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RESEARCH ARTICLE

Determinants of Rural Development in European Union Countries and Türkiye[1]

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Abstract

There are many variables that can affect rural development. The aim of the study is to find out what variables affect rural development in Türkiye and European Union countries. The data period used in the study was, annual data for the period 2002-2020. According to the results of the random effects model, Inflation, Rural Population, and Rural Population Increasing variables from 8 independent variables affect Rural Development. According to the results of the Generalized Estimation Equality Mass Average Test based on the Random Effects Model, population growth in Rural Areas, Population in Rural Areas and Inflation variables were statistically significant. In the study, the Granger causality test was performed to measure the causality links of the variables. It was found that there is a bidirectional causality relationship between the exports of Agricultural Raw Material and the employment rate of young people aged 15 -24 in rural areas. Results with unidirectional causality or no causal relationship were found among the remaining variables.

Keywords: *Inflation, Rural Development, Economic Development, Agriculture in International Trade, Employment*

JeL Codes: *E31, F63, O13, Q17, E24*

Avrupa Birliğindeki Ülkelerde ve Türkiye'de Kırsal Kalkınma'nın Belirleyicileri

Özet

Kırsal Kalkınmayı etkileyebilecek birçok değişken bulunmaktadır Çalışmanın amacı, Türkiye'de ve Avrupa Birliği ülkelerinde kırsal kalkınmayı etkileyen değişkenlerin ne olduğunu bulmaktır. Çalışmada kullanılan veri dönemi, 2002 – 2020 döneminde yıllık veriler kullanıldı. Tesadüfi etkiler modeli sonuçlarına göre, 8 bağımsız değişkenden Enflasyon, Kırsal Nüfus ve Kırsal Nüfustaki Artış değişkenleri Kırsal Kalkınmayı etkilemektedir. Tesadüfi Etkiler Modeli baz alınarak yapılan Genelleştirilmiş Tahmin Eşitliği Kitle Ortalaması Testi sonucuna göre, Kırsal Alanlarda nüfus büyümesi, Kırsal Alanlardaki nüfus ve Enflasyon değişkenleri istatistiksel açıdan anlamlı bulunmaktadır. Çalışmada, değişkenlerin nedensellik bağlarını ölçmek için Granger Nedensellik testi yapıldı. Tarımsal Hammadde İhracatı ile Kırsal Alanda 15 – 24 yaş arası genç istihdam oranı değişkenleri arasında çift yönlü nedensellik ilişkisi olduğu saptandı. Kalan diğer değişkenler arasında tek yönlü nedensellik ilişkisi veya nedensellik ilişkisi olmayan sonuçlar bulundu.

Anahtar Kelimeler: *Enflasyon, Kırsal Kalkınma, Ekonomik Kalkınma, Uluslararası Ticarette Tarım, İstihdam*

Jel Kodları: *E31, F63, O13, Q17, E24*

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1.INTRODUCTION

When countries are taken as criteria in terms of population and settlements, they are divided into cities and rural settlements. Rural settlements have limited opportunities for employment and assess various services compared to cities. People residing in rural areas migrate to cities where service and job opportunities are high. Accordingly, it is the main cause of social problems in cities. It seems that the most important solution to eliminating social problems and migration problems in cities is to ensure that people living in rural areas stay in the countryside. Accordingly, infrastructure services job opportunities should be expanded in rural settlements (Baldıran, 2021: 17).

Rural development is defined as raising the quality of life in rural areas, reducing the development differences between cities and rural areas, establishing integrated systems between agriculture and industry, developing infrastructure services such as education, health, transportation, communication and revealing local handicrafts and traditional values. (Kuşat, 2014: 77-78).

IPARD (Instrument for Pre – Accesion – Rural Development) is a program implemented by the European Union and used in rural development programs before full membership in the EU. The primary aim of this program is to ensure the implementation of acquis regarding the EU Common Agricultural to the countries that have applied to the EU, but have not been granted full membership, and to propose solutions to some problems related to the agricultural sector and rural areas in the candidate countries. Some of the results obtained in the Strengths, Weaknesses, Threats, and Opportunities (SWOT) Analysis conducted for the renewal and development of rural settlements and infrastructure in Türkiye within the scope of IPARD are expressed in Table 1 as follows (Turhan, 2005: 124).

Figure 1: According to IPARD Experts, SWOT Analysis of Rural Areas in Türkiye

Strengths	**Weaknesess**
1. Rich Heredity **2. Production Pattern large rural regions**	**1. Insufficient infrastructure** **2. Low Quality of Transportation Vehicles** **3. Deficiencies in Education**
Opportunities	**Threats**
1. Suitable climatic conditions **2. Connection of Rural Region with Non – Governmental Organizations**	**1. Insuffıcient Financial Resources** **2. Ineffectiveness in Spending** **3. Low Public Participation**

Source:https://www.tarimorman.gov.tr/ABDGM/Belgeler/%C4%B0DAR%C4%B0%20%C4%B0%C5%9ELER/uzmanl%C4%B1k%20Tezleri/uzmanliktezi_turhan.pdf

The basis of rural development policies is the activation of all elements that will help people residing in a particular rural area to develop in agricultural, economic, and social areas as a whole. In addition, rural development policies are related to reducing the poverty of individuals living in rural areas (Gülbuçuk, 2020).

Rural development in Türkiye was mentioned in this development plan for the first time until the Eighth Five - Year Development Plan. It is possible to see that since the Eighth Five Year Development Plan, rural development policies have been carried out with the state and non-governmental organizations and sustainable rural development policies based on the protection of nature have been put into practice (Avcu ve Yayla, 2021: 70).

In recent years, Macedonia, Serbia, and Bosnia and Herzegovina have been very willing to implement the necessary reforms to enter the EU, giving importance to rural development support, It is expected that rural policy principles and operational framework (participation, networks, partnerships etc.) and rules governing support for rural development (co – financing, compliance with minimum standards) will be taken into account, based on the experience gained from the EU's expansionary policies (Stojcheskai Kotevska, Bogdanov & Nikolic, 2016: 72).

The aim of the study is to find out what variables affect rural development in Türkiye and European Union countries. The study was inspired by the study of Paun and Ivascu (2021). The originality of the study is that more variables are used in econometric analysis compared to other studies, the study is conducted in the field of rural development, and the data periods are more up – to – date.

In the study, after first mentioning the theoretical explanations, the studies in rural development were mentioned in the literature review. The data set used in the study consists of annual data for the period 2002 – 2020. The dependent and independent variables of the study are nine in total. As a result of the LLC, IPS, and Fisher PP Unit Root tests applied in the study, it was found that the variables were stationary at their level values. According to the Hausman Test, the random effects model turned out to be effective. According to the random effects model, the variables of Rural Population, Rural Population Growth, and Inflation are effective on Rural Development. According to the Granger Causality Test results, unidirectional and bidirectional causality relationships were found between nine variables.

2. LITERATURE REVIEW

In the studies in the literature, either only panel data econometrics or only panel time series were used. In this study, panel data econometrics and panel time series tests were performed. In addition, the study is more up – to – date and wider in terms of the number of years and variables used compared to the study in the literature. In table 2, there are studies on the determinants of rural development conducted around the world.

Similarity of this study with Zhang W. H., Chen W.G., Zhang J. (2012), Financial Sector Productivity and Rural Bank Loans have a positive effect on rural development. In the relevant study, according to the results of the Granger Causality Test, there is a one – way causal relationship between raw material exports in the agricultural sector and insurance and financial services. Bank loans for the agricultural sector, Insurance and Financial Services and Financial Sector Efficiency variables may initiate reverse migration from urban to rural

areas with the increase in investments in rural areas. Therefore, thanks to these variables, great progress is made in rural development and agricultural export.

Differences between this study Zhang W. H., Chen W.G., Zhang J. (2012), OLS Estimators and GMM Estimators were used because it was a fixed effects model. In the relevant study, the GEE Population Average Model was used because it is a random effects model.

In this study with Kan A. (2019), there is a similarity between the two studies since the variable of female employment in the agricultural sector, which is one of the variables, was preferred in the related study, and the variable of youth employment between the ages of 15 and 24 in the agricultural sector was preferred. As a result of the Granger Causality Test in this study, a bidirectional causal relationship was found between Agricultural Raw Material exports and youth employment between the ages of 15 and 24 in the agricultural sector. Along with other studies, the presence of Tractors in the Agricultural Sector will positively affect Women or Youth employment Rural Development, as well as exports in the agricultural sector.

This study with Kan A. (2019), the differences in this study in 2019 is the application of different econometric tests.

Similarity of this study with Paun C. and Ivascu C. (2021), almost the same unit root tests were applied in this study and in the other study. Unlike the other study, a fixed effects model was used.

Differences between this study and Paun C. and Ivascu C. (2021), The study in 2021 revealed that Agricultural Grants have a positive impact on agricultural production. Also, the welfare gap between rural and urban areas will decrease as Agricultural Grants encourage people to investment.

Table 2: Literature Review

SOURCES	DATA	VARIABLES	METHOD	RESULT
Zhang W. – H. Chen W. – G. Zhang J. (2012)	1978 – 2006 (Annual Data)	Urban and Income Gap, Compound Financial Variable, Government Spending, Production per Person	Descriptive statistics of variables, Two – way fixed effects: OLS Estimate, GMM Estimate	In this study, financial sector productivity, rural bank loans can reduce the rural and urban income gap in some regions. Public expenditures also increase the urban -rural income gap. As a result, financial sector productivity and rural bank loans have a positive effect on rural development.
Olatunji, G. B. Omotesho, O. A Ayinde, O. E Adewumi, M. O (2012)	1970 – 2006 (Annual Data)	Agricultural Production, Inflation Rate	Granger Causality Test	According to the results of the study, they concluded that there is a direct relationship between agricultural product change and inflation rate.
Sehrawat M. Giri A.K. (2015)	1986 – 2012 (Annual Data)	Financial Development, Income inequality from village to city, Economic Growth, Percent of foreign trade volume of GDP, Consumer Price Index	Unit Root Test, Pedroni Residual Cointegration Test, Pedroni Panel FMOLS Test, Panel Granger Causality Test, Impulse Response Function	The Empirical Findings in the study show that financial development increases income inequality between rural and urban areas, while trade openness reduces income inequality between rural and urban areas. In addition, it was revealed that economic growth and financial development variables cause income inequality between rural and urban areas.
Shen, X. Hartarska, V. Nadolnyak, D. (2015)	1991 – 2010 (Annual Data)	Agricultural Finance, GDP Growth, Interest Rate, Rural Population, Number of Farms	Abstract statistics of state level, Summary statistics of regional data, Fixed effect regression, state, and regional data	According to the results of the analysis in the study it was found that agricultural credit is positively related to GDP Growth in rural areas.
Nolte, K. Ostermeier, M. (2017)	1.346 deals, 35.2 million hectar	Labour Market Effects of Large – Scale Agricultural Investment: Conceptual Considerations and Estimated Employment Effects	Transition Matrix	In 5 African Countries – Ethiopia, Kenya, Nigeria, Tanzania, and Uganda – they noted that large – scale farming creates employment but fails to absorb all the labor previously released from income- generating activities, especially from small farmers.

SOURCES	DATA	VARIABLES	METHOD	RESULT
Verkaart S. Munyua G. B. Mausch K. Michler D. J. (2017)	2006 – 2014 (Annual Data)	Distance to neighboring cities, Technology transfer, Access to advanced seed, House size, Non -Farm income, Land Owner, First Asset Owner, Average Rainfall in the last five seasons, Black Earth, Sandy Soil, Mixed Soil	Survey Method: Descriptive statistics of adopters of an agricultural product, Socioeconomic characteristic of those who adopt or not adopt the agricultural product, Real income per capita, Adopters Decision: Correlated random effects estimation using Cragg's double hurdle model, Panel Series Analysis: Descriptive statistics for variables used in econometric analysis, The impact of adopting a product on income and poverty, Fixed effects estimation.	According to analysis results of the study, yielding results from improved chickpeas seems to be promising for rural development in chickpea products in Ethiopian regions.

Imai S. K. Gaiha R. Garbero A. (2017)	2000 – 2014 (Annual Data)	Number of Poor People Earning $1.25 a day by Purchasing Power Parity, Number of Poor People Earning $ 2.00 a day by Purchasing Power Parity, Poverty Gap earned $1.25 based on PPP, Share of Agricultural Production, Population Share in Mega Cities, Share of population in population of excluding Rural Agriculture, Population Share in Towns, Simple Average of four Management Indicators of World Bank: Political Stability, Rule of Law, Conflict and Accountability, Logarithm Real GDP per capita	Fixed or Random Model for Poverty based on $1.25 or $2.00 for poverty, Arellano – Bover/ Blundell – Bond linear dynamic panel estimator between $1.25 and $2.00, Robust Quantitative Regression for $ 1.25 Base Poor Employee Ratio	Considering that rapid population growth or internal migration in the urban population will increase poverty in the cities, more emphasis should be placed on rural development policies. Therefore, the result of this study does not coincide with the result of recent studies that have emphasized the role of towns or urbanization as drivers of poverty reduction.
Taş T. Duramaz S. (2018)	2006 – 2015 (Annual Data)	Amount of herbal production, Farm loans of governmental capital deposit banks, Farm loans of foreign capital deposit banks	LLC, IPS, ADF Fisher, Breitung Hadri Panel Unit Root Tests, Kao Panel Cointegration Test, FMOLS – dols Long Term Coefficient Estimation	In this study, in order to contribute to the agricultural sector, public banks as well as private and foreign banks should increase and diversify their loan opportunities in a structure suitable for the needs of agricultural producers.
Kan A. (2019)	2004 – 2017 (Annual Data)	Agricultural Production Value, Female Employment in Agriculture, Tractor Asset	Cross Section Dependency and Homogeneity Tests, Pesaran Unit Root Test, ARDL Test, Durbin Hausman Cointegration Test,	According to the results of the research, it has been determined that the employment of women in the rural sector and the presence of tractors increase agricultural production. Considering that women are an indispensable element of production, the education of women in the agricultural sector becomes increasingly important. In addition, it can be said that increasing the entrepreneurial capacity and removing the barriers to access to resources will enable women to participate for in the formal labour market and affect agricultural production more positively.

			Granger Causality Test	
Feng W. Liu Y. Lulu Q. (2019)	2001 – 2013 (Annual Data)	Urbanization: Population Urbanization, Economic Urbanization, Land Based Urbanization Rural Development: Crop Yield, Rural Life	Extended Cobb Douglas Model, Panel Unit Root Tests: LLC, IPS, ADF – Fisher and PP – Fisher Unit Root Test, Panel Cointegration Test, Correlation Analysis	In the study, urbanization in the economically developed regions has a significant impact on rural development when the residential areas in western regions of China are compared with the relatively poor regions.
Miglietta, P. P. Porrini, D. Fusco, G. Capitanio, F. (2020)	2010 – 2017 (Annual Data)	Agricultural Insurance, Subsidy System, Farmer Policies, Total Premiums Paid	Dynamic Panel Data Analysis	In the study conducted in Italy between 2010 and 2017, they concluded that there is a negative relationship between crop subsidies, farmer policies and total premiums paid. According to these results, it is emphasized that public aids and subsidies have a disincentive and exclusionary effect on the choice of whether to have agricultural insurance and support the low tendency to have agricultural insurance in Italy.
Romanenko O. Y. Boiko O. V. Shevchuk S. M. Barabanova V.V. Karpinska V.N. (2020)	2007,2013 and 2018 (Annual Data)	Rural Population Growth (Annual Percentage),Rural Population, Share of Agriculture Forestry, and Fisheries Sector in Growth, State Support to Agricultural R&D (Euros Per Person)	Correlation Matrix of Agricultural Sector Development Indicators of EU Countries, Random Effects Models	Rural Tourism has positively affected rural development in EU Countries. As a result, it was concluded that tourism development policy will improve both rural development and tourism in the European Union countries will develop.
Yılmaz, E., Turgut, U., Tosun, D., Gümüş, S. (2020)	2020	Aging Trend of Rural Population and Agricultural Activities	Kruskall Wallis Test, Chi - Square Test, Wilcoxon Signed Rank Test	Looking at the results of the survey conducted in Ödemiş and Bayındır districts in 2019, it is seen that most of the young people have migrated to the cities, and %56 of the farmers with a high age ratio do not want to continue their agricultural activities and do not want their children to work in the agricultural sector.

Erdinç Z. Aydınbaş G. (2021)	2000 – 2018 (Annual Data)	Agricultural added value, Income per capita, Gross fixed capital formation, Agricultural labour rate, Urbanization rate, Political stability, Rule of law index, Current Account Deficit	Hausman Test, Fixed Effects and Random Effects Generalized Method of moments Forecast, Resistive fault estimators	In this study, the independent variables which were positively correlated with dependent variable, Agriculture value added, GDP per capita, gross fixed capital formation, agricultural labour rate and urbanization rate. The independent variable, which was found to have a significant but negative relationship with agricultural value added, was the rule of law index. In addition, no statistically significant relationship was found between the agricultural value added and the political stability index, which is one of the independent variables.
Makhubele L., Tshidzumba, R. P., & Chirwa P. W. (2021)		Dependent Variables: Land Use Options Independent Variables: Age, Gender, Household Income Level of Education	Logistic Regression, Friedman Test, Survey Method	In their study, the authors conducted a survey in Limpopo Province in which they analyzed the desirable land use options and land drivers of rural dwellers. The results of the survey revealed that rural dwellers lack land for farming and other socio-economic activities, and that population growth in the province has increased the demand for land and the use of natural resources.
Avcu N. Yayla N. (2021)	2008 – 2018 (Annual Data)	Rural Development Index, Migration – Receiving, Migration Sending, Number of College Graduates, Agricultural Requirements Loan Revenues	KMO – Bartlett Test and Variance Explanation Ratios, Principal Components Analysis Load Matrices, Fisher ADF and Fisher PP Unit Root Tests, Hadri Unit Root Test, Kao Panel Cointegration Test, Pedroni Panel Cointegration Test, Principal Components Analysis Load Matrices	In general, the findings obtained in the study revealed that migration to rural areas affected rural development positively, while migration from rural areas to cities negatively affected rural development in rural areas.
Paun C. Ivascu C. (2021)	1993 – 2016 (Annual Data)	Crop Yield, Subsidize of Crop Yield	ADF Fisher and PP Fisher Unit Root Test, Levin Lin Chu Unit Root Test, Cointegration Tests, Akaike and Bayesian Information Criteria, Likelihood Ratio Fixed Effects Test, Hausman	According to results of the analysis in this study, the positive effect of agricultural subsidies on the long – term relationship on the volume of agricultural production has emerged.

			Random Effects Test, Fitted Models with period fixed effects, Long Run Effect of net subsidies on output value, descriptive statistics for Panel Data	
Hou, D, Wang, X. (2022)	2008 – 2020 (Annual Data)	Agricultural Insurance, Agricultural Green Development, Low Carbon Cigarette Pins	Panel Data Analysis	According to the results of the analysis of the study, agricultural insurance has a restrictive effect on agricultural green development. It was revealed that agricultural insurance does not have an impact on green agricultural development.

3. DATA SET

In this study, it was considered how it might affect rural development while creating the independent variables. The rural population growth variable was chosen considering that if the rural population increases, it can positively affect rural development. This variable was preferred because it is thought that the percentage of forested areas in the total area will positively affect rural development since forest areas are smaller and agricultural areas are larger. The variable of the export of Agricultural Raw Materials is thought to increase with the export of rural development. The variable of employment rate between the ages of 15 – 24 was chosen because it is thought that rural development will increase as the employment rate increases. The Insurance and Financial Services variable was chosen because it is thought that it will enable farmers to make their production in rural areas sustainable and increase rural development. The inflation variable has been chosen considering that rural development will increase, as farmers and traders with higher capital will generate more income as it will increase production costs.

In this part of the study, the variable or variables that have an impact on rural development in the European Union countries and Türkiye will be determined. In this study, annual data covering the period 2000 – 2020 were preferred. Econometric Analyses were prepared in the Stata 15 program. The data in the study were obtained from World Bank data. Dependent and independent variables consist of: Share of agriculture, fisheries and forestry sectors in growth (AgDe) (Dependent Variable), Rural population growth (AgPg), Percentage of forest area in total area (FaTa), Rural population (AgP), Forest areas in KM (KMFa), Export of agricultural raw materials (AgRMe), Employment rate for aged 15 -24 (YeR), Insurance and financial services (IfS) and inflation (InF) (Independent Variables).

The reason for choosing these variables in the relevant study was to try to obtain more consistent analysis results by keeping the period range (2002 – 2020) long and using as many variables as possible.

Table 2: Descriptive Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
AgDe	380	1.3521	10.4882	-27.0691	54.5996
AgPg	380	-0.6595	0.8904	-3.3385	2.3751
FaTa	380	33.1051	13.2847	9.4115	73.7356
AgP	380	6576	6909	22199	2.2207
KMFa	380	71282.09	69474.9	5745.8	224090
AgRMe	380	2.0697	1.7444	0.2834	8.7315
YeR	380	31.5195	11.5169	11.892	65.296
IfS	380	4.6225	5.1118	-0.0434	28.8790
InF	380	2.9878	3.8371	-4.6198	37.5748

Descriptive statistics emerge from the descriptive properties of variables. Descriptive statistics show the mean of the variables, the number of observations, their standard errors and their minimum and maximum values (Tatoğlu, 2021: 28).

4. METHOD

In the application part of the study, the explanatory statistics of the variables were included. The Fisher PP unit root test was used to determine the stationarity of the variables. The Hausman Test was applied to understand whether the model has fixed effects or random effects. An estimator with random effects was made. Finally, the Granger Causality test was performed to determine the causality of the variables.

4.1. Fisher PP Unit Root Test

Unit root tests are determined according to whether the result of the regression analysis is stationary or not. Which causality tests will be used depends on the results of the unit root tests. The Fisher unit root test is better than other unit root tests because it does not require a balanced panel (Tatoğlu, 2018: 47).

Table 3: PP Fisher Unit Root Test of All Variables at Level Values

Variables	P	Z	L*	Pm	P - value
AgDe	604.1588	-21.7596	-37.4225	63.0749	0.0000
AgPg	110.3112	-1.7985	-4.5016	7.8610	0.0000
FaTa	239.0188	-6.9638	-12.1210	22.2510	0.0000
AgP	114.5606	-1.8504	-4.0343	8.3361	0.0000
KMFa	298.8649	-9.4642	-16.5839	28.9420	0.0000
AgRmE	77.7183	-2.8996	-3.5726	4.2170	0.0003
YeR	38.7179	-0.2916	-0.3971	-0.1433	0.5279
IfS	68.3074	-1.9901	-2.1087	3.1649	0.0035
InF	128.6623	-6.4707	-7.4113	9.9127	0.0000

According to the Fisher PP Unit Root Test Results, 8 out of 9 variables will be stationary in their level values, while the employment rate variable between the ages of 15 and 24 will be used at the first difference level in the next tests, since the variable of the employment rate is not stationary at the level value.

4.2. Levin Lin and Chu Panel Unit Root Test

The Levin Lin Chu Panel Unit Root Test examines whether the panel series is stationary. In this test, only the balanced panel is preferred. H_0 hypothesis is " units contain unit roots", H_1 hypothesis is " units are stationary"

Table 4: LLC Panel Unit Root Test of All Variables at Level Values

Variable(AgDe)	**Statistics**	**P - Value**
Unadjusted t	-26.48	
Adjusted t*	-18.37	0.00
Variable(AgPg)	**Statistics**	**P - Value**
Unadjusted t	-17.72	
Adjusted t*	-11.38	0.00
Variable(FaTa)	**Statistics**	**P - Value**
Unadjusted t	-7.32	
Adjusted t*	-4.15	0.00
Variable(AgP)	**Statistics**	**P - Value**
Unadjusted t	-11.82	
Adjusted t*	-8.23	0.00
Variable(KMFa)	**Statistics**	**P – Value**
Unadjusted t	-6.98	
Adjusted t*	-3.86	0.00
Variable(AgRmE)	**Statistics**	**P - Value**
Unadjusted t	-10.56	
Adjusted t*	-3.86	0.00
Variable(YeR)	**Statistics**	**P - Value**
Unadjusted t	-10.61	
Adjusted t*	-3.77	0.00
Variable(IfS)	**Statistics**	**P - Value**
Unadjusted t	-13.16	
Adjusted t*	-5.41	0.00
Variable(InF)	**Statistics**	**P - Value**
Unadjusted t	-13.51	
Adjusted t*	-7.20	0.00

According to the LLC Panel Unit Root Test results, it is revealed that all variables are stationary at their level values (Güriş, 2018: 277). If the series of variables are stationary in the previous or subsequent unit root tests, the causality test to be used is the Granger Causality Test.

4.3. IM, Pesaran and Shin (IPS) Panel Unit Root Test

The previous Fisher PP and LLC Unit Root tests were found to be stationary, and the stationary of the series was tried to be reinforced by applying the IPS Unit Root test. The IPS Panel Unit Root Test examines whether the panel series is stationary.

Table 5: IPS Panel Unit Root Test of All Variables at First Difference Levels

Variable(AgDe)	**Statistics**	**P - Value**
W – t - bar	-23.98	0.00
Variable(AgPg)	**Statistics**	**P - Value**
W – t – bar	-12.36	0.00
Variable(FaTa)	**Statistics**	**P- Value**
W – t - bar	-3.17	0.00
Variable(AgP)	**Statistics**	**P - Value**
W – t - bar	-3.61	0.00
Variable(KMFa)	**Statistics**	**P - Value**
W- t - bar	0.73	0.76
Variable(AgRmE)	**Statistics**	**P - Value**
W – t - bar	-8.71	0.00
Variable(YeR)	**Statistics**	**P - Value**
W – t – bar	-3.75	0.00
Variable(IfS)	**Statistics**	**P - Value**
W – t – bar	-11.63	0.00
Variable(InF)	**Statistics**	**P - Value**
W – t – bar	-14.28	0.00

According to the IPS Panel Unit Root Tests results, all other variables were stationary at the first difference level, except for the forest areas in KMFa (Güriş, 2018: 293).

4.4. Hadri Panel Unit Root Test

The difference between the Hadri Unit Root Test and other unit root tests is that the effect of correlation between units is intended to be reduced. In addition, the test proposed by Hadri (2000) is the stationary null hypothesis, unlike the previous first-generation tests (Hurlic & Wignon, 2007: 7).

Table 6: Hadri Panel Unit Root Test of All Variables at First Difference Levels

Variable(AgDe)	**Statistics**	**P -Value**
z	-4.1691	1.000
Variable(AgPg)	**Statistics**	**P – Value**
z	-0.9264	0.8229
Variable(FaTa)	**Statistics**	**P - Value**
z	6.8894	0.0000
Variable(AgP)	**Statistics**	**P - Value**
z	25.3507	0.0000
Variable(KMFa)	**Statistics**	**P – Value**
z	26.6797	0.0000
Variable(AgRmE)	**Statistics**	**P - Value**
z	2.5913	0.0048
Variable(YeR)	**Statistics**	**P – Value**
z	1.5221	0.0640
Variable(Ifs)	**Statistics**	**P - Value**
z	-0.7594	0.7762
Variable(Inf)	**Statistics**	**P - Value**
z	1.9491	0.0256

In the Hadri Panel Unit Root Test, H_0 and H_1 hypotheses are used, the opposite of the previous panel unit root tests. According to the Hadri Panel Unit Root Test results, the variables Rural Development, Rural Population Growth, Youth Employment Rate in the Agriculture Sector and Insurance and Financial Services were found to be stationary.

4.5. One Way Hausman Test

The Hausman test is a test that allows us to choose between Fixed Effects Model and Random Effects Model. Therefore, the probability value becomes important in the Hausman Test. Ho hypothesis is " there are Random Effects " in the model. H_1 hypothesis is " there are Fixed Effects" in the model (Purba & Bimantara, 2020: 153).

Table 7: Hausman Test

Variables	**fe(b)**	**re(B)**	**Difference (b – B)**	**S.E.**
AgPg	0.05190	0.5547	-0.5027	0.92094
Fata	1.0462	-0.0272	1.0734	1.3157
AgP	8.7207	-9.8108	9.7007	2.4406
KMFa	0.0715	7.1406	0.0644	0.4453
AgRmE	0.6791	0.0738	0.6053	1.0065
IfS	-0.3087	0.0535	-0.3623	0.3204
InF	0.2759	0.2861	-.01014	0.1093
chi2(6)		3.81		
Prob.>chi2		0.7029		

According to the Hausman test result, since the Ho hypothesis was not rejected, the random effects were consistent while the fixed effects were inconsistent. Therefore, the next test will be related to the random effects model (Tatoğlu, 2021: 197).

4.6. Model Estimation

The random effects model can also be estimated using the Generalized Equality of Predictions Mass Mean Model.

Table 8: Random Effects Model Prediction Results

AgDe	Coef.	P>|z|
AgPg	0.7957	0.010
FaTa	-0.0339	0.24
AgP	-1.1107	0.033
KMFa	8.1806	0.098
AgRmE	0.07400	0.744
D(YeR)	0.2197	0.404
IfS	0.0586	0.277
InF	0.2587	0.005
Wald	24.39 chi2(8)	0.00
R^2	0.4679	

According to the estimator results, while the Wald test is significant, the independent variables Agricultural Population Growth, Agricultural Population and Inflation are statistically significant. Also, the R^2 coefficient is % 46. Related variables explain % 46 of rural development.

According to the economic results of the significant variables in the Generalized Estimate Equation Mass Average Model Estimator in the random effects model, a 1 br increase in Rural Development Increase in Rural Population increased 0.79 br. Accordingly, the increase in Rural Population has a very important effect on Rural Development. In addition, a 1 br increase in Rural Development and 1 br decrease in Rural Population occurred. Accordingly, a decrease in Rural Population can increase Rural Development. 1 br increase in Rural Development Inflation creates an increase of 0.25 br. Accordingly, the fact that, rich agricultural business owners get richer with the increase in inflation creates rural development.

4.7. Levene, Brown and Forsyhthe Test

Levene, Brown and Forsyhthe Test, indicates whether heteroscedasticity is present in the random effects model. The H_0 hypothesis states that " the variances of the units are equal ", while the H_1 hypothesis states that " the variances of the units are not equal".

Table 9: Levene, Brown and Forsyhthe Test

Test Statistics (W0, W50, W10)	df	Pr > F
W0 = 6.0201	(19, 360)	0.0000
W50 = 5.2802	(19, 360)	0.0000
W10 = 5.8276	(19, 360)	0.0000

According to the results of Levene, Brown and Forsythe Test, there is heteroscedasticity in the relevant model since the H_0 hypothesis is rejected.

4.8. Breusch Pagan Lagrange Multiplier Test

In the Breusch Pagan Lagrange Multiplier Test, it is determined whether there is autocorrelation in the random effects model. In this test, both unit effects and autocorrelation are used in the random effects model. In this test, both unit effects and autocorrelation are tested in the random effects model.

Table 10: Breusch Pagan Lagrange Multiplier Test

Serial Correlation			
LM (Lambda = 0)	37.68	Pr>chi2(1)	0.0000
ALM (Lambda = 0)	30.48	Pr>chi2(1)	0.0000
Joint Test			
LM (Lambda = 0)	38.46	Pr>chi2(2)	0.0000

According to the results of the Breusch Pagan Lagrange Multiplier Test, since the H_0 hypothesis is rejected, there are unit effects and autocorrelation in the random effects model. Therefore, estimators resistant to autocorrelation and heteroscedasticity will be used.

4.9. Arellano, Froot and Rogers Estimator (Random Effects)

The Arellano, Froot, and Rogers Estimator is the robust estimator made in case of autocorrelation and heteroscedasticity in the random effects model.

Table 11: Arellano, Froot and Rogers Estimator

AgDe	Coef.	P>|z|
AgPg	0.6030	0.095
FaTa	-0.028	0.229
AgP	-7.85	0.110
KMFa	6.78	0.046
AgRmE	0.2485	0.453
YeR	-0.0178	0.526
IfS	0.0613	0.295
InF	0.2184	0.045
R^2	0.46	
Wald chi2 (8)	72.18	
Prob. > chi2	0.0000	

According to Arellano, Froot and Rogers Estimator results, Inflation (InF) and Forest Areas in KM (KMFa) variables were statistically significant. The Wald Test is meaningful. R^2 is % 46. The relevant variables in the study explain rural development by %46.

Equation 1: Random Effects Model

$$AgDe = 6.78KMFa + 0.21InF$$

According to the equation, 1 br increase in Rural Development causes an increase of % 6.78 in Forest Areas in KM. Also, a 1 br increase in Rural Development causes % 0.21 increase in inflation.

4.10. Granger Causality Test

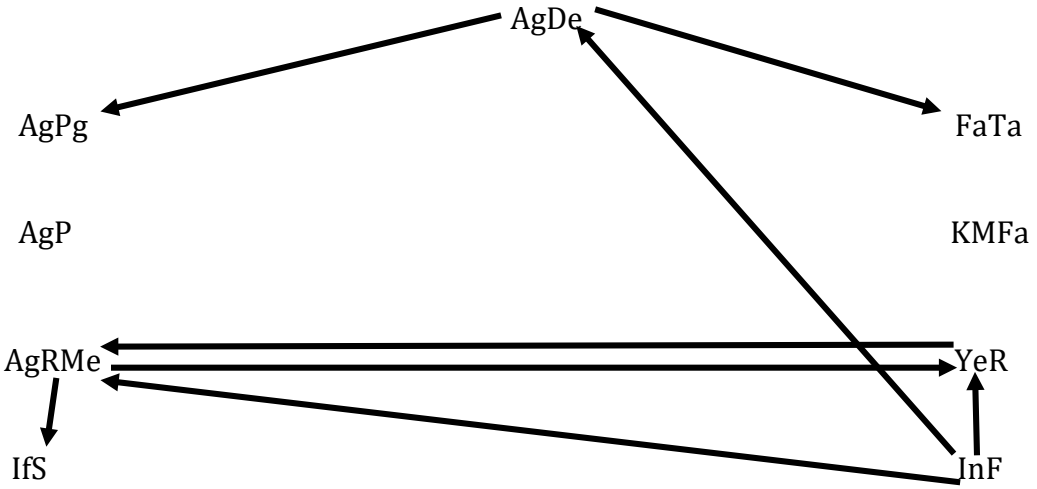
In the Granger causality test, there must be a stationary relationship between the variables. Accordingly, in the relevant study, the Granger Causality Test was used because the variables were stationary in the LLC, IPS and Fisher PP Unit Root Tests (Pala & Örgün, 2017: 16). The Granger Causality Test determines whether the causal relationship between the variables is unidirectional or bidirectional.

Table 12: Granger Causality Test

Equation/Excluded	Chi2	Prob.>Chi2
dAgDe/dInF	4.919	0.085
dInF/dAgDe	6.725	0.035
dAgDe/dAgPg	9.740	0.008
dAgDe/dFaTa	5.651	0.05
dAgRmE/dYeR	13.259	0.001
dYeR/dAgRmE	9.406	0.009
dAgRmE/dIfS	6.104	0.047
dIfS/dAgRmE	3.570	0.168
dAgRmE/dInF	3.655	0.161
dInF/dAgRmE	6.146	0.046
dInF/dYeR	9.591	0.008
dYeR/dInF	2.032	0.362

While no causal relationship was found between some variables in the study, one – way causality was found between some variables. A bidirectional causality relationship emerged between the employment rate variable between the ages of 15 and 24 in the agricultural sector and the variable of agricultural raw material exports. There was no causal relationship between Rural Development variable and Inflation variable. Additionally, there is no causal relationship between Rural Population and Rural Development.

Figure 2: Causality Relationship Between Variables



According to the Granger Causality Test result, there is a one – way causality relationship from Rural Development to Rural Population Increase, while the rise in Rural Development causes population growth in Rural Areas as it will make living in Rural Areas more attractive. In a place where there is Rural Development, people living in cities will be eager to migrate to rural areas, as investments are high and cooperatives in rural areas become effective and farmers earn a higher income.

There is a unidirectional causality from rural development to Forest Areas in Total Area variable. Accordingly, the increase in Rural Development may adversely affect the Forested Areas. Since more agricultural land will be needed to achieve Rural Development, forest areas will have to be cut. Therefore, Rural Development will negatively affect forest areas.

There is a unidirectional causality from Agricultural Raw Material Export to Insurance and Financial Services variable. Accordingly, Export of Agricultural Raw Materials increases the need for Insurance and Financial services. Because, export business owners need banks and insurance companies. With the increase in Insurance and Financial Services, investments will be made with suitable loans that can be provided to entrepreneurs. Accordingly, with the investments made, entrepreneurs will be more willing to export agricultural raw materials.

There is a two – way causal relationship between the Export of Agricultural Raw Materials and the Young Employment Rate in the Agricultural sector. Accordingly, as more investments are made with the increase in Agricultural Raw Material Exports, there will be an increase in the Young Employment Rate in the Agricultural Sector. With agricultural exports to be made, youth employment in the agricultural sector will increase. The increase in youth employment in the agricultural sector will lead to an increase in agricultural exports.

There is a one – way causal relationship between inflation and the variables of Youth Employment Rate in the Agricultural Sector, Rural Development and Agricultural Raw Material Export. Accordingly, because of the depreciation of the currency of the relevant country, there is a decrease in the Young Employment Rate in the Rural Development and Agriculture Sector. In addition, with the decrease in the value of money in the relevant country, the demand for Agricultural Raw Materials will increase as Agricultural Raw

Materials become cheaper. As a result, Inflation increases the Export of Agricultural Raw Materials.

There are some studies in the literature that empirically determine the determinants of rural development. For this reason, there is no example of a study directly like the literature arising from the model used in the study. Theoretical studies in the literature on the variables included in the study model are mentioned. In light of the theoretical studies in the literature, causality test results are evaluated.

In the general literature, it is known that there is a relationship between rural development and inflation. The finding of unidirectional causality from inflation to rural development at the end of our causality analysis is theoretically important. In addition, there are some studies on the share of agricultural production in the rural development variable (Olatunji et al., 2012). Olatunji et al. (2012) concluded that there is a direct relationship between the change in agricultural output and the inflation rate. They suggested that agricultural output stocks should be kept under control to prevent inflation.

The study differs from our in that it finds the direction of the relationship from the increase in agricultural product stock to inflation. According to Akgiş & Karakaş (2018), the determinants of agricultural subsidies in Türkiye are determined by the natural environment, the availability and amount of arable agricultural land, the main economic activity of the population, and proximity to the market. The similarity between the two studies is the use of the variable of availability and amount of arable agricultural land. In Janssen's (2018) study, according to the results of the structural equation model, the same determinants were effective in the behavior towards organic food and the purchase of organic food. However, the importance of the determinants differed. "Naturalness and Healthiness" and "Environmental Protection "were the two most influential factors in both models. Other important determinants with a positive effect were "preference for local food "and "liking for quality food ", while "price consciousness" and "convenience orientation " had a negative effect.

A causal relationship was found between rural development and rural population variables from rural development to rural population. According to these results, it shows that the change in rural development affects the rural population. The fact that policies in rural areas encourage the creation of employment in these areas can be explained by the implementation of polices that prevent migration. Hartarska, V. Shen, X. Nadolnyak, D. (2015), Boiko O. V., Romanenko O. Y., Shevchuk S. M., Barabanova V.V., Karpinska V.N., (2020).

In this study, no causal relationship was found between the rural development variable and the employment variable. Although, there is no empirical study to be directly based on in the literature, it is necessary to look at the shares of agriculture, fisheries, and forestry sectors in the GDP of the countries subject to analysis. Apart from this, especially in the agricultural sector, Nolte and Ostermeier (2017), in their study in five African countries, emphasized that while large farm enterprises create employment, they negatively affect the employment of small family businesses. Yılmaz et al. (2020), in their study conducted in İzmir province, concluded that farmers do not want to continue agricultural production due to economic factors such as high input prices used in production and limited marketing opportunities. In addition, Baki et al. (2021) draw attention to the increase in offshore fishing and aquaculture areas in the fisheries sector in Türkiye and predict that there will be an increase in

employment in the fisheries sector with the inclusion of new potential areas in these areas over time. Baydur (2015) concluded that in a certain period of agricultural production, intermediary profits increased more than farmer incomes. The distribution phenomenon in the agricultural sector will increase agricultural production and cause increases in agricultural product prices. The similarity of this study with the current study is that there is a causal relationship between agricultural product production and agricultural product prices. In Sarıözkan's (2016) study, although fish products increased less than other products, they were consumed less. It was revealed that producers in the fisheries sector in Türkiye need policies to support promotion activities, product diversification and increase consumption. A similar aspect of this study to the current study is that inflation, one of the dependent variables, affects fisheries production.

In the study, no causal relationship was found between the rural development variable and agricultural raw material exports, forest area in km, or rural population growth rate variables. On the other hand, although there is no relationship with the data on forest area in km, the fact that there is a relationship with forest area in total area draws attention as a determinant of development. In addition, although no relationship was found with the rural population growth rate, a relationship was found with the substitute rural population variable. Qin, Li, Lu, Pan (2020) investigated the important factors in the development of villages. In addition, in terms of econometric analysis, an inclusive approach consisting of multiple regression analysis and augmented regression trees was used to address the marginal effects of variables and the effects of variables on economic development in villages. Moreover, infrastructure, non-agricultural employment, entrepreneurship, bottom-up partnership and the vitality of rural development in developed countries were found to have positive effects on rural development in villages. The concepts of transportation infrastructure, retention of the agricultural labor force, and increased intensive land use not only have an impact on the rural development of villages, but also have increased marginal effects. Non-agricultural employment, entrepreneurship, and bottom-up partnership variables also have a positive impact on village economic development. The difference between the two studies is the positive impact of infrastructure and entrepreneurship on rural development. In Levers, Schneider, Prishchepov, Estel & Kuemmerle (2018), the spatial econometrics method was preferred for the determinants of agricultural abandonment in Europe. According to the results of the study, spatial analysis revealed that managers in rural areas should accelerate decision – making processes related to the abandonment of rural areas. The difference from the present study is that spatial econometrics were preferred in the econometric analysis.

In the literature, the relationship between rural development and insurance is generally focused on the relationship between agricultural production. In our study, no relationship was found between the dependent variable of rural development and insurance. However, there are studies in the literature on the relationship between agricultural products and insurance, such as Miglietta et al. (2020) in their empirical study in Italy, which shows that the total premium paid is affected by subsidies and policies and that the tendency to insure agricultural production is low. In addition, Hou and Wang (2020) concluded that low carbon premiums have an impact on farmers' agricultural production decisions in China. At this point, given the limitations of our study, we cannot say that insurance premiums do not have an impact on rural development through agricultural production. Hazell and Hess (2010)

argue that agricultural insurance can make important, market – based contributions to risk management and promote agricultural growth. While the private sector is the main driver of insurance services, the public sector should also provide various supports. The similarity between this study and the present study is that insurance and financial services are variables that can affect rural development in the model.

In the study, a unidirectional causality relationship was found from the rural development variable to the FaTa (Forested Area in Total Area) variable. The use of forest land as agricultural land is important due to its impact on agricultural production. In the Makhubele et al. (2021) study, it is noteworthy that the land use preference of the people living in rural areas is needed for agricultural production rather than livestock production. The study also emphasized that the government should build capacity, skills and knowledge on how to diversify land uses to meet the socio – economic needs of beneficiaries.

5. CONCLUSION

In the econometric analysis of this study, first descriptive statistics of the variables, the Fisher PP Unit Root Test and LLC Unit Root Test were applied. According to the Fisher PP Unit Root Test and LLC Unit Root Test results, except for the employment rate variable between ages 15 – 24 in the agricultural sector, other variables are stationary at level values. Additionally, in the IPS Unit Root Test, the variables were stationary at the first difference level. Moreover, in the Hadri Unit Root Test, some variables are not stationary at the first difference level. The one – way Hausman test was performed to determine whether the random effects or fixed effects models were consistent. According to the Hausman test result, since the Ho hypothesis was not rejected, the random effects model appeared to be consistent. Since it is a random effects model, the estimation was made using the Generalized Equation of Estimation Population Mean model. According to the estimation result, the increase in the population dealing with the agriculture population, agricultural population and inflation variables was significant. Also, the Wald test is statistically significant. Since the R^2 coefficient is % 46, the relevant independent variables explain % 46 of rural development. Levene, Brown and Forsyhthe test was applied to determine whether heteroskedasticity was present in the random effects model. As a result of this test, there is heteroskedasticity in the random effects model. In order to determine whether there is autocorrelation in the random effects model, the Breusch Pagan Lagrange Multiplier test was applied. As a result of this test, it was revealed that there is autocorrelation in the model. Due to the existence of Heteroskedasticity and Autocorrelation in the Random Effects Model, Arellano, Froot and Rogers Estimator was used. According to the results of this estimator, the variables Inflation and Forested Areas in terms of KM and the Wald test are statistically significant. The R^2 coefficient is the same. The Granger Causality Test was applied to measure causality between variables. As seen in the figure above, there was no causal link between some variables; there was a one – way causality link between some variables, and a bidirectional causality link was found between two variables. Lastly, causality testing was not performed because testing for causality among some variables did not result in an economic result.

For reverse migration from cities to rural areas, public policy makers should encourage reverse migration. In order to encourage reverse migration, infrastructure investments in rural areas, rural tourism investments, training of farmers and protection of farmers against inflation while carrying out agricultural activities are required. Finally, in order to ensure the

sustainability of rural development, youth employment between the ages of 15 and 24 should be provided in rural areas and farmers should be protected against inflation.

Educational support provided to farmers, machinery and equipment support, agricultural grants, measures to protect farmers against inflation, expansion of infrastructure investments in cities to rural areas, carrying out social activities in rural areas, ministries acting together on rural development, cooperatives gaining financial strength, encouraging cooperatives. Cities will become more livable with that take these precautions. A country that is economically self-sufficient in the agricultural sector, not only loses foreign currency, but also ensures food security.

The study was conducted based on data from the period 2002 – 2020. Instead of some statistically non -significant independent variables in the study, independent variables such as Agricultural Grant, Tractor asset in the Country and loans provided for the agriculture sector could have been preferred if data were available.

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