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ANALYZING THE EFFECT OF EMPLOYMENT IN THE AGRICULTURAL AND INDUSTRIAL SECTORS ON ECONOMIC GROWTH WITH THE ARDL BOUNDS TEST

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Abstract

One of the important indicators determining the welfare level of a country is its Gross Domestic Product (GDP). However, many parameters affect GDP, and employment in agriculture and industry sectors constitute two of them. This study aims to determine the effect of employment in the agricultural and industrial sectors on economic growth in Turkey with the ARDL bounds test. Turkey's employment rate in the agricultural and industrial sectors of the years 2000-2019 and GDP data were used as material. According to the ARDL model, it was determined that there is a long-term positive relationship between A_Employment and I_Employment and GDP. It was also observed that there was no structural break in the variables. With the Toda-Yamamoto test, a one-way causality relationship from A_Employment to GDP and a two-way causality relationship between S_ employment and GDP were determined. As a result, although about 20% of total employment in Turkey is in the agricultural sector labor productivity is quite low. This situation leads to an increase in the urban population and thus a decrease in employment in agriculture. Therefore, it is recommended that economic policies be developed to increase labor productivity in the agricultural sector.

Keywords: Agriculture, ARDL, Employment, Industry

JEL Code: A12, C50, Q10

1. Introduction

It is important to have an idea about the phenomena that significantly affect human life and to determine the effect levels of these phenomena. Thus, the effects of these phenomena that have positive effects on human life and nature can be increased and the effects of those with negative effects can be eliminated. Statistics and data analysis emerge as an important field of science at the point of determining these effects. In this context, how the Gross Domestic Product (GDP), which is one

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of the important indicators affecting the living standards, is affected by employment in the agriculture and industry sectors and the analysis of the relations between them can be determined.

The agricultural sector has strategic importance in the food supply. Also, it is regarded as one of the sectors of special importance due to its contribution to employment, national income and exports, and its ability to meet the needs of industries that use agricultural products as inputs. Although the agricultural sector maintains this importance today, the share of the agricultural population in the total population is decreasing day by day. Comparing the developed countries and developing countries in terms of the agricultural population and the ratio of the agricultural population to the total population, the downward trend in developed countries is higher (Çelik, 2008). Both the rural population and the share of employment in the agricultural sector in Turkey is decreasing day by day and shows a significant downward trend. In 2018, in Turkey, the share of agricultural employment in total employment was determined as 18.4% (TÜİK, 2019a) and the share of the agricultural sector in Gross Domestic Product (GDP) was determined as 5.8% (TÜİK, 2019b). Thus, it can be said that employee productivity in the agricultural sector is quite low.

The industrial sector is one of the most important factors that show the economic strength of a country. The high employment rate in this field indicates that the country is developed in the industrial field and that this sector plays a role in economic development (Altun and İşleyen, 2019). Increasing national income together with the increase in production in the manufacturing industry, productivity increase and the speed of social change make a great contribution to economic development. For the increase in production in the manufacturing industry to result in development, the importance of a balanced increase in the amount of production should not be overlooked, rather than the income obtained. The importance of this will be understood more clearly when oil-rich countries are considered. Since the production of industrial products is not developed in many of the oil-rich countries, there will be no development in these countries when their oil resources are depleted. Real development is possible by fulfilling all three criteria (Tekeli, 2010). It is observed that the share of the industrial sector in national income is directly proportional to the industrialization levels of countries. The size of the industrial sector generally depends on the ratio of manufacturing industry output to GDP, the ratio of employment in the manufacturing industry to the total active population, and the relative share of industrial products in export revenues (Koç et al., 2018).

Employment is one of the important parameters showing the development level of a country. The socio-economic conditions of each country are not the same, and the effects of employment on growth on a sectoral basis also differ from country to country. In countries with high economic levels, the problem of unemployment is low in general. In developing countries and countries with a high rate of young population such as Turkey, although productivity is low, there is high employment in the agricultural sector (Altuntep and Güner, 2013). In addition, the role of the industrial sector is important, although not as much as the agricultural sector in employment in these countries. Therefore, in this study, the effect of employment in the agricultural and industrial sectors on economic growth in Turkey was studied using the ARDL bounds test. Besides, the causality relationship between these variables was examined by the Toda-Yamamoto test.

2. Material and Method

As material in this study, the employment rate in the agricultural and industrial sectors in total employment in Turkey and a data set consisting of Turkey's GDP data are used. This data set covering the 20 years between 2000-2019 was obtained from the World Bank, "https://databank.worldbank.org/source /world-development-indicators" and the necessary analyzes were made with Eviews 9 package program.

2.1. Stationarity Tests in Time Series

If the mean and variance do not change over time in a time series, it is considered as stationary. If a time series satisfies the stationarity condition, it is stated that in the long run this time series fluctuates around the average and tends to return to the average. When the effect of one-unit shock applied to series is temporary, series that are stationary tend to return to the mean (Gujarati and Porter, 2009). The presence of unit root in variables means that the series cannot be stationary. It has been determined that analyzes performed with non-stationary data do not yield reliable results and cause a relationship called spurious regression (Altun et al., 2018).

In this study, using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, it has been tried to determine whether there is unit root in the series.

Augmented Dickey-Fuller Unit Root Test

The autocorrelation problem was ignored in the unit root test developed by Dickey and Fuller (1979). Later, Dickey and Fuller (1981), in the unit root test, assumed that the error terms in the model were autocorrelated and the lagged terms of the dependent variable were included in the model to solve the autocorrelation problem. Dickey and Fuller used the critical values they developed for the unit root test in 1979 in the augmented unit root test (ADF) they expanded in 1981. They used criteria such as the Schwarz information criteria (SIC) or the Akaike information criterion (AIC) to decide the appropriate number of delayed terms in the extended test. While AIC gives stronger results in finite samples, SIC gives more reliable results in large samples.

To overcome the autocorrelation problem, equations with AR (p) process have been developed in the ADF unit root test. Equation (1) for the intercept model and equation (2) for the intercept + trend model is given.

$$\Delta Y_t = \beta_0 + \theta\, Y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta Y_t = \beta_0 + \beta_1 t + \theta\, Y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

In these equations, ΔY_t ; the first difference of variables, β_0; constant term, t; trend, Y_{t-1}; lagged difference trend, p; the appropriate lag length; ε_t; error term, β_1, θ and α indicate the correlation coefficients (Pata et al., 2016). Hypothesis tests for ADF are established as follows.

$H_0 : \rho = 0$ or $\delta = 0$ (The series is not stationary, there is a unit root)
$H_1 : \rho < 0$ or $\delta < 0$ (Series is stationary, no unit root).

Phillips-Perron Unit Root Test

Phillips and Perron (1988) introduced a non-parametric test that corrects the autocorrelation between error terms. In this non-parametric test, models are created using the autoregressive-moving average process (ARMA). Phillips and Perron (1988) is a unit root test developed against the weakness of DF and ADF tests in the stationarity analysis of time series. This test gives stronger results than DF and ADF unit root tests in the stationarity analysis of time series with the trend. Phillips Perron test is shown by equation (3) or (4).

$$y_t = \hat{\mu} + \hat{\alpha} y_{t-1} + \hat{\varepsilon}_t \quad (3)$$

$$y_t = \tilde{\mu} + \tilde{\beta}\left(t - \frac{1}{2}T\right) + \tilde{\alpha} y_{t-1} + \tilde{\varepsilon}_t \quad (4)$$

Where, T is the number of observations, ε is the error term, and μ, α, and β are the least-squares (LS) regression coefficients.

When a non-zero intercept term is added to the models given in Equations (3) and (4), the data generation process, t-statistics and coefficients will remain the same, so equation (5) can be used instead of these equations.

$$y_t = \mu + \alpha y_{t-1} + \varepsilon_t \qquad t = 1,2, \dots n \quad (5)$$

Phillips and Perron (1988) defined Z statistics by transforming the traditional test statistics obtained from equations (3) and (4) to asymptotically eliminate the parameter dependency problem. These test statistics;
The model for equation (3),

$$Z(\hat{\alpha}) = T(\hat{\alpha} - 1) - \frac{\hat{\lambda}}{\bar{m}_{yy}}, \qquad Z(t_{\hat{\alpha}}) = \left(\frac{\hat{S}}{\hat{\sigma}_{Tl}}\right) t_{\hat{\alpha}} - \frac{\hat{\lambda}' \hat{\sigma}_{Tl}}{\bar{m}_{yy}^{\frac{1}{2}}},$$

$$Z(t_{\hat{\mu}}) = \left(\frac{\hat{S}}{\hat{\sigma}_{Tl}}\right) t_{\hat{\mu}} - \frac{\hat{\lambda}' \hat{\sigma}_{Tl} m_y}{\bar{m}_{yy}^{\frac{1}{2}} m_{yy}^{\frac{1}{2}}} \quad (6)$$

And the model for equation (4), it is as follow:

$$Z(\tilde{\alpha}) = T(\tilde{\alpha} - 1) - \frac{\tilde{\lambda}}{M}, \qquad Z(t_{\tilde{\alpha}}) = \left(\frac{\tilde{S}}{\tilde{\sigma}_{Tl}}\right) t_{\tilde{\alpha}} - \frac{\tilde{\lambda}' \tilde{\sigma}_{Tl}}{M^{\frac{1}{2}}},$$

$$Z(t_{\tilde{\mu}}) = \left(\frac{\tilde{S}}{\tilde{\sigma}_{Tl}}\right) t_{\tilde{\mu}} - \frac{\tilde{\lambda}' \tilde{\sigma}_{Tl} m_y}{M^{\frac{1}{2}} \left(M + m_y^2\right)^{\frac{1}{2}}} \quad \text{ve}$$

$$Z(t_{\tilde{\beta}}) = \left(\frac{\tilde{S}}{\tilde{\sigma}_{Tl}}\right) t_{\tilde{\beta}} - \frac{\tilde{\lambda}' \tilde{\sigma}_{Tl} \left(\frac{1}{2} m_y - m_{ty}\right)}{\left(\frac{M}{12}\right)^{\frac{1}{2}} \bar{m}_{yy}^{\frac{1}{2}}} \quad (7)$$

Where;

$$m_{yy} = T^{-2} \sum y_t^2, \qquad \bar{m}_{yy} = T^{-2} \sum (y_t - \bar{y})^2,$$

$$m_y = T^{-3/2} \sum y_t, \qquad m_{ty} = T^{-5/2} \sum t y_t$$

$$M = (1 - T^{-2}) m_{yy} + 12 m_{ty}^2 + 12(1 + T^{-1}) m_{ty} m_y - (4 + 6T^{-1} + 2T^{-2}) m_y^2$$

$$\hat{\lambda} = \frac{1}{2}\left(\hat{\sigma}_{Tl}^2 - \hat{S}^2\right), \qquad \hat{\lambda}' = \frac{\hat{\lambda}}{\hat{\sigma}_{Tl}^2}, \qquad \tilde{\lambda} = \frac{1}{2}\left(\tilde{\sigma}_{Tl}^2 - \tilde{S}^2\right), \qquad \tilde{\lambda}' = \frac{\tilde{\lambda}}{\hat{\sigma}_{Tl}^2}$$

Thus, using Z statistics, the parameter dependency problem is eliminated asymptotically. Since this test has the same limit distribution as the DF test, Z statistics use DF critical values and hypotheses are set up as follows.

$H_0 : \rho = 1$ or $\delta = 0$ (The series contains a unit root, so the series is not stationary)

$H_1 : \rho < 1$ or $\delta < 0$ (The series does not contain a unit root, so the series is stationary).

2.2. Co-integration Test

The number of studies investigating the possible relationships between economic time series has been increasing in recent years. Co-integration analysis is used to reveal these relationships. These analyzes are widely used in econometrics and form the basis of time series analysis. Co-integration analysis is a method developed by Granger (1981) and Engle and Granger (1987). It has been widely used since its development and has become very popular today. Engle and Granger (1987) demonstrated that analysis with non-stationary time series may not reflect the real relationship, in other words, the relationship may be spurious. The existence of a long-term relationship between variables and the common stochastic trend of these variables is defined as co-integration. It is stated that in such a situation, they cannot act independently from each other (İşleyen et al., 2017).

The Autoregressive Distributed Lag Model (ARDL) Bounds Test Approach

The ARDL approach based on the Least Squares (LS) method, which Peseran and Shin (1998) and Peseran et.al (2001) have introduced to the literature, is used to explain the dynamic (autoregressive) relationship structure between variables. In the regression analysis using time series, if the model includes not only the current values of the independent variables but also the delayed values, this model is called the distributed lag model. If the model contains one or more delayed values of the dependent variable among its independent variables, this model is called a cascading model. These two models are referred to by equations (8) and (9), respectively.

$$Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \varepsilon_t \tag{8}$$

$$Y_t = \alpha + \beta X_t + y Y_{t-1} + \varepsilon_t \tag{9}$$

Thus, equation (8) refers to the distributed lag model and equation (9) refers to the cascading model. In the Engle-Granger method, the estimated long-run equilibrium deviation is used when deciding whether there is a co-integration relationship between two variables. Ignoring the lagged values of the variables causes a specification error. For this reason, Phillips and Loretan proposed an Auto-Regressive Distributed Lag (ARDL) model in determining the co-integration relationship (Sevüktekin and Çınar, 2017). One of the advantages of the ARDL bounds test is that it is possible to determine the co-integration relationship between the series regardless of whether the series is stationary or not, and the other is that it is highly effective in studies with small samples.

ARDL bounds test approach consists of three stages. These can be listed as examining the co-integration relationship between the variables in the model with the unconstrained error correction model (UECM), determining whether there is a long-term relationship between the variables, and estimating the long and short-term coefficients if there is a co-integration relationship between the variables. Hypotheses to determine the co-integration relationship in the ARDL bounds test approach;

$H_0: y_1 = y_2 = \ldots = 0$, There is no co-integration relationship,
$H_1: y_1 \neq y_2 \neq \ldots \neq 0$, There is a co-integration relationship.

Thus, when the calculated F statistic is greater than the upper bound critical value, the hypothesis H_0 is rejected and it is said that there is co-integration between the variables, while it can be said that there is no co-integration between the variables by accepting the hypothesis H_0 when the lower bound is less than the critical value. If the calculated F statistics is between the lower and upper bound critical values, a decision cannot be taken about co-integration.

The greatest advantage of the ARDL approach over other co-integration methods is that it can analyze variables simultaneously, regardless of the degree of stationarity. Thus, while some variables are stationary at the level of I(0), the remaining variables can be tested to determine whether there is co-integration between them in the long run after I(like 1) is made stationary. In addition, the other important advantages of the ARDL approach are that it gives good results in small sample sizes and prevents serial correlation and internality problems (Narayan, 2004).

2.3. Toda-Yamamoto Causality Test

The Granger causality test is more commonly used in the literature. In order to use this test, the series must be stationary or integrated to the same degree. If the series is not stationary to the same degree, applying this test may give erroneous results. Also, when the series is made stationary by taking the differences of the series, a certain amount of data loss occurs. For this reason, the Toda-Yamamoto causality test is preferred instead of the Granger causality test in the analysis of such series. Because the Toda-Yamamoto (1995) test, which is based on the vector autoregressive (VAR) model, can make a model estimation at the level regardless of whether the variables in the model are stationary or not (Squalli, 2007; Meçik and Koyuncu, 2020).

To apply the Toda-Yamamoto test, it is necessary to determine the lag length (p) and the maximum integration degree (d_{max}). Determining the model correctly and obtaining more successful results at the level depend on the determination of these two parameters. After determining these two parameters, the Toda-Yamamoto test is applied by creating a $p + d_{max}$ dimension VAR $\left(\text{VAR}_{(p+d_{max})}\right)$ model. In this case, the relevant VAR model is defined by the following equations (Riyath, 2018).

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$$Y_t = \alpha_0 + \sum_{i=1}^{p+d_{max}} \alpha_1 Y_{t-1} + \sum_{i=1}^{p+d_{max}} \alpha_2 X_{t-1} + \mu_{yt} \quad (10)$$

$$X_t = \beta_0 + \sum_{i=1}^{p+d_{max}} \beta_1 X_{t-1} + \sum_{i=1}^{p+d_{max}} \beta_2 Y_{t-1} + \mu_{xt} \quad (11)$$

However, for the Toda-Yamamoto causality process to be applied, the d_{max} value should not exceed the p value.

3. Findings

ADF and PP unit root tests were used to analyze the stationarity of variables, and the unit root test results are given in Table 1.

Table 1. ADF and PP Unit Root Test Results

Tests		Variable	Intercept		Intercept + Trend	
			t-bar	p	t-bar	p
I(0)	ADF	GDP	-2.008	0.003	-3.063	0.007
		A_Employment	-2.170	0.307	-3.170	0.301
		I_Employment	-2.417	0.170	-3.103	0.370
	PP	GDP	-2.101	0.001	-3.028	0.003
		A_Employment	-2.113	0.340	-3.401	0.329
		I_Employment	-2.273	0.230	-3.031	0.303
I(1)	ADF	GDP				
		A_Employment	-2.190	0.001	-3.381	0.001
		I_Employment	-2.307	0.001	-3.104	0.010
	PP	GDP				
		A_Employment	-2.473	0.001	-3.310	0.001
		I_Employment	-2.010	0.001	-3.031	0.002

p<0.05

ADF and PP unit root test results for both intercept and intercept + trend models by taking the level (I(0)) and first-order differences of the variables (I(1)) are given in Table 1. When Table 1 is examined, for both tests, in both intercept and intercept + trend model at level, the H_0 hypothesis for GDP is rejected (p <0.05), thus it is accepted that the GDP series is stationary at the level. However, at the level, it can be said that the hypothesis H_0 is accepted (p> 0.05) for the series of employment in the agricultural sector (A_Employment) and employment in the industrial sector (I_Employment) and thus these variables are not stationary at the 5% significance level, that is, they contain unit-roots. To stabilize these two non-stationary series, their first order differences are taken. After taking the first-order differences, the stationarity of the variables is tested again. As a result of the analysis, the hypothesis H_0 was rejected for the variables A_Employment and I_Employment in both models (p< 0.05). Thus, after taking the first-order differences of these variables, it can be said that at the 5% significance level, they are made stationary, that is, they do not contain unit-roots.

ARDL approach is more suitable for co-integration analysis if the variables under consideration are stationary at different levels.

Table 2. ARDL Co-integration Bounds Test

Number of Independent Variable (k)	F-Statistics	Significance Level	Critical Value	
			Lower L.	Upper L.
		%1	1.75	2.87
2	27.01500	*%5*	*2.04*	*3.14*
		%10	2.13	3.11

Whether there is co-integration between variables at 1%, 5% and 10% significance level is shown in Table 2. When Table 2 is examined, it is seen that the calculated F statistic value is greater than the upper bound critical value at the 5% significance level. Therefore, it is determined that there is co-integration between the variables by accepting the H_1 hypothesis. After determining a long-term relationship between variables with the F test, the parameters of this relationship were estimated with the ARDL model based on the Least Squares (LS) method and the results are given in Table 3.

Table 3. Predicted Values of ARDL (1,2,2) Model

Variable	Coefficient	Standard error	t-Statistics	p
Constant (c)	0.038637	0.002531	5.073071	0.013
GDP(-1)	0.112016	0.021793	-2.248501	0.024
A_Employment (-1)	0.121986	0.010941	-2.723216	0.021
A_Employment (-2)	0.120093	0.019043	-2.210304	0.032
I_Employment (-1)	0.118369	0.028375	-2.101310	0.031
I_Employment (-2)	0.109034	0.020346	-2.161023	0.011

$p<0.05$

Table 3 shows the values of the variables in the ARDL (1,2,2) model. When Table 3 is examined, it is seen that all three variables have significant ($p< 0.05$) and positive coefficients. These results indicate that the model estimation is successful.

One of the important elements that should not be ignored in the analyzes made with the ARDL model is the basic assumptions of the LS. The results of the basic assumptions of LS are given in table 4.

Table 4. ARDL Diagnostic Tests

Diagnostic Tests	Tests Statistics	p
R^2	0.809201	
Adjusted R^2	0.783202	
F-Statistic	15.01893	0.001
Breush-Godfrey LM Test	0.480273	0.261
ARCH Test	2.081025	0.371
Jargue-Bera Normallik Test	0.307904	0.816
Ramsey-Reset Test	1.754703	0.736

Table 4 shows the basic test results for the basic assumptions of the LS. The coefficient of determination (R^2) expressed as a percentage varies between 0 and 1 and shows how much of the variance in the dependent variable is explained by the independent variables. Thus, it is seen that approximately 80% of GDP is explained by A_Employment and I_Employment. If the model was generalized with the adjusted R^2 and derived from the model population, approximately 78% of the variation in GDP would have been explained by A_Employment and I_Employment. The changing variance problem is tested with the Breush-Godfrey LM test. When the Breush-Godfrey LM test probability value is greater than its critical value, it is assumed that there is no variance problem. According to the Breush-Godfrey LM test probability value (p> 0.05) in Table 4, it can be said that there is no variance problem. Whether there is autocorrelation in the predicted model is determined by the ARCH test. When the probability value of the ARCH test is greater than the critical value, it is assumed that there is no autocorrelation. According to the ARCH test probability value in Table 4 (p> 0.05), it was determined that there was no autocorrelation. The Jargue-Bera normality test tests whether the errors have a normal distribution. When the probability value of the Jargue-Bera normality test is greater than the critical value, the errors are considered to have a normal distribution. According to Table 4 (p> 0.05), it is observed that the errors have a normal distribution. Ramsey-Reset test analyzes whether there is a model building error or not. When the Ramsey-Reset test probability value is greater than the critical value, it is concluded that there is no modeling error. According to the Ramsey-Reset test probability value (p> 0.05) in Table 4, it was determined that there was no modeling error.

Table 5. Long Term ARDL Co-integration Results

Variables	Coefficient	Standard error	t-Statistics	p
Constant (c)	0.044701	0.002079	6.063170	0.037
A_Employment	0.134180	0.017830	-2.107203	0.001
I_Employment	0.110311	0.037221	-2.071746	0.001

Table 5 shows the values of the parameters calculated with the long-term ARDL model. In this way, the state of the long-term relationship between variables can be determined. In the study, GDP dependent variable, Agricultural Sector Employment (A_Employment) and Industrial Sector Employment (I_Employment) show the independent variables. According to Table 5, a positive and significant ($p < 0.05$) relationship was determined between A_Employment and I_Employment and GDP. Besides, a one-unit increase in employment in the agricultural sector causes an increase of 0.13418 units of GDP and a one-unit increase in employment in the industrial sector leads to an increase of 0.110311 units of GDP. Thus, when the effects of employment in the agricultural and industrial sectors on GDP compared in Turkey. It can be said that the impact of employment in the agricultural sector is greater.

The stability of the ARDL model was investigated by determining whether there is any structural break in the variables. For this purpose, CUSUM and CUSUMQ graphs using backward error term squares and investigating structural breakage in variables were used. In CUSUM and CUSUMSQ graphs, if the variables are within the critical limits, it is determined that the ARDL model is stable and thus the model coefficients are stable.

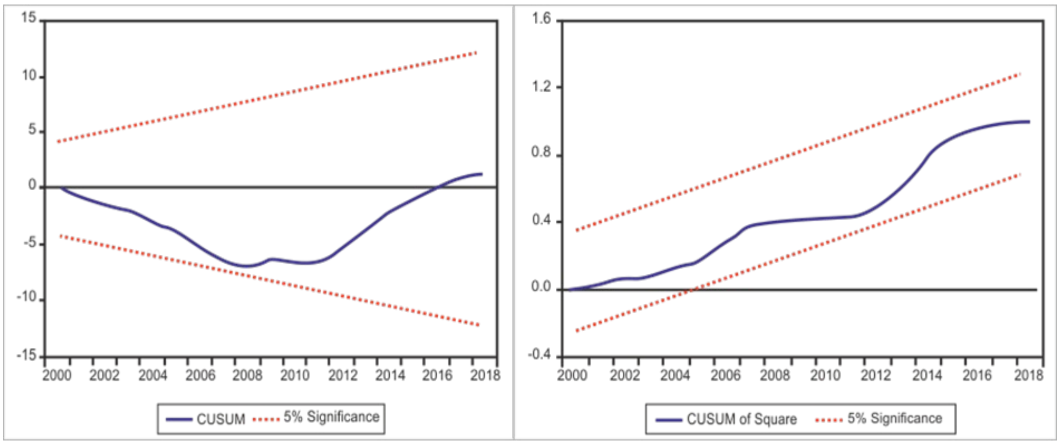

Figure 1. CUSUM and CUSUMQ results

Figure 1 shows the stability of the estimated ARDL model. When the CUSUM and CUSUMSQ plots were examined, it was determined that the variables were between the critical bounds at the 5% significance level. Thus, it was observed that there was no structural break in the variables and the long-term coefficients calculated by the ARDL bounds test were stable.

After the ARDL co-integration test, the appropriate lag length was determined with the VAR model to determine the direction of causality among the variables, and causality analysis was performed with the Toda-Yamamoto test.

Table 6. Lag lengths in the VAR model

Lag	LR	FPE	AIC	SC	HQ
1	49.00090*	3278.603*	23.76150*	27.60731*	24.73021*
2	50.40331	3514.641	25.12246	29.14770	26.87858
3	54.12723	3893.873	25.30691	31.89542	26.97013

In Table 6, the lag lengths calculated by considering the Sequential modified (LR) test statistics, Final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criteria (SIC) and Hannan-Quinn information criteria (HQ) are given and According to Table 6, the appropriate lag length is determined as 1. It can be said that all values provide the same optimum lag, the series do not have variance and serial correlation problems, so they have a normal distribution.

After determining the optimum lag length, the Toda-Yamamoto causality test was applied to the data set and the results are given in Table 7.

Table 7. Toda-Yamamoto Causality Test Results

Causality Direction	Test Statistics	p
GDP → A_Employment	2.621	0.071
A_Employment → GDP	3.180	0.001
GDP → I_Employment	2.593	0.014
I_Employment → GDP	3.184	0.002

When Table 7 is examined, in Turkey, it is seen that GDP does not cause A_Employment ($p \geq 0.05$) but A_Employment causes GDP ($p \leq 0.05$). In this case, it can be said that there is a causality relationship from A_Employment to GDP. It is seen that GDP causes I_Employment ($p \leq 0.05$) and I_Employment causes GDP ($p \leq 0.05$). Thus, it can be said that there is a bidirectional causality relationship between GDP and I_Employment.

4. Discussion and Conclusion

Examining the structural relations between the sectors gains great importance in terms of economy and development policies. Because, clearly determining the inter-sectoral relations can help put forward a positive and appropriate development strategy (Degu, 2019). Therefore, new econometric methods are used every day in modeling and testing economic theories. However, many economic variables in economic theory exhibit asymmetrical behaviors. Therefore, it is thought that it is possible to model the relationships between economic variables correctly by using nonlinear methods. Thus, one of the important methods used in modeling the relationships between variables in time series that are expected to exhibit asymmetrical behaviors is the ARDL model. In this context, the relationship between employment in agriculture and industry sectors and GDP, which is thought to have a significant effect on GDP, was examined with the ARDL co-integration bounds test.

Data from 1988 to 2011 were analyzed based on growth and employment in Turkey by Altuntep and Guner (2013). As a result, they determined that total employment had a positive effect on total growth. In addition, they found that employment in the agricultural sector did not have a significant effect on growth and that employment in the service sector negatively affected growth. Thus, they linked the effect of employment on growth to sectors not included in the analysis. Murat and Yilmaz-Eser (2013), in the framework of growth without employment, have examined the relationship between employment and economic growth in Turkey. As a result, it is observed that economic growth does not always increase employment. This process, called jobless growth, covers the years 1993, 2000, 2002, 2003, and 2004 in Turkey and stated that it was the most important cause of the increase in labor productivity. Kohansal et al. (2013), using the ARDL co-integration test, determined the role of agriculture on economic growth in Iran. As a result, it was determined that there is a long-term and equilibrium relationship between the variables and based on this, the long-term relationship is estimated. After all; they showed that there is a positive and significant relationship between the added value variables in agriculture, services, mining and industry and oil sectors and economic growth. However, they stated that the contribution of agriculture to economic growth was negligible since the agricultural added value was low (0.09). Yetiz and Ozden (2017), using the Engle-Granger causality test with agriculture in Turkey between the years 1968 to 2015, studied the relationship between GDP by industry and services sectors. The results show that there is unidirectional causality from the agriculture sector to the GDP, industry and services sector and that the agricultural sector is not affected by other sectors. In addition, it has been determined that a significant portion of GDP consists of the agricultural sector. Şaşmaz and Özel (2019), for the years between 1980 and 2016 in Turkey, analyzed how the incentives provided to the agricultural sector affect the agricultural sector with the ARDL co-integration test. As a result, they determined that the incentives provided to the agricultural sector did not significantly affect the development of the sector in the long run, but that economic growth positively affected the development of the sector. Altun and İşleyen (2019), based on data from the years 1991 to 2017, have tried to identify the relationship between economic growth and employment in the industrial sector in Turkey using the ARDL bounds test co-integration. According to the ARDL test, they determined that there is a long-term relationship between employment and growth in the industrial sector.

The agriculture and industry sector, both in the world and Turkey, is of great importance in terms of production and employment. Employment in these sectors varies according to the people, the level and type of production, country and regions. However, when the literature is examined, it is observed that there is generally a linear relationship between employment and economic growth, but growth is not sufficient to explain employment alone. In this study, it was found that there is a positive relationship between employment in the agriculture and industry sector and GDP. Thus, this study is generally compatible with the literature. Also, a one-way causality relationship from A_Employment to GDP and a two-way causal relationship between GDP and I_Employment has been determined.

As a result, as can be seen from the TÜİK 2019 data, despite the low employee productivity in the agricultural sector, approximately 1 out of every 5 individuals continue to be employed in agriculture. Therefore, the agricultural sector particularly in Turkey continues to be a feature of importance in the employment sector care. However, low labor productivity has recently increased the rural-urban migration and thus caused a decrease in employment in agriculture. To prevent this, it is of great importance to develop economic policies to increase labor productivity in the agricultural sector.

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