuccessful (such as, Uysal, 1993 and Yavuz, 2000). In recent years, however, studies generally have focused on the effects of the transformation in support policies, with great attention paid to direct income supports, due to the agreements signed with international institutions, structural adjustment programs and ongoing negotiations with the EU on agricultural issues. OECD (2011) finds some of agricultural policies and support instruments applied in Turkey financially unsustainable while some of them ambitious. But more importantly, it states that implementation of the reforms after 2000 encountered difficulties and their focuses are not sufficiently clear. Kasnakoglu and Cakmak (2000) and Cakmak (2003) analyze the instruments of agricultural supports in Turkey and compare them with other countries regarding the PSE and sub-parameters of it. These studies state that wealthy farmers with big farmlands benefit from agricultural supports more than poor farmers and also most of the subsidies classified as consumer transfers come from low income group rather than higher ones. Burrell and Kurzweil (2007) emphasize that there are important institutional and structural disorders in the agricultural sector in Turkey and note that it is impossible for this sector to improve without government intervention. They claim that distortive agricultural policies are not the main cause of unimproved situation of agriculture sector in Turkey, but they still propose that elimination of these policies is necessary for achieving macroeconomic stabilization and providing sectoral policy liberalization.

Empirical studies on agricultural policies in Turkey are highly concentrated on the evaluation of the both contents/clauses and the effects of the ARIP, AoA, and negotiations with EU (i.e. Cakmak and Akder, 1999; Tekinel and Deniz, (2001); Dogan, 2002; Cakmak, 2004 and 2007). Cakmak (2007) evaluates the effects of changing structure of Turkish agricultural policies through mostly focusing on the effects of trade liberalization in the light of recent agricultural agreements and reforms. He asserts that if the adjustment ability of the agricultural sector is not improved through agricultural reforms, even small decreases in the protection levels may easily damage the

whole sector. Similar apprehensions could be found in Saracoglu and Bulut (2004), Ay and Yapar (2005), TUSIAD (2005), Susam and Bakkal (2008) and Kandemir (2011) about the WTO agreements and the EU negotiation process with Turkey and the duties of Turkey originated from these agreements. Kandemir (2011) evaluates the harmonization process of Turkish agricultural policies with that of the EU, and asserts that total amount of support payments in Turkey is less than what is stated in Agricultural Law. He argues that direct income supports leads to a decrease in the production of various agricultural products and makes the farmers lazy and he concludes that this system negatively effects both the agricultural development and the balance of agricultural trade.

Oren and Bahadır (2005) compare the agricultural policies in Turkey with those implemented in OECD countries at the agricultural subsector level, namely livestock. They claim that although the total agricultural support as share of GDP in our country is higher than the OECD average, the amount of subsidies per hectare is lower. They also argue that the share of livestock supports in total agricultural supports is low compared to the crop oriented supports, besides most of the livestock subsidies are provided through the border measurements or protection policies which create a tax-like effect on consumers due to high domestic prices. Erdal and Erdal (2008) examine the relationship between premium payments and the production of cotton, sun flower, soybean, canola, aspire and maize. They report that there is not any relationship between production areas and premium payments for cotton, sunflower and soybean products. However, there is a unidirectional relation between canola production area and premium payment, and a bidirectional relation between those of maize. They also note that there is a causality relationship between production areas and product prices of sun flower, soybean, canola and aspire, indicating that commodity prices affect the production decision of farmers.

Since Turkey recently launched several structural reforms in agricultural policies addressing the replacement of producer price subsidies with direct income transfers, the studies about the Turkish agricultural system or subsidies tend to concern with macroeconomic effects of these new policies and especially direct income supports. Yilmaz et al. (2008) state that farmers with big farmland utilize from DIS more than small farmland owners due to the failures occurred in the application process of DIS, and so they claim that this support distorts income distribution in agriculture sector further. However, both Aslan and Boz (2005) and Bor (2005) find that more than 50 percent of received DIS payments are spent for agricultural purposes and the socio-economic characteristics of farmers is an important factor in farmers' attitude towards supports.

III.II. Exchange Rates and Agricultural Trade

Impacts of both exchange rate level and exchange rate volatility or variability especially on exports, bilateral trade flows and volume of trade have been empirically and theoretically discussed in the literature. The effect of exchange rate on agricultural trade first is considered by Edward Schuh in 1974 and then investigated in many empirical studies. Kristinek and Anderson (2002) review the literature on the role of exchange rates on agricultural trade and argue that there is no consensus on the best method to measure the impact of exchange rates on trade. Kargbo (2006) finds a negative relationship between the exchange rate volatility and South Africa's agricultural trade. He emphasizes on the significant impacts of price, domestic agricultural production capacity and real income of partner countries on the agricultural trade of South Africa. Baek and Koo (2009) find that bilateral exchange rates have significant roles on the agricultural bilateral trade (export/import) between the US and its ten major trading partners. They emphasize that in the long run while bilateral exchange rates have negative impacts on the US agricultural exports in all cases, they have a positive impact on imports in only one case.

Notions about the effects of exchange rate volatility are in a changing structure regarding the aggregated and disaggregated data at sectoral or commodity levels. Bahmani-Oskooee and Hegerty (2008) examine the effects of the real exchange rate volatility on the trade between Mexico and the U.S. They claim that although the exchange rate volatility has both positive and negative short-run impacts on most of the sectors; in the long run, most industries are not affected from the increased exchange rate volatility and however the number of negatively affected industries is more than the positively affected ones. They also emphasize that the export or trade of agricultural goods and textile products are clearly reduced due to the increased volatility. Cho et al. (2002) examine whether the impact of exchange rate volatility is similar for different sectors by separating the aggregate data into agriculture, machinery, chemicals, and other manufacturing based on bilateral trade flows between ten developed countries. They find that the effect of exchange rate uncertainty on trade is significantly negative and the most adversely affected sector is the agriculture among others. Kandilov (2008) analyzes the relationship between exchange rate volatility and agricultural exports by extending the study of Cho, Sheldon and McCorriston (2002) in a way to include developed, emerging and developing countries and also agricultural export subsidies as an explanatory variable in the gravity model. According to Kandilov, agricultural trade of developing countries is affected more by the volatility of exchange rates compared with that of developed countries. Awokuse and Yuan (2006) claim that using aggregated data in examining the impact of

exchange rate volatility on trade could be the very reason of the inconclusive empirical evidence in the literature since the elasticity of price, income and exchange rate are different among sectors or commodities. After investigating the data for 49 poultry importers from the US, they find out that there is a positive relationship between exchange rate volatility and the US poultry exports. Since they use three different measurements of exchange rate risk in their study, they emphasize that conclusions are sensitive to the choice of exchange rate volatility measurements. Karemera et al. (2011) and Sheldon et al. (2013) also undertake commodity (fruit and vegetable) specific analyses about the impacts of exchange rate volatility on trade flows. Karemera et al. (2011) investigate the trade data among OECD countries and find is a negative relationship between exchange rate volatility and trade for most of the commodities, but the relationship is positive for some specific ones in both short and long run. Sheldon et al. (2013) use a gravity type trade model for the US bilateral fresh fruit and fresh vegetable trade data. They argue that while there is a negative relationship between medium-to-long run exchange rate uncertainty with the US fresh fruit bilateral trade, the same relationship is seen only on the export model for the fresh vegetables.

Nonetheless, there is a considerable amount of studies describing the effects of both exchange rate and its volatility on trade flows of Turkey. Gul and Ekinci (2006) argue that there isn't any causality from real exchange rate to neither import nor export of Turkey, but a unidirectional causality from export and import to the exchange rate. While Ozturk and Acaravci (2002) find a negative relationship between the exchange rate volatility and the real export flows of Turkey, Solakoglu et al. (2008) claim that the exchange rate volatility has no significant effect on the real exports of Turkey.

Erdem et al. (2010) argue that agricultural trade is more related to exchange rate volatility than to the level of exchange rate and more importantly they emphasize that the effects of exchange rate and its volatility can be different for different agricultural commodities. However, Erdal et al. (2012) find a significant positive unidirectional relationship between real effective exchange rate volatility and agricultural exports of Turkey and a negative relationship for imports.

Yanıkkaya (2001) undertakes a commodity-specific analysis by using the export data of citrus fruit, nuts, tobacco and cotton from Turkey to twenty five countries and claims that exchange rate plays an important role in determining the export of tobacco and cotton but not for other commodities. Although he groups the countries as European Community, European Free Trade Area, North America and Middle East in order to examine regional differences, he reports that the results don't vary across regions. In another commodity-specific study based on the data for dried

figs, grapes and tobacco, Buguk et al. (2003) find that there is no significant relationship between exchange rate or its volatility and the exports of aforesaid commodities in the case of Turkey. Yanikkaya et al. (2013) examine the effect of real exchange rate and its volatility on agricultural export flows of Turkey at the commodity level. They argue that although the real exchange rate has an important effect on Turkish agricultural commodity exports, exchange rate volatility hasn't. They find that the effects of real exchange rate and its volatility on trade differ among the agricultural commodities.

IV. METHODOLOGY and DATA

We employ commonly used gravity model to investigate the determinants of export flows of eighteen Turkish agricultural commodities. The gravity model explains bilateral trade flows between two countries as being directly proportional to both countries' economic sizes and inversely proportional to distance between them.

The gravity type trade model can basically be written as;

$$EXP_{ijt} = \beta_0 GDP_{it}^{\beta_1} GDP_{jt}^{\beta_2} DIST_{ij}^{\beta_3} \quad (1)$$

i= Turkey j =1, 2 . . . 72 and t =1965-1969; 1970-1974;…..,2005-2010.

where EXP_{ij} is the exports of Turkey to country j, GDP_i and GDP_j is the GDP of Turkey and country j, $DIST_{ij}$ is the distance between Turkey and country j.

Regarding our analysis, after integrating other control variables, the augmented gravity model forms as follows;

$$EXP_{ij} = \beta_0 GDP_{it}^{\beta_1} GDP_{jt}^{\beta_2} DIST_{ijt}^{\beta_3} RER_{ijt}^{\beta_4} VOL_{ijt}^{\beta_5} SUP_{it}^{\beta_6} D_{ijt,k}^{\beta_{7,k}} \varepsilon_{ijt} \quad (2)$$

where RER_{ij} is the real exchange rate, VOL_{ij} is the exchange rate volatility, SUP_{it} is the agricultural supports in Turkey, proxied by Nominal Rate of Assistance or Producer Support Estimate and D_{ij} denotes a set of dummy variables. In our estimates, the following dummies are used; *contiguity:* 1 for contiguous countries and 0 for others, *gatt* : 1 if partner country is GATT/WTO member and 0 for others and *rta/fta*: 1 if the the countries are part of a regional/free trade agreement with Turkey in force and 0 for others. ε_{jt} is error term.

In this study, exports of eighteen Turkish agricultural commodities to 72 countries[4] are empirically investigated by using nine five-year averages for 1965-2010 period. The commodities are beef and veal, sheep meat, poultry meat, milk, egg, wheat, barley, rice, maize, potato, tomato, apple, cotton, refined sugar, sunflower seed oil, hazelnut, grape-raisin and unmanufactured tobacco. Bilateral trade data at commodity levels are obtained from UN COMTRADE database regarding 3, 4 and/or 5 digit Standard International Trade Classification (SITC) Rev.1. Although the number of importer countries and available observations vary across commodities, bilateral exports data covers 70 through 98 percent of aforementioned commodities' exports in the last twenty years.

Data on GDP (constant US Dollars) and consumer price indices are from the World Bank *World Development Indicator Database*. Monthly and yearly average exchange rates against the US dollar are retrieved from IMF *International Financial Statistics Database*. Also, in order to convert the Euro values of EU member countries into their own currencies, Euro conversion rates are collected from the Central Bank of Republic of Turkey. The list of GATT member countries are obtained from the WTO and FTAs of Turkey are obtained from the Ministry of Economy. Bilateral distance between two capital cities of the trading partners is measured by using great circle formula and utilizing CEPII database for longitudes and latitudes of the capital city of countries.[5, 6]

Although there are different methods in the literature for measuring exchange rate volatility, we follow the same methodology used in Yanikkaya et al. (2013). The proxy for exchange rate volatility is obtained by utilizing commonly used standard deviation of the first difference of logarithm of the monthly exchange rate over a one-year period for short-run and also it is measured over a five-year period for long run. The equations for the measurement of exchange rate volatilities are;

$$VOL_{ijt}^{short} = st.dev[lnRER_{ijt,m} - lnRER_{ijt,m-1}], \text{ m=1,2,…,12} \quad (3)$$

$$VOL_{ijt}^{long} = st.dev[lnRER_{ijt,m,k} - lnRER_{ijt,m-1,k}], \quad (4)$$

m = 1,2,…,12; k = t-1, t-2,…,t-5.

Data on NRA and PSE are collected from the World Bank and OECD databases, respectively. PSE is defined as "the annual monetary value of gross transfers from consumers and taxpayers to

[4] List of the all covered countries is in the Appendix Table A.I.
[5] For more information, see http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=6
[6] Descriptive statistics are reported at the Appendix Table A.II.

agricultural producers, measured at the farm-gate level, arising from policy measures that support agriculture, regardless of their nature, objectives or impact on farm production or income" (OECD, 2010, p. 22). Since PSE is currently calculated at country level, we actually use Producer Single Commodity Transfers (Producer SCT) in our analysis. The percentage SCT measures that how much of the production of commodities is supported by policy measures. A 20% of SCT means that the estimated value of transfers to producers represents 20% of gross receipts from related commodity. However, a 20% of PSE means that twenty percent of gross farm receipts come from transfers due to policy measures supporting producers. The interpretation of producer SCT is very similar with the interpretation of the PSE; the only difference is that the producer SCT includes transfers from policy measures that are specific to that commodity (Web 1, 2013).

More importantly, we should interpret the indicators in the PSE database such that all of these indicators reflect the provision of support. They only measure the level of governments' efforts for supporting agriculture. Nevertheless, they don't measure the impact of these policy efforts on production, income and trade or any other concept (OECD, 2010). Thus, this is the main point of our study.

Similarly, NRA is defined as "the percentage by which government policies have raised gross returns to farmers above what they would be without the government's intervention (or lowered them, if NRA is negative / below zero)" (Anderson et al., 2009, p.5). NRA reveals how the incentives are distorted. WTO (2011) explains the distortions such that if prices are higher or lower than normal (normal = no government intervention or under competitive market conditions), and also if quantities produced, bought, and sold are higher or lower than normal, then trade can said to be distorted. Several policies can cause such distortions such as import barriers and domestic subsidies. These lead to increases in domestic agricultural commodity prices and stimulate over-production and increased exports, in turn.

There are some differences between these indicators about their coverage of year, country and agricultural product. But more importantly their calculations are also a bit different. While percentage PSE is explained as a fraction of the distorted (domestic) prices due to the national policies, NRA is explained as a fraction of undistorted values. However, the maximum score that PSE can take is 100 (=100 percent or 1), but that of NRA is not limited to 100. In fact, PSE takes generally positive values and they are also smaller than NRA (Anderson, 2009).

Log linearization of equations has a long history in empirical studies. Although log-linearized equations in gravity type trade models are mostly estimated with ordinary least squares (OLS) method, it also differs across studies[7]. Recently, however, the usage of log-linearized equations especially with OLS in gravity models has been highly criticized. The most important study about this issue is conducted by Santos Silva and Tenreyro (2006). They begin their argument with Jensen's inequality that emphasizes the difference between expected value of the logarithm of a random variable and the logarithm of its expected value. This inequality implicates that if there is heteroscedasticity in residuals, to interpret the parameters of log-linearized models estimated through OLS as elasticities can be specious. , They then present the inconsistency of the OLS in the log-linear specification due to the assumption on error term – the error term should be statistically independent from explanatory variables. Since the expected value of the error term in the log-linearized models depends on the covariates, OLS estimator will be inconsistent. Moreover, the residuals will be heteroskedastic. All of these will cause biased estimations. To cope with these problems, they suggest to using Poisson Pseudo-Maximum-Likelihood (PPML) that is presented by Gourieroux et al. (1984). They consider the appropriateness of PPML from two aspects. It provides consistent estimates under the presence of both heteroscedasticity and excessive zero values in dependent variable, say trade data in gravity models, without any necessity to transform related variable. However, they find that PPML is more successful and consistent than OLS via their Monte Carlo simulation results.

Stationarity of variables are tested through utilizing LLC (Lewin, Lin, Chu), IPS (Im, Pesaran, Shin) and Fisher Augmented Dickey Fuller (Maddala & Wu and Choi) panel unit root tests. All variables are found stationary at their levels. In addition, we control whether there is heteroscedasticity in the residuals since our panel data covers agricultural commodity exports of Turkey to 72 countries. Panel level heteroscedasticity test is conducted with log-linearized model by using iterated generalized least square (GLS) with heteroscedasticity and GLS without heteroscedasticity. Then the log-likelihoods of the models estimated with and without heteroscedasticity are compared by employing a likelihood ratio (LR) test. Our results show that while twelve of commodities suffer from heteroscedasticity, eight of them don't. Since PPML deals with heteroscedasticity as stated in Santos Silva and Tenreyro (2006), there is no need to correct the heteroscedasticity of residuals.

[7] For more detail see, Kepaptsoglou et al. (2010) that reviews the literature about gravity model specifications and estimation techniques and also Herrera (2010) that reviews and compares estimation methods for gravity models of bilateral trade flows.

V. EMPIRICAL RESULTS

V.I. Regression Results

Table III reports the PPML estimates for the full sample[8]. Before discussing the coefficients on the variables of interest, we briefly discuss our estimations on the control variables. The estimated coefficients on the partner countries' GDP indicates that larger economies are more likely to import Turkish agricultural commodities due to their larger market sizes since for the half of the analyzed commodities we obtain significant and positive coefficients. Regarding the insignificant coefficients on importing countries' GDP might be explained due to the fact that most agricultural products have low income elasticities (Coyle et al., 1998, Cranfield et al., 2003: cf. Serrano and Pinilla, 2010). The size of the Turkish GDP has a negative impact on the exports of sheep meat, cotton and unmanufactured tobacco; and has a positive impact on the exports of poultry meat, milk, egg, wheat, barley, maize and tomato. While positive coefficients may be regarded as the increased export potential due to the higher GDP, the negative coefficients on Turkish GDP could indicate that domestic production is aimed to meet domestic demand in those commodities.[9]

The estimated coefficients on the GATT membership are generally negative and significant. Kim (2010) states that in order to accurately appreciate the importance of any trade organization (GATT, in our case) in promoting trade, commodities under the influence of that organization should be considered. Given this, the contradictory coefficients should be plausible because agricultural commodities are not included in the GATT system until the year of 1995. The estimated effect of the existence of any free or regional trade agreements between Turkey and partner countries on the agricultural exports is mixed, it leads to a decrease in the export of sheep meat, milk, wheat and tomato, and an increase in the export of poultry meat, barley, maize, cotton, refined sugar, hazelnut, grape-raisin and unmanufactured tobacco. This situation can also be attributable to the content of agreement again. The relationship between sharing a common border with a partner country and agricultural exports exhibits mixed results. While it is positive and significant as expectedly for six commodities (poultry meat, milk, egg, rice, maize and refined sugar), the signs of this relationship are negative for sheep meat and cotton. These mixed and unexpected results could be the result of similar climatic conditions with neighbor countries, which enables them to produce similar agricultural commodities. This situation could also be the result of political conditions

[8] We obtain similar results, if we use annual series (short-run estimates).

[9] Although, Atici and Guloglu (2008) distinguish the trade effects of GDP and population such that while GDP affects economic capacity of trade, population impacts market size, we take only the GDP series into our model due to the high correlation (almost unity) between the countries' GDP and population series. If we use only population variable, our results do not change in any significant way.

between Turkey and its neighbor countries. The last dummy variable, the geographical distance between Turkey and the partner country, has generally negative effects on the exports of agricultural commodities except rice and refined sugar. It means that the larger the distance between Turkey and the partner country, which causes more transportation costs, the smaller export of agricultural commodities from Turkey to these partner countries, and vice versa.

As seen from Table III, agricultural supports measured by NRA significantly affect the exports of six commodities. While they reduce the exports of milk and tomato, they raise the exports of sheep meat, barley, cotton and refined sugar. Note that NRA shows the difference between domestic and border prices of individual commodities. The domestic price used in NRA calculations is determined by not only market forces but also government interventions to markets such as support or protection policies. So a positive signed NRA value for a commodity means that domestic price of the commodity is higher than the border or world price of that commodity, indicating the government is subsidizing or protecting it. Thus, it is expected that higher NRA leads to decreasing exports such as seen in the milk and tomato exports.

However, some of the estimated coefficients on NRA exhibit unexpected results indicating that there are positive relationships between the NRA and the exports sheep meat, barley, cotton and refined sugar. These can be explained by several factors. First, if the domestic demand elasticities of these products are low, then the higher NRA can increase export flows of them, after the domestic demand has been met. Second, it also can be related to the relative NRAs between Turkey and its trading partners. It means that domestic prices of these products are lower in Turkey than those in partner countries, so it increases Turkish exports of these commodities. However, the insignificant estimated coefficients on NRAs can also show that government interventions to agricultural sector through price related policies such as supports and/or border measures do not affect the agricultural exports.

Theoretically, the depreciation of Turkish Lira against a partner country's currency decreases the relative price of Turkish exportable commodities in international markets, so its expected effect is to raise Turkish agricultural exports. Although there are empirical findings in the reviewed literature consistent with this basic theory, there are also contradictory ones. Our estimated coefficients on real exchange rates in the analysis exhibit mixed results, although they are generally positive. While it increases the exports of sheep meat, milk, egg, wheat, maize, tomato, sunflower seed oil and grape-raisin, the depreciation of Turkish lira decreases the export of only unmanufactured tobacco regarding our full sample. These results especially support Kristinek and

Anderson (2002) that reviews the literature and emphasizes the varying impact of exchange rate on agricultural trade. However, these findings are also consistent with Buguk et al. (2003) and Erdem et al. (2010) that also investigate the effects of exchange rate on Turkish agricultural trade at aggregate level. Erdem et al. (2010) explain unexpected results through supply and demand elasticities. They also present an alternative explanation to such findings in the light of Irandoust et al. (2006) and suggest that exporters can price their products according to market conditions rather than exchange rate movements in order to sustain their sales. However, the decrease in the export of tobacco to the Europe and the USA can also be explained through the shift references against tobacco products. Although estimated coefficients on exchange rate volatility show mixed results, they don't present any significant relationships for ten commodities. It leads to a decrease in the exports of poultry meat, milk, egg, tomato, apple and sunflower seed oil, while it leads an increase in the exports of maize and cotton. Our results indicate that the effects of exchange rate volatility differ among the commodities within the same sector. Since this issue is largely empirical (see, Kandilov, 2008), as reviewed in the literature review section, our results are also consistent with it.

If we use PSE instead of NRA in our estimates, our results show that the effects of NRA and PSE on Turkish agricultural exports have both similarities and differences. But they are generally as significant as exchange rates in the determination of the exports pattern of Turkish agricultural commodities. However, the reason behind the changing effects of these indicators on different agricultural commodity exports could be attributable to the government's using of different support tools for different agricultural commodities. For example, we can consider the effect of a reduction in any one component of PSE such as stated in Hertel (1989b). He asserts that decreasing subsidies on an input such as fertilizer could lead to greater long-run reductions in output, exports etc. than would decreasing output subsidies in an equal magnitude. Thus, the reverse should be true regarding our analysis. Since our entire sample of commodities are not supported with the same mix of support instruments, the difference in the effects of NRA or PSE on individual commodity exports should be seen understandable. More importantly, the Turkish government provides exports refunds for some commodities in addition to production supports and there are some differences between the effects these two types of support instruments, especially on the exports. In brief, changing effects of agricultural supports on different commodity exports could be attributable to the difference of the policy instruments used to support them.

V.II. Regression Results for Developed and Developing Countries and Regional Groups of Countries

We estimate the exactly same specifications employed above but classify countries into two groups based on their income levels. For the sake of brevity, we report the coefficients of three important variables namely NRA, exchange rate and its volatility in Table IV. While there are significantly negative relationships between the levels of agricultural supports, measured by NRA, and the exports of five commodities (beef, milk, barley, potato and tomato) to the developed countries; the signs of these relationships are positive for the exports of poultry meat and cotton. For exports to developing countries, NRA negatively affects only the export of milk, and it positively affects the export of sheep meat, rice and refined sugar. Our results indicate that the effects of agricultural supports on Turkish commodity exports do not differ significantly by the development stage of importer countries.

The depreciation of Turkish Lira decreases the exports of beef, tomato, grape-raisin and unmanufactured tobacco to the developed countries and the exports of only tomato to the developing countries. It also increases the exports of six commodities (sheep meat, milk, egg, wheat, maize and potato) to the developed countries, and the exports of sheep meat, milk, egg and sunflower seed oil to the developing countries. As seen from the results, the exchange rate is a more important determinant of exports to developed countries rather than that of developing ones. The estimated coefficients on exchange rate volatilities show that while

Table III: PPML Estimation for Full Sample

	NRA	EXC	LVOL	GDP	TRGDP	GATT	FTA	CONT	DIST	CONS	N	R^2
Beef	-4.545	-0.109	-0.689	-0.247	-1.811	**-3.534****	3.387	0.423	1.574	21.23	35	0.35
Sheep Meat	**47.523****	**0.004*****	-0.29	**4.456*****	**-18.717*****	-0.53	**-7.715*****	**-5.922*****	**-19.814*****	**0.003*****	27	0.71
Poultry Meat	-10.221	0.255	**-0.921***	-0.25	**0.001*****	-0.519	**0.004*****	**1.644*****	1.218	**0.001*****	97	0.46
Milk	**-16.228*****	**0.003*****	**-3.866****	-0.17	**4.897****	0.194	**-1.181***	**0.006*****	-1.555	**-58.454****	146	0.51
Egg	-6.81	**0.371****	**-1.474****	-0.444	**0.001*****	**-1.024****	-1.313	**0.002*****	**-4.685****	**0.001*****	82	0.71
Wheat	0.541	**0.412*****	-0.628	**-0.279***	**0.005*****	0.697	**-0.813***	-0.324	**-0.609***	**0.003*****	178	0.2
Rice	2.206	0.341	-0.418	**0.005*****	-0.565	-0.307	0.217	**0.005*****	**0.002*****	-8.085	86	0.47
Barley	**0.009*****	0.154	-1.135	**0.437***	**2.999****	-0.02	**0.001*****	-0.123	-0.336	**-37.769****	70	0.36
Maize	3.265	**0.224****	**0.002*****	**1.811*****	**5.45*****	**0.001*****	**0.007*****	**1.283****	**-5.209*****	**-80.482*****	124	0.78
Potato	-0.645	0.015	0.087	-0.025	1.558	**-1.587*****	-0.501	0.083	-1.433	-16.795	168	0.12
Tomato	**-9.259***	**0.01*****	**-1.186****	**1.813*****	**9.191*****	**-2.494*****	**-1.225****	-1.301	**-6.841*****	**-122.698*****	175	0.81
Cotton	**1.378***	0.15	**0.905****	**1.224*****	**-4.503*****	-0.356	**0.56****	**-2.969*****	**-2.087*****	**40.791*****	334	0.29
Refined Sugar	**2.295***	0.089	-0.067	0.169	-1.492	**-0.979***	**0.001*****	**1.879*****	**0.008*****	15.322	131	0.59
Apple	-1.802	0.072	**-1.4****	-0.002	-0.684	**-1.141***	-0.764	0.24	-1.443	6.293	166	0.11
Sunf. Seed Oil	0.963	**0.004*****	**-0.827****	0.218	2.354	**0.001*****	0.209	0.486	**-3.74*****	-29.625	187	0.44
Hazelnut	-0.493	-0.113	0.209	**2.712*****	-1.041	-0.385	**0.005*****	-0.398	**-5.025*****	-14.866	261	0.68
Grape-Raisin	2.754	**0.003*****	0.161	**1.905*****	-0.545	**-1.12****	**0.995*****	-1.119	**-2.693*****	-12.339	358	0.5
Tob. Unm.	-0.289	**-0.172****	-0.367	**2.16*****	**-1.155***	**0.008*****	**0.714****	0.437	0.423	-10.123	298	0.91

***, ** and * denote significance at 1, 5 and 10 per cent level respectively

they lead to decreases in the exports of beef and apple, volatilities lead to increase only in the export of refined sugar to developed countries. For developing country cases, the exchange rate volatility decreases the exports of seven commodities namely, poultry meat, milk, egg, rice, tomato, apple and sunflower seed oil; it increases only the export of sheep meat.

Our results indicate that there is a generally negative relationship between the exchange rate volatility and the exports to developing countries, while the relationship for developed countries is not as strong as for developing countries. Therefore, the exchange rate volatility cannot be considered as an important determinant in the Turkish agricultural exports to developed countries. Probably because it is easier for traders in developed countries to avoid the negative effects of the volatility through advanced forward markets, but it may not be the case in developing countries. Furthermore, the insensitivity of commodity exports to the volatility in developed countries could be attributable to the demand functions, market structures or features of the commodities. Thus our results imply that the effects of exchange rate volatility can differ by the stage of development of the partner country.

Table IV: PPML Estimations for Developed and Developing Countries

	DEVELOPED COUNTRIES					**DEVELOPING COUNTRIES**				
	NRA	**EXC**	**LVOL**	**N**	**R²**	**NRA**	**EXC**	**LVOL**	**N**	**R²**
Beef	**-13.849*****	**-2.685****	**-4.19*****	20	0.95	4.529	-0.399	0.953	15	0.37
Sheep Meat	61.436	**5.948*****	-0.617	16	0.99	**40.947*****	**4.918*****	**1.162*****	11	0.99
Poultry Meat	**16.498****	-0.253	0.154	37	0.26	-17.616	0.193	**-1.025***	60	0.43
Milk	**-7.911*****	**0.99*****	-1.598	67	0.56	**-30.231****	**0.432*****	**-6.652***	79	0.55
Egg	-3.545	**0.875*****	-0.305	38	0.71	-8.773	**0.395****	**-1.783****	44	0.88
Wheat	4.022	**0.865*****	0.944	90	0.51	0.007	-0.177	-0.504	88	0.27
Rice	-1.066	0.17	1.176	54	0.11	**2.702***	0.349	**-1.445*****	32	0.85
Barley	**-5.396***	0.634	-1.299	36	0.51	-1.047	-0.017	-0.312	34	0.6
Maize	1.418	**0.457*****	0.846	82	0.87	2.715	0.05	1.22	42	0.91
Potato	**-5.405*****	**0.441*****	1.044	104	0.64	0.615	-0.339	0.036	64	0.14
Tomato	**-4.505****	**-0.278***	0.183	124	0.32	-12.241	**-1.152****	**-1.058***	51	0.79
Cotton	**2.099****	0.099	0.57	196	0.28	1.658	-0.047	0.806	138	0.38
Refined Sugar	-0.639	-0.127	**2.17****	72	0.19	**2.377***	0.201	-0.114	59	0.58
Apple	-5.833	-0.25	**-1.784***	89	0.53	-1.841	-0.187	**-1.538***	77	0.23
Sunf. Seed Oil	0.108	0.093	-0.622	109	0.24	1.532	**0.517*****	**-0.905***	78	0.42
Hazelnut	-0.035	-0.106	0.157	159	0.69					
Grape-Raisin	1.188	**-0.267*****	0.422	222	0.50					
Tob. Unm.	-0.061	**-0.206****	-0.256	186	0.93					

***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively.

Since the size of Turkish agricultural exports vary among different geographical regions[10], it is important to run regressions for each region with the exact same specification used above. We divide the recipient countries into five sub-groupings to examine whether the effects of our variables of interest in our models differs by the region. These regions are namely Middle East and North Africa (MENA), Commonwealth of Independent States (CIS), Europe, Asia, and America. We run our regressions for the products whose export share in a region is above ten percent of the total exports of each product.

Tables V and VI report the estimation results for the sub-groupings. Higher NRA leads to an increase in the exports of sheep meat and rice, and leads to a decrease in the exports of poultry meat, milk and egg to MENA countries. The depreciation of Turkish Lira has not any significant effect on more than half of the commodities' exports; but the significant estimated coefficients on the real exchange rate have generally positive signs except for maize. The effect of exchange rate volatility on the export of agricultural commodities is also generally insignificant. While higher exchange rate volatility increases only the exports of rice, it decreases the export of milk and egg to this region.

Table V: PPML Estimations for MENA and CIS Countries

	MENA						**CIS**				
	NRA	**EXC**	**LVOL**	**N**	**R^2**		**NRA**	**EXC**	**LVOL**	**N**	**R^2**
Beef	-3.452	2.201	-2.148	12	0.89						
Sheep Meat	**29.477*** **	**1.39*** **	-0.221	14	0.99						
Poultry Meat	**-66.151*** **	-0.01	-0.788	29	0.99		**137.424***	**-2.592*** **	-0.225	30	0.9
Milk	**-20.271***	**0.745** **	**-5.156** **	48	0.91		2.829	**0.661***	1.28	35	0.97
Egg	**-15.011*** **	**1.633*** **	**-4.112** **	33	0.96		10.199	**-2.045*** **	-0.606	26	0.83
Wheat	-0.625	0.202	-0.435	62	0.17		-21.214	-0.292	**-3.275** **	29	0.66
Rice	**17.959*** **	-0.845	**6.993***	11	0.99		**-19.188*** **	0.559	0.45	26	0.79
Barley	-0.615	-0.229	0.09	42	0.56						
Maize	3.239	**-1.171*** **	1.423	25	0.99						
Potato	-0.12	0.009	-0.399	53	0.07		**3.545***	**-0.866***	-0.939	47	0.64
Tomato	1.973	**2.172*** **	2.074	33	0.4		-3.356	**0.543** **	**-1.388*** **	63	0.98
Cotton							-0.21	-0.318	-0.833	62	0.75
Refined Sugar	1.521	**0.849*** **	-0.046	37	0.71		-1.116	**-0.788*** **	**-1.915** **	33	0.73
Apple	-2.705	0.18	-1.164	67	0.16						
Sunf. Seed Oil	2.144	**0.931*** **	-0.729	60	0.65		0.289	**-0.693***	**-3.022*** **	33	0.85

***, ** and * denote significance at 1, 5 and 10 per cent level respectively.

10 See Table A.III for Turkish bilateral trade by the regional basis.

CIS region is an important market for Turkish agricultural commodities with around 20 percent shares for many commodities. The estimated coefficients on NRA indicate that there are positive relationship between NRA and exports of beef and potato while there is a negative relationship between NRA and the export of rice. The estimated coefficients on exchange rates imply that the depreciation of the Turkish Lira generally decreases the exports of agricultural commodities except milk and tomato. Note that most of tomato exports go to a single buyer in this region, namely the Russian Federation. Exchange rate volatility has a negative impact on the export flows of tomato, refined sugar, sunflower seed oil and wheat. These results show that Turkish agricultural commodity exports to the countries in the CIS region are generally negatively related to the depreciation of Turkish Lira and the higher exchange rate volatility. However, they are not much related to the agricultural supports.

Table VI: PPML Estimations for Europe, Asia and America Countries

	EUROPE						**ASIA**				
	NRA	**EXC**	**LVOL**	**N**	**R²**		**NRA**	**EXC**	**LVOL**	**N**	**R²**
Beef	**371.757*** **	-0.224	**-22.526*** **	12	0.99						
Poultry Meat	-2.845	**-0.56***	**1.33*** **	19	0.99		**-237.129*** **	**1.951*** **	-1.128	13	0.95
Milk	**-8.976** **	-0.474	**-3.218*** **	35	0.99		**-31.782***	0.145	-5.743	23	0.7
Wheat	1.251	**0.861*** **	0.168	59	0.58						
Rice	-1.954	**1.358** **	**4.024** **	40	0.33						
Barley	**-9*** **	-0.322	**-3.925** **	25	0.72						
Maize	3.685	**0.498*** **	0.806	59	0.88						
Tomato	1.665	**-0.564*** **	1.439	79	0.71						
Cotton	**2.558** **	0.068	0.441	114	0.3						
Refined Sugar	**45.635** **	-0.311	-2.33	47	0.34						
Sunf. Seed Oil	1.527	**-0.384***	-1.345	65	0.36			**AMERICA**			
Hazelnut	0.293	**-0.163***	-0.046	84	0.73		**4.822*** **	-1.175	0.435	18	0.91
Grape-Raisin	1.674	**-0.288*** **	0.269	122	0.61						
Tob. Unm.	0.542	**-0.157***	-0.33	118	0.28		-0.099	**-1.029** **	-0.216	23	0.98

***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively.

Similar to the Turkish manufactures exports, Europe is extremely important destination for some Turkish agricultural commodities. It has the largest shares in the exports of maize, cotton, hazelnut and grape-raisin. Our estimates show that larger NRA leads to an increase in the exports of beef, cotton and refined sugar to this region. Nonetheless, it leads to a decrease in the exports of milk and barley.

The depreciation of Turkish Lira generally decreases the exports of Turkish agricultural commodity exports to Europe. These negatively affected commodities are poultry meat, tomato, sunflower seed oil, hazelnut, grape-raisin and unmanufactured tobacco. However, the depreciated Turkish Lira increases the exports of wheat, rice and maize exports. Compared to the other regions, exchange rate also has a more negative effect on the export flows of Turkish agricultural commodities to Europe and CIS countries. Similar to the previous results, most of the estimated coefficients on exchange rate volatility are insignificant.

For Asia region, there are only two commodities (poultry meat and milk) that we investigate. While the exchange rate has a positive impact, higher NRA has a negative impact on the exports of poultry meat to Asia region. And all three variables don't have any significant effects on the exports of milk. Moreover, in the cases of tobacco and hazelnut exports of Turkey to America; NRA has a positive impact on the export of hazelnut and the depreciation of the Turkish Lira has a negative effect on the export of tobacco.

VI. CONCLUSION

Our paper empirically investigates the effects of agricultural supports or distortions, measured with PSE and NRA, on the Turkish exports of beef and veal, sheep meat, poultry meat, milk, egg, wheat, barley, rice, maize, potato, tomato, apple, cotton, refined sugar, sunflower seed oil, hazelnut, grape-raisin and unmanufactured tobacco to 72 countries over the 1965 - 2010 period. We conduct our analyses with panel data and employ the gravity equation for modeling the Turkish agricultural export by utilizing the Poisson Pseudo-Maximum-Likelihood (PPML) estimation method. We extend the pure gravity equation by adding the exchange rate, its volatility and some commonly used dummy variables. We first examine the effects of agricultural supports and real exchange rates on each commodity exports for the full sample, we then divide the recipient countries into sub-groupings to study whether the effects of our variables of interest in our models differs by the region and/or the development stage of recipients countries.

Most of the estimated coefficients on NRA imply that our results on the exports of agricultural commodities are sensitive to the commodities considered, measurement of support, region and stage of development of partner countries, and short/long run estimates. Although we have very diverse results, we are still able to obtain some general conclusions

for the effects of agricultural supports on commodity exports. Regardless of the measurement of agricultural supports, exports of wheat, maize, apple and grape-raisin obviously don't exhibit any sensitivity to the level of agricultural supports. If we put aside the insignificant results and exceptional cases for the sake of generalization, we can conclude that the depreciation of Turkish Lira generally increases the Turkish agricultural commodity exports especially to the developed countries. Conversely, the depreciation of Turkish Lira negatively affects the exports three commodities in our sample, namely tobacco, hazelnut (in the case of exports to Europe, which constitute 76% of total hazelnut exports) and grape-raisin, which have important shares in the Turkish agricultural exports. Although the negative relationship between exchange rates and exports of hazelnut, grape-raisin and tobacco can be attributable to the monopoly power of Turkish producers in these commodities as stated in Yanikkaya et al. (2013), their consistent insensitivity to the domestic supports or border measures is interesting since hazelnut and tobacco are highly subject to government interventions. On the effects of exchange rate volatility, our analysis show that although there are mixed results, general effect of volatilities on the Turkish agricultural exports is negative. However, exchange rate volatility generally doesn't affect the Turkish agricultural export flows to developed countries.

Since we conduct our study at the disaggregated commodity level in order to cope with an aggregation bias, we show that every commodity has its own features and should be evaluated in its own market conditions. Our results indicate that governments should consider the effects of their interventions (including both domestic support policies and border measures) on not only production but also exports of the commodities. On the exporter side, as stated in Buguk et al. (2003), exporter firms do not consider only the factors that we analyzed, but they also consider relative prices, marketing margins, promotion, political environment, and supply and demand conditions of the products. Besides, as stated in Koo et al. (1994), producer subsidies may have minor effect on trade flows, and importer countries' policies could be more influential than those of exporter countries on agricultural trade such as seen in their sample meat trade.

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APPENDIX

Table A.I: List of Countries

No	Partner	No	Partner	No	Partner
1	Albania	25	Georgia	49	Philippines
2	Algeria	26	Germany	50	Poland
3	Angola	27	Greece	51	Portugal
4	Australia	28	Hungary	52	Qatar
5	Austria	29	Indonesia	53	Republic of Korea
6	Azerbaijan	30	Iran	54	Republic of Moldova
7	Bahrain	31	Iraq	55	Romania
8	Bangladesh	32	Ireland	56	Russian Federation
9	Belarus	33	Israel	57	Saudi Arabia
10	Belgium	34	Italy	58	Singapore
11	Brazil	35	Japan	59	Slovenia
12	Bulgaria	36	Jordan	60	Spain
13	Canada	37	Kazakhstan	61	Sudan
14	China	38	Kuwait	62	Sweden
15	China, Hong Kong S.A.R	39	Latvia	63	Switzerland
16	Congo	40	Libya	64	Syria
17	Croatia	41	Malaysia	65	Tajikistan
18	Cyprus	42	Malta	66	Thailand
19	Czech Rep.	43	Mexico	67	Tunisia
20	Dem. Rep. Congo	44	Morocco	68	Ukraine
21	Denmark	45	Netherlands	69	United Kingdom
22	Egypt	46	New Zealand	70	USA
23	Finland	47	Norway	71	Viet Nam
24	France	48	Pakistan	72	Yemen

Table A.II: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Exports of					
Beef	52	0.86696	3.76291	0.00015	26.2515
Sheep Meat	65	5.33768	9.31081	0.00019	56.9251
Poultry Meat	110	1.32908	4.5476	0.00013	42.2798
Milk	157	0.26604	1.28912	4.41E-06	15.2155
Egg	94	2.52048	9.72061	0.00018	67.2759
Wheat	207	6.41512	10.725	4.41E-06	61.1989
Rice	130	0.20234	0.96016	0.00021	9.94896
Barley	81	6.55751	8.45435	0.00055	38.4657
Maize	131	0.57117	1.78812	8.8E-05	15.4575
Potato	192	0.7854	2.22389	0.0004	25.0538
Tomato	190	3.00155	13.9967	0.00015	176.585
Cotton	407	7.55907	20.4982	0.00025	201.777
Sugar	160	4.21851	12.4562	3.7E-05	124.466
Apple	194	1.27106	3.38302	0.00017	24.1024
Sunf. Seed Oil	202	1.3232	4.04126	0.00025	33.5472
Hazelnut	447	8.65632	28.5574	0.00036	301.46
Grape-Raisin	443	4.49001	10.8693	0.00133	83.9344
Tob. Unm.	371	11.5777	41.2532	0.00028	345.021
Nominal Rate of Assistance for					
Beef	360	0.25865	0.09796	0.10228	0.37464
Sheep Meat	360	0.08782	0.03726	0.02964	0.13601
Poultry Meat	360	0.18058	0.02306	0.14141	0.21019
Milk	648	0.20654	0.08549	0.06708	0.35198
Egg	432	0.13432	0.1107	-0.0989	0.22761
Wheat	648	0.0464	0.11298	-0.1166	0.18197
Rice	360	0.28917	0.14348	0.04003	0.48796
Barley	648	0.02872	0.1611	-0.25	0.22549
Maize	576	0.04303	0.15769	-0.2201	0.20214
Potato	648	0.13646	0.15357	-0.0055	0.43886
Tomato	648	-0.0924	0.11629	-0.2888	0.13392
Cotton	648	-0.1558	0.11997	-0.344	0.04057
Sugar	360	0.22112	0.11141	0.0671	0.35693
Apple	648	-0.0759	0.18916	-0.3291	0.31908
Sunf. Seed Oil	648	-0.0041	0.16541	-0.3201	0.18889
Hazelnut	432	-0.1862	0.10905	-0.3345	-0.0061
Grape-Raisin	648	0.03926	0.07642	-0.0544	0.19874
Tob. Unm.	648	-0.1005	0.20593	-0.5014	0.17009

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Producer Support Estimate for					
Beef	360	0.12869	0.04831	0.04456	0.18488
Sheep Meat	360	0.03921	0.02738	-0.0115	0.06476
Poultry Meat	360	0.08043	0.0422	-0.0032	0.10944
Milk	360	0.17147	0.028	0.13281	0.20297
Egg	360	0.09053	0.00886	0.07543	0.10232
Wheat	360	0.09763	0.0173	0.06768	0.11492
Barley	360	0.09293	0.0153	0.07163	0.11564
Maize	360	0.09885	0.02102	0.0675	0.12759
Potato	360	0.12957	0.05841	0.07485	0.20079
Tomato	360	0.0334	0.03978	0.00143	0.10798
Cotton	288	0.04447	0.02119	0.02655	0.07867
Sugar	360	0.1272	0.04989	0.04935	0.18312
Apple	360	0.05168	0.0664	0.00946	0.1815
Sunf. Seed Oil	360	0.09074	0.01805	0.06095	0.11369
Grape-Raisin	360	0.07148	0.03247	0.04449	0.13202
Tob. Unm.	360	0.06379	0.03357	0.02897	0.11946
Control Variables					
Exchange Rates	532	0.84414	1.13617	-1.2133	4.05635
Long Run Volatility	534	-1.3349	0.29946	-3.4804	0.07593
Partners' GDP	554	10.7738	0.82168	8.79778	13.0605
Turkish GDP	648	11.2136	0.23011	10.8404	11.5683
GATT	648	0.27222	0.42962	0	1
FTA	648	0.11358	0.30685	0	1
CONT	648	0.09722	0.29649	0	1
DIST	648	0.43452	0.35032	-0.273	1.22703

Table A.III: Distribution of Turkish Agricultural Commodity Exports Based on the Regional Location and Development Level of Countries (%)

	MENA	CIS	Europe	Asia	America	Developed Countries	Developing Countries
Beef	69.58	11.90	15.86	0.00	2.67	39.55	60.45
Sheep Meat	94.83	0.28	4.89	0.01	0.00	46.69	53.31
Poultry Meat	35.36	24.38	18.28	21.64	0.00	26.31	73.69
Milk	58.13	12.09	16.01	10.87	2.90	49.16	50.84
Egg	66.89	30.35	2.73	0.02	0.01	19.74	80.26
Wheat	53.62	11.59	27.56	7.10	0.15	32.28	67.72
Rice	37.64	13.04	45.57	0.09	3.66	51.07	48.93
Barley	76.10	2.86	21.04	0.00	0.00	59.24	40.76
Maize	22.47	3.59	67.86	1.74	4.33	83.78	16.22
Potato	74.75	17.50	7.56	0.00	0.18	24.03	75.97
Tomato	56.97	29.96	13.08	0.00	0.00	49.89	50.11
Cotton	3.78	10.80	74.49	8.44	2.49	85.27	14.73
Refined Sugar	56.44	23.32	18.36	0.30	1.58	27.73	72.27
Apple	90.21	2.39	7.41	0.00	0.00	39.31	60.69
Sunflower Seed Oil	72.51	12.33	12.93	2.03	0.18	21.31	78.69
Hazelnut	6.96	4.29	75.82	1.56	11.37	93.29	6.71
Grape Raisin	3.90	5.65	82.66	4.19	3.60	91.76	8.24
Tobacco Unman.	1.84	7.01	25.27	9.78	56.10	92.38	7.62

Source: Authors' own calculation. See the text for data sources.

Table A.IV: PPML Regression Results for Full Sample with PSE Variable

	PSE	EXC	LVOL	N	R^2
Beef	-6.46	-0.127	-0.555	35	0.33
Sheep Meat	**31.126****	**1.563***	-0.471	27	0.66
Poultry Meat	-5.804	0.256	-0.85	97	0.46
Milk	**-74.504***	**0.45*****	-3.467	144	0.5
Egg	25.617	**0.374****	**-1.285****	79	0.69
Wheat	-1.819	**0.384*****	-0.655	160	0.13
Barley	11.364	-0.039	-0.425	57	0.26
Maize	-15.237	**0.233****	**1.716***	118	0.78
Potato	-5.078	0.05	0.168	139	0.16
Tomato	5.222	**-0.289****	-0.822	152	0.87
Cotton	**51.326*****	**0.362*****	0.228	220	0.65
Refined Sugar	**6.888****	0.095	-0.091	131	0.6
Apple	-2.149	-0.534	**-1.408****	137	0.16
Sunf. Seed Oil	**-21.067***	**0.412*****	**-1.188*****	175	0.5
Grape-Raisin	-1.073	**-0.32*****	-0.081	275	0.58
Tob. Unm.	2.417	**-0.203****	**-0.914****	214	0.84

***, ** and * denote significance at 1, 5 and 10 per cent levels, respectively