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Impact of Agricultural Supports on the Agricultural Export

Nisa Sansel Tandogan[1]

Tarımsal Desteklerin Tarımsal İhracat Üzerindeki Etkisi	**Impact of Agricultural Supports on the Agricultural Export**
Öz	**Abstract**
Bu çalışma tarımsal desteklerin Türk tarımsal ihracatı üzerindeki etkisini, krizleri de göz önünde bulundurarak ele almaktadır. 1986-2019 dönemleri için yıllık veriler kullanılarak, tarımsal ihracat üzerindeki etkiyi görmek için ARDL sınır testi, krizleri analiz etmek için de yapısal kırılma testi uygulanmaktadır. Ampirik bulgular tarımsal ihracatın, tarımsal destek ve kişi başına GSYİH ile pozitif ilişkili olduğunu, reel döviz kuru ve kriz dönemi ile ise negatif ilişkili olduğunu göstermektedir. Yapısal kırılma testi sonuçları, 2000-2002 dönemi için anlamlı olmamakla birlikte, tarımsal ihracat üzerinde negatif etkisinin olduğunu göstermektedir.	This paper aims to analyze the impact of agricultural supports on Turkish agricultural export by taking the crises into consideration. By using annual data for the 1986-2019 period, ARDL bound test is implemented for the impact on agricultural export and structural break test for the crises. The empirical results reveal that while agricultural export has a positive relationship with agricultural support and GDP per capita, negative relationship with real exchange rate and the crisis period. Structural break test shows the importance of 2000-2002 period on the export, however that period is not significant, it has a negative impact on the agricultural export.
Anahtar Kelimeler: Tarımsal Destek, Tarımsal İhracat, Sürdürülebilirlik, Ekonomik Kriz, Yapısal Kırılma Testi	**Keywords:** Agricultural Support, Agricultural Export, Sustainability, Economic Crisis, Structural Break Test
JEL Kodları: G01, Q17, Q18	**JEL Codes:** G01, Q17, Q18

Araştırma ve Yayın Etiği Beyanı	Bu çalışma bilimsel araştırma ve yayın etiği kurallarına uygun olarak hazırlanmıştır.
Yazarların Makaleye Olan Katkıları	Çalışmanın tamamı tek bir yazar tarafından oluşturulmuştur.
Çıkar Beyanı	Yazarlar açısından ya da üçüncü taraflar açısından çalışmadan kaynaklı çıkar çatışması bulunmamaktadır.

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1. Introduction

It is a stubborn fact that agriculture has become more of an issue in the world day by day based on climate changes, increasing urbanization and global health crises (Hayaloglu, 2018: 59; Bayrac and Dogan, 2016: 33). Also, for Turkey, although the need for agriculture increases, the numbers of agricultural employees has decreased in recent years. Besides the agriculture requires more effort than other sectors, the increase in input prices, climate changes and the decrease in income lead agricultural employees shift to the other sectors. While these shifts cause the decrease in agricultural productivity on the one hand, it prevents sustainable agriculture on the other hand. In this sense, the government has a big role to support the agricultural sector.

Agricultural supports and sustainable agriculture are more important for Turkey as having a big role agricultural export country. According to Turkish Exporters Assembly (TIM) data, the share of agriculture in total export is 14.4% (Turkish Exporters Assembly, 2020). To be able to protect and increase this share, supports and subsidies provided by the government are very essential. These supports can be done in many different ways such as field-based supports, deficiency payments, agricultural insurance supports and agricultural credits. Apart from these, governments can prevent shifts from the rural area to the urban area by developing infrastructure, providing more opportunities in a rural area and adapting technologies. Turkey has currently applied agricultural supports including field-based supports, deficiency payment supports, livestock supports, agricultural insurance services, compensatory payments, other agriculture-based supports and rural development supports. The field-based supports comprise the fuel, fertilizer, soil analysis, organic farm, good agriculture practices, hazelnut, the rehabilitation of traditional olive gardens, family-owned businesses, solid organic and organomineral fertilizer supports. The deficiency payment supports contain the oilseed crops, cereals and legumes, corn, tea premium, olive and olive oil support. Forage plants, apiculture, fisheries, angora breeding, milk analysis, herd manager employment, animal disease compensation, cattle fattening etc. are involved in the livestock supports. Agricultural insurance services include tea pruning compensation and expense, plant quarantine. Other agriculture-based supports comprise the certified sees usage and production, the certified seedling usage and production, environment based agricultural land protection program (CATAK), research and development, farm accounting data network, agricultural extension and consultancy, licensed warehousing and agricultural irrigation electricity supports. Rural development supports include rural development, instrument for pre-accession assistance rural development programme co-financing and such special projects (Republic of Turkey Ministry of Agriculture and Forestry, 2021). In this sense, if the agricultural supports and subsidies can be ascertained and planned well, because determining the needs of farmers is very important to remedy the deficiencies in agriculture, the increase in agricultural supports and developments affects agricultural productivity and export to a great extent.

Undoubtedly, another factor on the agricultural productivity and agricultural export is the crises. Economic crises, political crises and global-scaled crisis affect the number of productivity and export negatively. While the economic crises have a negative impact on the employment, export, consumption expenditures and the economies (Gocer, 2013: 184); political crises lead to some quotations and sanctions on import and export (Ozertem, 2017: 126). Global-scaled crises, such as crises that occurred in the health and spread all over the world, also affects the

agricultural export negatively due to the logistic problem and tight control and endangers the food and nutrition security (FAO, 2020: 3; Ceylan and Ozkan, 2020: 474).

In this direction, this paper aims to analyze the impact of agricultural supports on Turkish agricultural export by taking the crises into consideration. By using annual data for the 1986-2019 period, ARDL bound test is implemented for the impact on agricultural export and structural break test for the crises. When looking into the literature, it is seen that there is a very limited study focusing on the agricultural supports in Turkey. Because this paper covers a long period and there is a lack of similar extensive empirical study handling the impact of agricultural supports on agricultural export, this study will be beneficial for the literature. The paper consists of seven sections. The second section provides brief literature about the studies on the impact of agricultural supports on agricultural productivity and exports in terms of both Turkey and other countries. In the third and the fourth section, the data and methodology are explained in detail. The fifth section gives the results obtained from the empirical study. The sixth section concludes the study by interpreting the results and the seventh section touches on the policy recommendations.

2. Literature Review

With regard to the agricultural supports, Hoekman et al. (2004) evaluate the world price-depressing effect of agricultural subsidies and border protection in OECD countries on the trade of developing economies. According to this study, if the border protection decreases by 50%, the export and welfare of developing countries have more positive effect than 50% fall in the agricultural subsidies. Similarly, Koo and Kennedy (2006) analyze the effect of domestic and export subsidies on welfare for both exporting and importing countries. They conclude that both subsidies have a distorting impact on the trade flows of agricultural goods from exporting countries to the importing ones. Also, these subsidies cause net welfare losses for the countries which provide the subsidies. Matthews et al. (2017) examines their trade impacts in the EU and concludes that the distorting effect decreased as a result of many changes in EU agricultural support over the past two decades. Price support guarantees are implemented on few products at relatively low safety levels rather than many products. Increasing the market access for third-country exporters via the rise in the number of free trade agreement provides the many low-income and least-developed countries benefit from the duty-free access for the agricultural exports to the EU market. However, for sensitive products, tariff protection is still high. Tong et al. (2019) analyze the elasticity of U.S. farm exports to U.S. farm subsidies by using a gravity model. Their study indicates that if the farm subsidies decrease by 1%, U.S. farm exports decrease by 0.40% per annum, as equal to $15.3 billion. Among subsidy programs, amber box programs such as marketing loan gains and counter-cyclical payments are found as the most effective ones on the export, the impact of green box subsidy payments are found as negligible. Moreover, the study shows that the impact of subsidy payments is seen only in agricultural commodities, not in livestock. Gbetnkom and Khan (2002) focus on the determinants of agricultural exports by taking cocoa, coffee and banana as export crops. By using the OLS estimation method, they find that while providing more credit to crop exporters, road network and the specific policy changes increase the export supply, price incentives are found as insufficient to obtain desired export supply of agricultural crops. Yilmaz (2013) handles the agricultural support policies in Turkey with the EU comparatively. The results show that the way money spent by EU for farmers changed and although income support continues under the “cross compliance”, the connection between support and payments are broken.

Agricultural applications provide money transfers to farmers, but the level of producer support estimate is low. Oppositely, for the last ten years, the share of output support in Turkey remains high and the importance of input support and premium payments increased. However, the support volume and producer support estimate levels are not high as observed in the EU.

Although there are several studies on agricultural production, the number of studies handling the impact of agricultural supports in Turkey is limited. While one strand of the literature takes this situation in the general context like their development process and implementation, the other few ones approach it in the base on the production and export. Konyali and Oraman (2020) evaluate the current situation of agricultural supports policies implemented in Turkey and propose some solutions to provide a sustainable agriculture. Depending on the basic statistics, the study concludes that agricultural supports provided for producers are not enough for Turkey when considered the input prices. Moreover, for the sustainable rural development, supports should be arranged in a way to increase farmers' incomes, find a solution for structural problems of the sector, improve rural development projects and so prevent farmers' migration. Akkaraca Kose (2012) analyzes the agricultural policy reforms and their implications within the context of Turkey and the EU. In this sense, the paper asserts that funds and supports that came from the EU have an opportunity to overcome with some problems like migration, uneducated labor and economic inequality in agriculture with a different allocation, if it can be used effectively. Cakmak (2003) evaluates the agricultural policies in a general context and asserts that policies implemented are for rich farmers rather than poor ones for that term because the burden of transfers stemming from the price interventions become the problem, especially for the low-income classes. In this sense, shifting from distributive transfer-oriented policies to productive policies are offered as a suggestion to be a player in the world competitive markets. Bayraktar and Bulut (2016) handle the reasons of agricultural supports and the changes that occurred in Turkey. The study uses comparative data of OECD, the EU and Turkey for the analysis. The results show that the main reasons of agricultural supports are agricultural employment, producer income obtained from agricultural activities and product-based support policies. Hasdemir (2016) focuses on the agricultural support in Turkey within the context of its share in the public budget. The paper presents that the agricultural policies in Turkey are area-based, and implementations are on the rural development, subsidiary payments and agricultural insurance supports. However, when compared the share of agricultural supports in Turkey to the EU countries, supports are not seen as enough and its increase is recommended. Yuceer et al. (2020) examine the improvement of agricultural supports in Turkey for the 2000-2020 period. The results show that Turkey's gross agricultural production value obtained from the implemented policies is below the EU and OECD countries. To be competitive in the market, the support policies should be arranged in a way to enhance the agricultural structure, provide sustainable competitive power and use technology and resources more effectively. Semerci (2019) analyzes the agricultural support implementations in Turkey by using simple descriptive statistics. It is suggested that, to be a better position, Turkey should implement policies which are long-term, world-integrated and competitive with other countries in the productivity and cost rather than short-term, temporary and costly.

Koc and Islek (2020) concentrate on the causal relationship between agricultural support and productivity in BRICS and Turkey for the period 2000-2016. The result of the panel causality test reveals that while Turkey and China have a bidirectional causality, Brazil and Russia has a

one-way causality from the agricultural support to the production. While there is no causal relationship in India, South Africa has a one-way causality from supports to agricultural production. Isik and Bilgin (2016) analyze the impacts of agricultural supports in Turkey on agricultural production by using econometric methods. The study, taking 1986-2015 as a period and using the Johansen cointegration method, indicates that agricultural production is positively affected by agricultural supports and the effectiveness of supports related to the market price is more than the others. Dogan et al. (2019) evaluates the relationship between agricultural credits provided in the years 2004-2017 and agricultural GDP. Using panel causality tests and dividing regions into three parts as urban area, intermediate and dominant rural areas, the study indicates that there is a two-way causal relationship between urban and intermediate rural area but no relationship in the dominant rural area. The reason of lack of relationship between agricultural credit and support is attributed to less agricultural productivity in terms of investment. Yanikkaya and Aktas Koral (2013) focus on the effects of the agricultural supports on the exports of individual agricultural products in Turkey for the 1965-2010 period. The study uses the gravity model for the determinants of export flows of agricultural commodities and concludes that supports are important for agricultural exports like in the exchange rate. According to the results, there cannot say exact thing about the impact of exchange rates because it exhibits different results. Ozer (2012) analyzes the impact of fluctuations in exchange rates on agricultural export by using the Johansen cointegration method. The results obtained indicate that agricultural export is affected by fluctuations in the real foreign income, relative prices and real exchange rate negatively. It is also detected that the agricultural exporters in Turkey are risk-averse.

3. Data

For the empirical analysis, the annual data between 1986 and 2019 are used. To see the impact on agricultural export, three variables as agricultural support, GDP per capita and real effective exchange rate are chosen. The numbers of agricultural export and GDP per capita are obtained from Turkish Statistical Institute (TUIK). The numbers of agricultural support are obtained from the Republic of Turkey Ministry of Agriculture and Forestry, and the OECD database. For the real effective exchange rate, the database of the Central Bank of the Republic of Turkey is used. The data is analyzed by using EViews 10 software program.

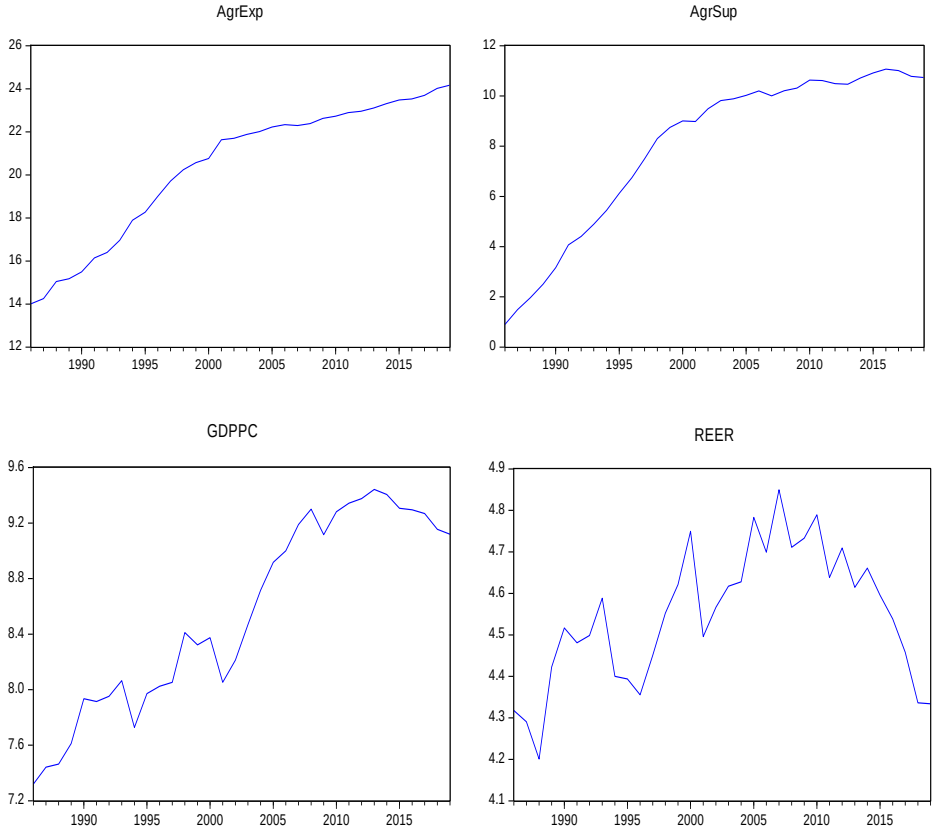
4. Methodology

In this study, agricultural export is considered as a log-linear econometric model. The equation including GDP per capita and reel effective exchange rate as control variables is expressed as follows.

$$lnAgrexp_t = \beta_0 + \beta_1 \ln (Agrsup)_t + \beta_2 \ln (GDPPC)_t + \beta_3 \ln (Reer)_t + \varepsilon_t$$

where *t* denotes the time, β_0 are parameters to be estimated and ε is the error term. *Agrexp* represents the agricultural export, *Agrsup* shows the agricultural support. As control variables, *GDPPC* and *Reer* are GDP per capita and real effective exchange rate respectively. The graphs of the variables taken their logarithms are shown as Graph 1.

Graph 1: Variables of the Models



4.1. Unit Root Tests

4.1.1. Without Structural Break

Because the series having a unit root can cause biased results, the existence of the unit root needs to be firstly tested. Among the unit root tests, Augmented Dickey-Fuller (ADF) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) unit root tests are chosen in this study. The null hypothesis of the ADF test shows that series contain a unit root, while the alternative hypothesis shows the stationarity of series (Dickey and Fuller, 1981).

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \delta_2 \Delta y_{t-2} + \cdots + \delta_p \Delta y_{t-p} + \varepsilon_t$$

where y_t denotes the time series to be tested, α is the constant term, efficient on a time trend, β_t is the coefficient on a time trend, γ shows the coefficient of interest, δ_i is the parameter of the augmented lagged first difference of y_t, p is the lag order of the autoregressive process and ε_t represents the White noise error term.

For the KPSS unit root tests, the null hypothesis states that the series is stationary, the alternative one states that the series is not stationary. The regression model of KPSS test is given as below.

$$y_t = \alpha + \beta_t + p y_{t-1} + \varepsilon_t$$

4.1.2. With Structural Break

To analyze the structural breaks and understand the crisis affecting agricultural export, Lee Strazizich Unit root test is applied. In this test, assuming that the breaking point is unknown, the breaking dates are determined internally and expressed as in regression model below (Lee and Strazicich, 2003).

$$y_t = \delta' Z_t + \mathrm{X}_t \qquad X_t = \beta \mathrm{X}_{t-1} + \varepsilon_t$$

where Z_t is a vector including exogenous variables. While Model A shows the two changes in level, Model C shows it in level and trend (Strazicich and Lee, 2003).

4.2. Cointegration Test

The long-term relationship among variables is examined by using the ARDL bounds test developed by Pesaran and Shin (1999). This approach allows variables to be integrated at I(0) and/or I(1) levels. Even if the sample is small or some variables are endogenous, the estimation of this test is efficient (Pesaran et al., 2001). As different lag length can be used in this model, the short-term and long-term coefficients of the model can be estimated by reduced equations. In this test, the cointegration among variables is firstly analyzed by using Error Correction Model (ECM) and if it exists, the short and long-term coefficients are estimated.

$$y_t = \theta + \alpha_1 \mathrm{y}_{t-1} + \cdots + \alpha_p \mathrm{y}_{t-\mathrm{p}} + \beta_0 x_t + \beta_1 x_{t-1} + \cdots + \beta_q x_{t-q} + \varepsilon_t$$

Here, p demonstrates a number of lags of y (lag order of y) and q shows a number of lags of x (lag order of x).

If the result of F value is greater than the upper critical value, the hypothesis stating that there is not a long-term relationship among variables is rejected. For the analysis of Error Correction Model, its coefficient should be negative and smaller than 1. If it positive, it means that the variables diverge in the long-term.

5. Empirical Results

5.1. Unit Root Tests

According to the result of ADF unit root test in Table 1, while all variables are not stationary at level with trend and intercept, they are stationary at first difference. The result of KPSS unit root test indicates stationarity in both level and first difference.

Table 1: ADF and KPSS Unit Root Tests

	ADF				KPSS			
	Level		First Difference		Level		First Difference	
Variables	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept
AgrExp	-3.67*** [0.00]	-0.71 [0.96]	-2.38 [0.15]	-5.79*** [0.00]	0.63***	0.17***	0.49***	0.09*
AgrSup	-3.20** [0.02]	-0.42 [0.98]	-2.29 [0.18]	-4.26*** [0.01]	0.61***	0.20***	0.67***	0.08*
GDPPC	-1.66 [0.43]	-1.44 [0.82]	-5.92*** [0.00]	-6.12*** [0.00]	0.64***	0.11*	0.22*	0.07*
Reer	-2.04 [0.26]	-1.55 [0.78]	-7.25*** [0.00]	-7.81*** [0.00]	0.34*	0.17***	0.20*	0.11*

Note: *, **, *** implies significance at 10%, 5% and 1% respectively.

When taking structural breaks into consideration, the result of Lee-Strazicich unit root test in Table 2 indicates that all variables are stationary on two structural breaks. As breaking dates, 2000-2002 period is distinguished from others. All these results show that the order of stationarity of the variables are appropriate for the ARDL bounds test.

Table 2: Lee-Strazicich Unit Root Tests

	Model A		Model C	
Variables	**Test Statistic**	**Breaking Date**	**Test Statistic**	**Breaking Date**
Exp	-1.74*	1988; 2000	-4.41*	1992; 2000
AgrSup	-1.73*	1991; 2001	-6.01**	1996; 2001
GDPPC	-2.58*	2002; 2014	-3.89*	2002; 2009
ExcRt	-2.42*	1999; 2012	-4.79*	1993; 2008
%1 Critical Value	-4.07		-7.00	
%5 Critical Value	-3.56		-6.18	
%10 Critical Value	-3.29		-5.82	

Note: *, **, *** implies significance at 10%, 5% and 1% respectively.

5.2. Cointegration Test

According to the results of Lee-Strazicich unit root test, the structural break in export, agricultural support and GDP per capita series are observed for 2000-2002 period. To obtain more reliable results, this period is added to the ARDL model as a dummy variable.

Table 3: ARDL Bounds Test

	F	**99% lower bound – 99% upper bound**
ARDL (1,0,0,0)	**52,868**	**4,093 - 5,532**
Long Term	**Coefficient**	**t-statistic**
AgrSup	0.982***	17.035 [0.000]
GdpPc	0.086	0.246 [0.807]
Reer	-2.508***	-5.064[0.000]
Dummy20002002	-0.004	-0.014[0.988]
C	23.747***	7.255[0.000]
Error Correction Model		
ECT	-0.39***	-18.26[0.00]
Tests	**Statistics**	**R^2 and Adjusted R^2**
Ramsey-Reset Test	0.74 [0.3971]	0.9986 and 0.9983
Breusch-Godfrey Test	1.778[0.138]	
White Test	1.250[0.343]	
Jarque-Bera Test	0.300[0.860]	

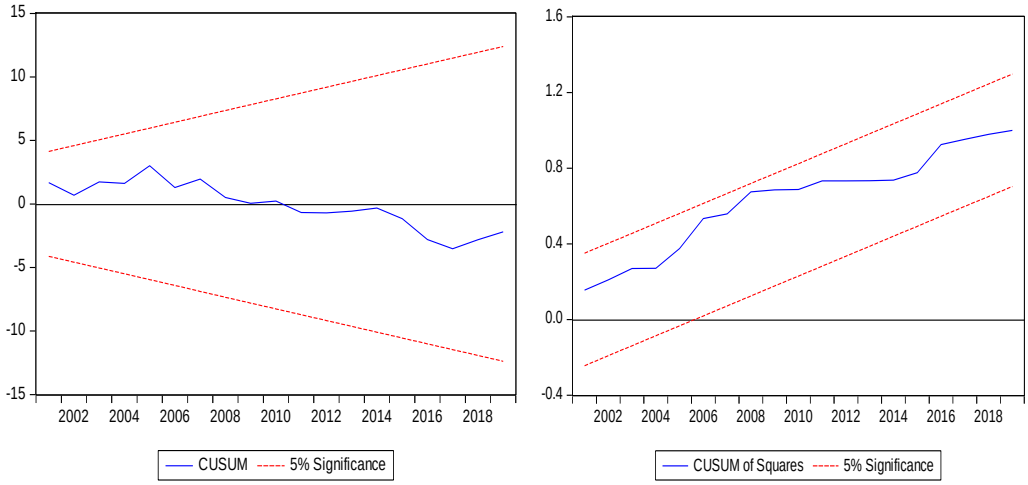
As it can be seen in the Table 3, the ARDL model is determined as (1,0,0,0) and F-statistic is greater than the critical values. This means that the null hypothesis stating no long-run relationship between variables is rejected, hence there is a long-run relationship between variables.

The coefficients indicate that while agricultural supply and GDP per capita have a positive impact, the real effective exchange rate and chosen period have a negative impact on the agricultural export as expected. However, only the coefficients of agricultural support and real effective exchange rate are significant. Although the coefficient of the dummy variable is not significant, it also affects the agricultural exports negatively.

The coefficient of error correction is found as -0.39 and it means that the short-term volatilities come to the long-term equilibrium within approximately 2.5 years. Ramsey-Reset test result shows that there is no setting model error. Breusch-Godfrey test result shows that there is an autocorrelation problem. The result of the White test proves the there is no heteroskedasticity and the Jarque-Bera test proves the normality.

The CUSUM and CUSUM of Squares in Graph 2 show whether coefficients estimated are steady or not in the related period. Results do not reject the null hypothesis stating the coefficients are steady in 2000-2002 period.

Graph 2: CUSUM and CUSUM of Squares



6. Conclusion

In the world which agriculture has gained importance each passing day, agricultural support to increase productivity plays a big role. Considering Turkey as an important agriculture country, the impact of agriculture on the export is a critical issue which needs to be handled and analyzed in terms of the Turkish economy. However, the literature about the relationship between agricultural support and export is very limited. In this sense, this study aims to fill the gap in the literature and explain the relationship with the 2000-2002 crisis period in a large time period from 1986 to 2019. To do it, the issue is examined by using structural break unit root tests and ARDL bounds test rather than evaluating it in the general concept and descriptive statistics.

ARDL bounds test covering 1986-2019 period indicates that while agricultural export has a positive relationship with agricultural support and GDP per capita, negative relationship with real exchange rate and the crisis period. As it can be seen in the literature, if agricultural support is organized effectively, they both decrease the costs and increase the productivity. Facilities provided to agricultural employers and employees ease to invest in the agricultural sector and production process. Likewise, the rise in GDP per capita provides to have agricultural input and machines easier. It also makes using different modern agricultural techniques and methods possible. Although the coefficient of GDP per capita is not significant, but agricultural support and GDP per capita have a positive effect. The coefficient of agricultural support shows its big role on agricultural export. Also, it is an indicator of the supports organized efficiently.

The effect of the real effective exchange rate on the export is negative and statistically significant in the long term. This means that the domestically produced goods compared to the goods produced abroad become more expensive. This leads to decrease in competition power and export. In this sense, the stability in exchange rates is important in terms of both exporters and the economy.

The findings of this study indicate that although the 2000-2002 period is not significant, it has a negative impact on the agricultural export. When considering that period, after Marmara earthquake in 1999, Turkey is in trouble with hyperinflation at the beginning of 2000s. Liquidity squeeze is in a very bad way. Moreover, in 2001, the lively discussion between the president and prime minister of Turkey gets Turkey into a bigger economic crisis which leads to many bank failures, the depression in demand and supply, the fall in the value of Turkish Liras. Although many steps are taken to regulate and regenerate the economy in 2002, the impact of the big crisis in 2001 is shown at the beginning of 2002s. Hence, its negative impact on agricultural export is inevitable.

7. Policy Recommendations

This study presents that agricultural support and GDP per capita have a positive impact on agricultural export. As the reasons of this positive relationship for agricultural supports, the fall in costs, facilitating investments and getting new equipment can be shown. It is also a preventive factor for rural-urban migration. Hence, policy makers need to increase the agricultural supports by analyzing farmers' needs. These may be product-based supports as well as project-based supports. It varies according to the field the farmers are dealing with because the needs differ depending on the region, soil structure and product etc. Hence, for an effective support, the needs should be analyzed in detail by taking many different conditions into consideration and determined. While the well-organized supports will increase productivity, it will also increase the investments for the future. Moreover, farmers can increase production efficiency and provide sustainability with informative supports. It also helps to do marketing and open to foreign countries. Thus, the rise in agricultural supports is very important factor for agricultural export.

It is hoped that this study will be a guide for future studies. The research analyzing the supports in detail will be helpful in terms of seeing on which agricultural problem and product the supports should be made. If any, the budget of low-impact supports can be allocated to the high-impact supports. This will both increase the supports efficiency and agricultural export.

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