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# Trade liberalization, financial development, and economic growth: A panel data analysis on Turkey and the Turkic Republics

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**Abstract**

**Purpose —** In this study, 5 Turkic Republics (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan and Turkmenistan) and Turkey are analysed to investigate the impact of trade liberalisation and financial development on economic growth.

**Methods —** In this study, long-term relationships among trade liberalisation, financial development, and economic growth are analysed by applying unit root, cointegration and causality tests for panel data analysis study for the period 1998 to 2017.

**Findings —** The findings reveal a strong cointegration relationship between trade liberalization, financial development, and economic growth. It was understood that trade liberalisation positively affected economic growth, and financial development negatively affected economic growth in the long term for the whole panel. However, when the variables are analysed for each country in the panel, it is seen that the sign and severity of the coefficients change. Also, according to panel causality test results, it was understood that there was no causal relationship between variables.

**Implication —** This paper supports the notion that the direction of the relationship among trade liberalisation, financial development, and economic growth change according to countries in Turkey and the Turkic Republics.

**Originality —** This paper contributes to the literature by the general view that trade liberalisation and financial development are the driving force of economic growth; these relations may vary according to the country group examined in the studies, the period handled, and the econometric method applied.

**Keywords —** Trade liberalisation, financial development, Turkic Republics, Turkey, panel data analysis

## Introduction

After the dissolution of the USSR in 1991, countries of the Union entered the transition period. Although the Turkic Republics started reforms later than other countries in this process, they are implementing structural reforms to transition to a planned market economy. Turkic Republics and Turkey should develop their financial systems and determine appropriate policies to ensure sustainable economic growth (Djalilov & Piesse, 2011).

International trade and financial markets are the driving forces of the economic growth process. While international trade is an area for the exchange of goods and services, the financial

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markets constitute the demand side of the economy through money. Although the groups that will benefit from economic growth are domestic residents, economic growth is determined by the competitiveness in international markets (Menyah, Nazlioglu, & Wolde-Rufael, 2014). Therefore, the question of how much and how the tradable goods will be subject to international trade becomes essential.

Although the role of financial markets in the economy cannot be ignored, another critical question is whether financial development supports economic growth. Gains from financial development are stable as the level of confidence in financial markets is high, generally due to the robust financial markets of developed countries. On the other hand, despite the increase in financial development in developing countries, it does not have a significant impact on economic growth due to the low level of confidence and the unstable gains from financial markets (Agayev, 2012).

Recent studies reveal that trade liberalisation and financial development may affect economic growth. Especially developing countries liberalise both their trade openness and financial systems to increase economic growth. Countries with strong financial markets can attract foreign direct investments more because they are considered safe environment for investors. The essential functions of the financial system are to produce and distribute information, monitor companies and implement corporate governance, reduce risks, bring savings together, and implement changes that will contribute to the economic growth (Agayev, 2012). Therefore, financial development contributes to countries' economic growth by increasing the performance of foreign direct investments.

The study aims to investigate the effect of trade liberalisation and financial development on economic growth. The study's novelty is that it deals with trade openness, financial development and economic growth in the context of the Turkic Republics. In this context, the effects of trade liberalisation and financial development on economic growth are analysed empirically in the 5 Turkic Republics and Turkey for 1998-to 2017 with annual data.

The effects of trade liberalisation and financial development on economic growth have been debated in the literature for many years. Especially in the last two decades, although there are many studies focusing on transition economies, the Turkic Republics have been ignored due to the lack of information. Although there is a general view that trade liberalization and financial development are the driving force of economic growth, these relations may vary according to the country group examined in the studies, the period handled and the econometric method applied (Gries, Kraft, & Meierrieks, 2009).

The traditional trade theory suggests that international trade stems from external differences among countries. Reallocation of national resources increases productivity and leads to an increase in national income. Trade liberalization both diversifies the increasing consumer goods and lowers the balance price due to the increasing competition (Krugman, 1980). Also, the increase in the size of the market brings along the phenomenon of scale economies.

The theoretical framework of the relationship between trade liberalization and economic growth is based on the Neoclassical growth theory. According to the theory, increasing trade liberalization increases the integration of countries into the world economy. Higher trade liberalization increases competition among countries and therefore the amount of exports and imports. This, in turn, could increase exports and thus economic growth as a result of falling prices of goods by specializing in the production of goods. Gül, Kamacı, and Konya (2013) examined the Turkic Republics and Turkey for the period 1994-2010 in their study and found that foreign trade a positive relationship between long-term economic growth. Silajdzic and Mehic (2018) discussed Transition economies for the period 1995-2013 and examined the relationship between trade liberalization and economic growth by PCSE and LSDVC methods. As a result of the study, they concluded that trade liberalization positively affects the economic growth in countries with high technology production. Erkişi and Ceyhan (2019) analyzed the 13 Transition economy for the period 1995-2016 and stated that trade liberalization positively affected economic growth in both the short and long run.

Financial markets are where borrowers and lenders meet and capital is reallocated. In the literature, there are two different aspects on the relationship between financial development and

economic growth. The first one argues that financial development increases economic growth due to resource allocation. The first view in the literature is that as the level of financial development increases, resource allocation becomes more efficient and this affects economic growth positively. Agayev (2012) examined 20 transition economies for the period 1995-2009 and found that there is a unidirectional causality relationship from financial development to economic growth. Asghar and Hussain (2014) analyzed 15 developing countries for 1978-2012 using the panel cointegration method and concluded that there is a long-term relationship between financial development and economic growth. The second one argues that economic growth will increase the ease of access to financial instruments and external financing. Financial development negatively affects economic growth in low-income countries and transition economies due to insufficient resources. Artan (2007) examined 79 countries for the period 1980-2002 and stated that financial development negatively affected economic growth in low-income countries. Djalilov and Piesse (2011) in his study on the Central Asian countries found that the effects of financial institutions and financial regulations are different, although the direction of these relations changes, but there is a generally negative relationship. Gries et al. (2009) and Menyah et al. (2014) highlighted the complex relationship between financial development and economic growth. Gries et al. (2009) discussed 13 Latin American and Caribbean countries and the period 1960-2004 and stated that while there was a mutual causal relationship between financial development and economic growth, there was no relationship in the long term. Menyah et al. (2014) studied on 13 African countries and found that trade liberalization and financial development had a limited impact on economic growth.

Current studies in the literature have reached the conclusion that both financial development and trade openness increase economic growth. Estrada, Park, and Ramayandi (2010) researched 116 countries and the period 1987-2008 and found that both trade liberalization and financial development positively affected economic growth. Le and Tran-Nam (2018) used the FGLS method in their study of 14 Asia-Pacific countries and concluded that there is a causal relationship from financial development to economic growth, from commercial liberalization to economic growth and from commercial liberalization to financial development. On the other hand, Tufaner (2020) discussed the relationship among trade liberalization, financial development and economic growth in the context of the Fragile Five countries. In this study, which examined the period of 1980-2017, it was found that both financial development and trade liberalization positively affect economic growth. In addition, it was emphasized that policymakers should contribute to the development of the financial system by making financial regulations and that both public and private sectors should make efforts to contribute to financial development. The common point of the current studies is that while the increase in trade openness increases economic growth through specialization in production, financial development increases economic growth through efficiency in resource allocation.

## Methods

The motivation for this study is to reveal whether there is a long-term relationship among trade openness, financial development and economic growth, given the limited and contradictory results of previous studies. The inconclusive nature of the studies investigating the relationship between financial development and economic growth motivated to overcome the limitations of previous studies by using both cointegration and causality tests by including all three variables in the model.

The basic model used for empirical analysis is shown in equation (1) below;

$$EcoGro_{it} = \alpha_{it} + \beta_i TradeLib_{it} + \gamma_i FinDev_{it} + \varepsilon_{it} \quad (1)$$

i = 1, 2, ..., N denotes the countries in the panel, and t = 1, 2, ..., T denotes the time. EcoGroit represents economic growth, TraLibit represents trade liberalization and FinDevit represents financial development variable, while $\varepsilon_{it}$ it expresses the classical error term. 5 Turkic Republic (Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, and Turkmenistan) and Turkey are analyzed with annual data for the 1998-2017 period in the study. The countries and the period range in the sample were selected considering the data availability. For economic growth (EcoGro) variable, the

natural logarithm of GDP per capita is used. For the trade liberalization (TraLib) variable, the logarithm of the export and import total in US dollars is used.

There is a discussion in the literature on the variables used for financial development. Although the ratio of M2 money supply to GDP or liquid liabilities to GDP ratio is used to measure the level of financial development, there is no consensus on which indicator is superior. Therefore, for the Financial Development (FinDev) variable, the financial development index, which is accepted as an indicator of financial development, is used in current studies. The financial development index consists of two components: financial institutions and financial markets. Financial institutions and financial markets are divided into three components: depth, accessibility, and efficiency. EcoGro and TraLib variables were obtained from the World Bank (World Development Indicators) dataset and FinDev variable was obtained from the IMF (Macroeconomic & Financial Data) dataset. Table 1 shows the country averages of the variables used in the study.

**Table 1.** Averages of Variables by Country

| Variables (Level) | EcoGro | TraLib | FinDev |
|---|---|---|---|
| Azerbaijan | 3671.907 | 27.5026 | 0.1413738 |
| Kazakhstan | 6534.726 | 79.146 | 0.2813643 |
| Kyrgyzstan | 756.7178 | 5.0244 | 0.1788924 |
| Uzbekistan | 1269.663 | 16.9866 | 0.2393554 |
| Turkey | 8304.855 | 292.9446 | 0.4458459 |
| Turkmenistan | 3604.242 | 16.03 | 0.1237967 |

In the study, the panel data method is used to investigate the relationships among economic growth, trade liberalization and financial development in 5 Turkic Republics and Turkey. Panel data consists of N units and T number of observations corresponding to each unit. Panel data has many advantages over sectional or time data. Using the panel data method for short time series allows more observation by collecting time-series data among countries and stronger results for the Granger causality test. Also, panel data are subjected to cross-sectional dependence testing, providing more informative data, greater variability, concurrency between variables, higher degree of freedom and more effectiveness (B. Baltagi, 2005).

Panel data models created using panel data are estimated by various methods, depending on the size of the unit and time dimension and whether the model provides some assumptions. If there is a cross-sectional dependence in the error term, first-generation estimators are insufficient because they do not consider this correlation. In the new generation panel data analysis developed in recent years, it is suggested that the cross-sectional dependency may exist among the countries that make up the panel and that the correlation among units is tested first. In case of cross-sectional dependence, new generation panel data analysis methods that consider this should be used.

Breusch and Pagan (1980) LM test can be used to test the cross-sectional dependence in fixed effects model. Null hypothesis is;

$H_0$: cov ($u_{it}$, $u_{jt}$) = $p_{ij}$ = 0 ( i≠j for all ts )

The LM test statistic is calculated as in equation (2);

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{p}_{ij}^2 \quad (2)$$

Where $\hat{p}_{ij}^2$; i, j is the correlation coefficient between of the residuals.

$$\hat{p}_{ij} = \hat{p}_{ji} = \frac{\sum_{t=1}^{T} e_{it}\, e_{jt}}{\left(\sum_{t=1}^{T} e_{it}^2\right)^{1/2} \left(\sum_{t=1}^{T} e_{jt}^2\right)^{1/2}} \quad (3)$$

$e_{it}$ are residuals estimated from each unit by the appropriate method.

The Pesaran (2004) CD test uses the residues obtained from the estimation of the ADF regression to test the cross-sectional dependence. The correlation of each unit with all units other than itself is calculated. Hypotheses are established as follows;

$H_0$: $p_{ij} = 0$
$H_1$: $p_{ij} \neq 0$

$P_{ij}$ refers to the correlation coefficient of residuals. Pesaran test is defined as in equation (4) for balanced panel;

$$CD = \sqrt{\frac{2T}{N\,(N-1)}}\ \sum_{i=1}^{N-1}\ \sum_{j=i+1}^{N}\ \hat{p}_{ij} \tag{4}$$

$$\hat{p}_{ij} = \hat{p}_{ji} = \frac{\sum_{t=1}^{T}\ e_{it}\,e_{jt}}{(\sum_{t=1}^{T}\ e_{it}^2)^{1/2}\,(\sum_{t=1}^{T}\ e_{jt}^2)^{1/2}} \tag{5}$$

In equation (5), $e_{it}$ are residuals estimated from each unit by the appropriate method. $T_{ij}$ correlation coefficient is the calculated number of observations. Under the $H_0$ hypothesis, which states that there is no correlation between units, this statistic has a normal distribution if $T_{ij}$> 3 and N is large enough. This test performs better in small samples under non-stationarity, structural breakage and heterogeneity conditions.

Pesaran, Ullah, and Yamagata (2008) developed the NLM test that is valid when N is small and T is large enough. NLM test statistic is calculated as follows in equation (6);

$$NLM = \sqrt{\frac{1}{N\,(N-1)}}\ \sum_{i=1}^{N-1}\ \sum_{j=i+1}^{N}\ (T\,\hat{p}_{ij}^2\ -\ 1) \tag{6}$$

Since the test loses power when N is large and T is small, mean and mean-variance deviation corrected versions of the test were also obtained. NLM test statistics are as follows in equation (7);

$$NLM^{*}\ =\ \sqrt{\frac{1}{N\,(N-1)}}\ \sum_{i=1}^{N-1}\ \sum_{j=i+1}^{N}\ ((T\ -\ K)\,\hat{p}_{ij}^2\ -\ \mu_{T_{ij}} \tag{7}$$

$$\mu_{T_{ij}} = E\left[(T\ -\ k\,)\hat{p}_{ij}^2\right] = \frac{1}{T-K}\ T_r\left(\,M_i M_j\,\right) \tag{8}$$

$$M_i = I_T - H_i\,H_i = X_i\,(X_{i'}X_i)^{-1}\,X_{i'} \tag{9}$$

The mean of the NLM statistics was found to be exactly zero for all T and N's. Although the increase in N decreases the power of the test, the variance of the test statistic has small sample deviation.

In the study, the presence of cross-sectional dependence was tested by Breusch-Pagan (1980) LM test, Pesaran (2004) CD test, and Pesaran, Ullah, and Yamagata (2008) NLM test. Results regarding the cross-sectional dependence tests are shown in Table 2.

**Table 2.** Cross-Sectional Dependence Tests Results

| Test | Statistics |
|---|---|
| LM | 47.69*** |
| LM adj* | 13*** |
| LM CD* | 0.3806 |

Note: *** denotes 1% significance level.

It is appropriate to use Breusch-Pagan LM test when T is big and N is small, Pesaran CD test when N is big, and Pesaran, Ullah and Yamagata NLM test when N and T are big. Since T (20)> N (6) in our analysis, it can be stated that Breusch-Pagan LM test will give more reliable results. When we look at the table, it is seen that $H_0$ hypothesis is rejected and there is a cross-sectional dependence according to both Breusch-Pagan LM test and Pesaran, Ullah and Yamagata NLM test results.

Cointegration tests to be used in the analysis differ depending on whether the constant and slope parameters are homogeneous or heterogeneous according to the units. Therefore, it is important to test the homogeneity before choosing the method to be used. One can look at the difference between the unit-specific OLS estimators that ignore the panel structure of the data and

the weighted average matrices of WE to test RCM. If there is no statistically significant difference between them, the parameters are homogeneous. The null hypothesis is established as follows;

$H_0$: $\beta_I = \beta$

The statistic of this test, which is a Hausman type test, is defined as follows in equation 10;

$$\hat{S} = \chi^2_{k\,(N-1)} = \sum_{i=1}^{N} (\hat{\beta}_i - \bar{\beta}^*)' \hat{V}_i^{-1} \hat{\beta}_i - \bar{\beta}^* ) \quad (10)$$

Here, OLS estimators obtained from regressions concerning $\hat{\beta}_i$ units, $\bar{\beta}^*$ weighted WE estimator and $\hat{V}_i$ represent the difference between the variances of the two estimators. The test statistic has an $\chi^2$ distribution with K (N-1) degrees of freedom. If the test statistic is greater than the critical value, it is concluded that the parameters are homogeneous. The Swamy S test was used to test the homogeneity and when looking at the results in Table 3, it is understood that the parameters are not homogeneous (Swamy, 1970).

**Table 3.** Homogeneity Test Results

| Statistics | Value |
|---|---|
| Chi-square (15) | 546.10*** |

Note: *** denotes 1% significance level.

Determining the lag length to be used in the analysis is of great importance for the reliability of the tests to be used in the analysis. In Table 4, $R^2$, Akaike (AIC) and Bayesian (BIC) information criterion results are given. When the results are analyzed, it is seen that $R^2$ values are very close to each other at all lag levels and the lag length that minimizes both AIC and BIC model selection criteria is 1. Therefore, the appropriate lag length to be used in the study has been determined as 1.

**Table 4.** Appropriate Lag Length Test

| Lag Length | $R^2$ | AIC | BIC |
|---|---|---|---|
| 1 | 0.999913* | -42.00537* | -117.4018* |
| 2 | 0.9998924 | -40.838 | -97.38531 |
| 3 | 0.9998349 | -31.44961 | -69.14782 |
| 4 | 0.9946537 | -16.39175 | -35.24085 |

**Panel Unit Root Test**

In the study, the stationarity of the series is examined first. Since the series includes cross-sectional dependence, second-generation panel unit root tests that take into account the correlation among units should be applied. Second-generation unit root tests are divided into a) panel unit root tests, which corrects first-generation tests to take into account the correlation among units with various transformations, and b) based on apparently unrelated regression system estimates. In this framework, both Breitung (2000), which is based on the difference of horizontal cross-sectional averages, and MADF panel unit root tests, which were successful in cases where horizontal cross-section covariances are different, and recommended by Taylor and Sarno (1998), were applied.

In order to use standard t statistics in the Breitung panel unit root test, the data are transformed before the regression is estimated. Breitung defined Yit as follows in equation 11;

$$Y_{it} = \mu_i + \beta_i t + X_{it} \quad (11)$$

Here it is generated by the $X_{it}$ autoregressive process;

$$X_{it} = \sum_{k=1}^{p+1} \alpha_{ik} X_{i,t-k} + \varepsilon_{it} \quad (12)$$

$X_{is} = 0$ for $s \leq 0$. $e_{it}$ is assumed to be white noise suitable for the process and is assumed to be independent of $e_{js}$ for all t and s. $H_0$ hypothesis expresses difference stationary;

$H_0: \rho_1 \equiv \sum_{k=1}^{p+1} \alpha_{ik} - 1 = 0$ (for all i)

Under the alternative hypothesis, the $Y_{it}$ (trend) is stationary. The $H_0$ hypothesis of the Breitung test is established as "there is a unit root", and the alternative hypothesis is "units are stationary".

Taylor and Sarno proposed the Multivariate Augmented Dickey-Fuller (MADF) unit root test similar to the standard single equation ADF test. The model is set up as follows in equation 13;

$$y_{it} = \mu_1 + \sum_{j=1}^{k} p_{ij}\ y_{it-j} + u_{it}\ \text{i} = 1, \dots, \text{N and t } 1, \dots, \text{T} \quad (13)$$

In the model, the error term is assumed to be an independent normal distribution with a non-scalar covariance matrix;

$u_{it} \sim IN\ (0, \Lambda)$

In the standard single equation ADF unit root test, each unit in the panel data is tested, but the power of the test is weak when there is a cross-sectional dependence. In the estimation of the above equation as a system, the correlation between residues is also taken into account and a test process that covers the whole system is applied. Therefore, the $H_0$ hypothesis of the MADF panel unit root test is tested as follows;

$$H_0: \sum_{j=1}^{k} p_{ij} - 1 = 0\ \forall \text{I} = 1, \dots, \text{N}$$

$$MADF = \frac{\left(t-\Psi\beta\right)' \widehat{\Psi[Z'(\widehat{\Lambda}^{-1} \otimes I_T)\, Z]^{-1} \Psi'} (t-\Psi\widehat{\beta})\ N\ (T-k-1)}{(Y-Z\widehat{\beta})^{-1} \left(\widehat{\Lambda}^{-1} \otimes I_T\right) (Y-Z\widehat{\beta})} \quad (14)$$

In equation (14) $\widehat{\beta}$ and $\widehat{\Lambda}$ are consistent estimators of β and Λ, respectively. The MADF test statistic has an $\chi^2$ distribution with N degrees of freedom.

**Panel Cointegration Test**

In the second stage of the analysis, the cointegration relationships among economic growth, trade liberalization, and financial development are investigated. Since there is a cross-sectional dependence in the series, second-generation panel cointegration tests should be applied. For this purpose, the second generation panel cointegration test developed by Gengenbach, Urbain, and Westerlund (2016) was used. Gengenbach, Urbain, and Westerlund panel cointegration test is based on the error correction model using a common factor structure, as seen in equation (15) below.

$$\Delta_{yi} = d\ \delta_{y,x_i} + \alpha_{y_i} y_{i,-1} + \omega_{i,-1} y_i + \upsilon_I \pi_i + \varepsilon_{y,x_i} = \alpha_{y_i} y_{i,-1} + g_i^d \lambda_i + \varepsilon_{y,x_i} \quad (15)$$

In the first phase of the test, OLS estimation of the model is made for the units and the hypothesis $H_0$: $\alpha_{yi} = 0$ is tested with the t test. (T-1-p) x (T-1-p) dimensional matrix; When $M_A = I_{T-1-p} - A(A'A)A'$, OLS estimator of $\alpha_{yi}$ is;

$\widehat{\alpha}_{yi} = \frac{y'_{i,-1} M_{g_i^d} \Delta y_i}{y'_{i,-1} M g_i^d y_{i,-1}}$, and the variance establishes as;

$\sigma^2_{\widehat{\alpha}_{yi}} = \frac{\sigma^2_{\widehat{\alpha}_{y.xi}}}{y'_{i,-1} M g_i^d y_{i,-1}}$, and the t statistic is defined as follows;

$t_{c_i} = t_{\alpha_{yi}} = \frac{\widehat{\alpha}_{yi}}{\widehat{\sigma}_{\widehat{\alpha}_{yi}}}$. Panel test statistics are the average of unit test statistics;

$\bar{t}_c = \frac{1}{N} \sum_{i=1}^{N} t_{c_i}$

The basic hypothesis of the test is $H_0$: $\alpha_{yi} = \dots = \dots = \alpha_{yN} = 0$, while the alternative hypothesis is set as $H_1$: $\alpha_{yi} < 0$.

**Long Term Panel Cointegration Test**

If there is a cross-sectional dependence in the residuals of the cointegration model, it is appropriate to use second-generation estimators, since the first generation estimators will be deviated. In the study, the Dynamic Ordinary Least Squares Mean Group (DOLSMG) estimator, which is among the second-generation long term panel cointegration tests, was used. In this method, variables are converted by taking the difference from horizontal cross-section averages and estimated by DOLS for units and Pedroni's (2001) DOLSMG for panel.

$$Y_{it} = \mu_i + \beta_I X_{it} + u_{it} \; \mathrm{i} = 1, \ldots, \mathrm{N} \; \mathrm{t} = 1, \ldots, \mathrm{T} \tag{16}$$

By adding the preliminary values and delays of the Xs to the DOLSMG estimator in the above model, the feedback effects and internality problems are eliminated. In the first stage, the model is estimated by dynamic ordinary least squares (DOLS), then the results are combined for the entire panel with the mean group (MG) approach as seen in equation (17).

$$\widehat{\beta}_{DOLSMG} = N^{-1} \left[\sum_{i=1}^{N} \left(\sum_{t=1}^{T} \left(Z_{it} \, Z'_{it}\right)^{-1}\right] \sum_{t=1}^{T} \left(Z_{it} \; \bar{Y}_{it}\right) \right. \tag{17}$$

$Z_{it}$ expresses the vector of explanatory variables in the equation and $\bar{Y}_{it} = Y_{it} - \bar{Y}_i$.

Therefore, the DOLSMG estimator is obtained by taking the mean of the DOLS estimators obtained for each i unit.

$$\widehat{\beta}_{DOLSMG} = N^{-1} \sum_{i=1}^{N} \widehat{\beta}_{DOLS,i} \tag{18}$$

**Panel Causality Test**

Dumitrescu and Hurlin (2012) stated that an economic event valid for one country will also apply to other countries. Therefore, causality relationships can be tested more effectively in observations in panel data. Dumitrescu-Hurlin panel refers to two stationary processes observed during the X and Y, N units and T time in Granger causality test. And at time t, the following linear model is established for each unit (i);

$$Y_{it} = \alpha_i + \sum_{k=1}^{K} \gamma_i^{(k)} \; Y_{it-k} + \sum_{k=1}^{K} \beta_i^{(k)} + \varepsilon_{it} \tag{19}$$

In equation (19), the lag length (k) is the same for each unit of the panel and while the panel is balanced, the autoregressive parameter $\gamma_i^{(k)}$ and the slopes $\beta_i^{(k)}$ vary according to units.

The null hypothesis is that "all $\beta_i$'s are equal to zero" and implies that there is no causality from X to Y for the entire panel, ie no homogeneous panel causality.

$$H_0: \beta_i = 0 \; i = 1, \ldots, N$$

Under the alternative hypothesis, the model is heterogeneous. $\beta_i$ is valued according to units. The alternative hypothesis is established as "some of the $\beta_i$'s are different from zero".

$$H_1: \beta_i = 0 \; i = 1, \ldots, N_1$$
$$\beta_i \neq 0 \; i = N_1 + 1, N_2 + 2, \ldots, N$$

The $H_0$ hypothesis expresses that there is no Granger causality relationship among all examined variables, while the alternative hypothesis expresses that there is a relationship between the variables in one of the units. Although the established model is heterogeneous, the basic hypothesis is homogeneous, while the alternative hypothesis is heterogeneous.

## Results and Discussion

In panel data analysis, firstly, panel unit root tests were applied to analyze the stationarity of the series.

**Table 5.** Panel Unit Root Test Results

| Variables | Breitung | | MADF | | | |
|---|---|---|---|---|---|---|
| | Level | First Difference | Level | | First Difference | |
| | Statistics | Critical Value | Statistics | Critical Value | Statistics | Critical Value |
| EcoGro | 1.1937 | -1.6386** | 26.654 | 41.700 | 107.316** | 45.195 |
| TraLib | 0.9771 | -2.1212** | 35.475 | 41.700 | 90.703** | 45.195 |
| FinDev | -0.6075 | -5.1930*** | 25.517 | 41.700 | 210.511** | 45.195 |

Note: ** and *** denotes 5% and 1% significance levels, respectively.

Table 5 shows the results of both panel unit root tests. The lag length for the MADF test was chosen as 1. In the Breitung test, a robust estimate was made. For the Breitung panel unit root test, $H_0$ hypothesis was established as: "units contain unit root" and the alternative hypothesis: "units are stationary". The $H_0$ hypothesis of the MADF test is established as "the panel's 19 time series are all I (1)". $H_0$ hypotheses cannot be rejected for both tests at the level of the series. It is understood that all three variables are not stationary for both tests and become stationary when their first order differences are taken.

Spurious regression problem may arise when econometric modeling is performed with panel data that are not stationary at level. The regression established may lead to biased values and misleading R2 values. In this case, it is possible to have a long-term relationship between variables, and the existence of the relationship can be tested using panel co-integration tests.

**Table 6.** Panel Cointegration Test Results

| Coefficient | T-bar | Prob. |
|---|---|---|
| -0.894 | -3.085 | <=0.1 |

Table 6 shows the results of the Gengenbach, Urbain, and Westerlund panel cointegration test. Lag length was chosen heterogeneously and varies according to units. The test results show that there is insufficient evidence to accept the $H_0$ hypothesis. Therefore, it is concluded that there is a cointegration relationship among economic growth, trade liberalization, and financial development. The cointegration test results are consistent with the studies of Asghar and Hussain (2014), Erkişi and Ceyhan (2019), and Tufaner (2020).

If non-stationary variables at level are cointegrated in the long run, it is not appropriate to take the differences of these variables. Because taking difference eliminates the common trend that allows variables to move together. Therefore, if a cointegration relationship is found between variables as a result of the cointegration tests, it is necessary to estimate the long term cointegration relationship.

**Table 7.** Panel Cointegration Test Results

| Countries | TraLib (Coefficient) | t-stat | FinDev (Coefficient) | t-stat |
|---|---|---|---|---|
| Azerbaijan | 0.9169** | 3.188 | -2.171 | -0.7264 |
| Kazakhstan | 0.261 | 1.294 | 2.727** | 5.255 |
| Kyrgyzstan | -1.184** | -2.181 | 2.012** | 5.163 |
| Uzbekistan | 0.4123 | 0.9815 | 1.596 | 0.774 |
| Turkey | 0.4233** | 7.758 | -5.195** | -14.93 |
| Turkmenistan | 0.3487** | 11.53 | -5.527** | -14.09 |
| PANEL | 0.1967** | 9.216 | -1.093** | -7.578 |

Note: ** denotes 5% significance level. The lag length is determined as 1. The table value of t is 1.96 for $\alpha = 0.05$.

Table 7 shows the long-term panel cointegration test results based on the DOLSMG estimator. $H_0$ hypothesis is rejected if the calculated t value is greater than the t table value as an

absolute value; otherwise, it cannot be rejected. The rejection of the $H_0$ hypothesis indicates that the statistics are significant. The coefficients in the test results show that between trade liberalization and economic growth there is a positive relationship in Azerbaijan, Turkey, and Turkmenistan, there is a negative relationship in Kyrgyzstan, and there is not any significant relationship in Kazakhstan and Uzbekistan. When looking at the relationship between financial development and economic growth it is understood that there is a positive relationship in Kazakhstan and Kyrgyzstan, there is a negative relationship in Turkey and Turkmenistan, and there is not a significant relationship in Azerbaijan and Uzbekistan. For the whole panel, it can be stated that trade liberalization affects economic growth positively as in the study of Erkişi and Ceyhan (2019) and financial development negatively affects economic growth as in the study of Asghar and Hussain (2014). Because trade liberalization increases the efficient distribution of world resources, and weak financial institutions cause the misallocation of resources that support economic growth.

Unidirectional or mutual causality relationship can be seen from one variable to another between economic variables. The existence and direction of causality can be tested with the help of causality tests.

**Table 8.** Panel Causality Test Results

| **Null Hypothesis ($H_0$)** | **W-Bar** | **Z-Bar** | **p-value** |
|---|---|---|---|
| TraLib does not Granger cause EcoGro | 1.8913 | 1.5438 | 0.346 |
| EcoGro does not Granger cause TraLib | 0.7570 | -0.4209 | 0.633 |
| FinDev does not Granger cause EcoGro | 1.0822 | 0.1423 | 0.254 |
| EcoGro does not Granger cause FinDev | 1.4189 | 0.7256 | 0.196 |
| FinDev does not Granger cause TraLib | 0.7064 | -0.5086 | 0.351 |
| TraLib does not Granger cause FinDev | 9.0594 | 4.3815 | 0.426 |

Note: The lag length was selected according to the Akaike information criterion.

Table 8 shows the Dumitrescu-Hurlin panel Granger causality test results. Lag length is determined as 4 in the last model according to Akaike (AIC) information criterion and 1 in other models. According to the test results, the $H_0$ hypotheses could not be rejected. Therefore, there is no causality between trade liberalisation and economic growth, financial development and economic growth, and trade liberalisation and financial development.

When the causality test results are examined, it is understood that, contrary to other studies, all three variables are not Granger causes of each other. Similar to the study of Menyah et al. (2014), it was observed that different findings of studies on trade liberalisation, financial development and economic growth causality in the analysed countries resulted from different country samples. In this context, political instability can delay financial product, and it can lead to a negligible impact on the economic effect on economic growth Gries et al. (2009). Also, according to Çevik, Atukeren, and Korkmaz (2019), the global financial crisis might also have affected the Granger causal relationships between the variables.

## Conclusion

After the dissolution of the Soviet Union in 1991, the countries of the Union started the transition period. The Turkic Republics have implemented structural reforms in this process to transition to a planned market economy. Turkey has put into practice structural reforms after experiencing the 2000 and 2001 crises. In this context, it is essential to identify the appropriate trade and financial policies to be implemented to perform sustainable economic growth for the Turkic Republics and Turkey.

This study investigates the impact of trade liberalisation and financial development on economic growth in the 5 Turkic Republics and Turkey. Trade liberalisation and economic growth data were obtained from the World Bank (World Development Indicators) dataset. In contrast, the financial development index was obtained from the International Monetary Fund (Macroeconomic and Financial) dataset. To determine the tests used in the study, cross-sectional dependence and homogeneity tests were conducted. It was understood that there were correlations and

heterogeneity among the units in the series. In the first stage of the analysis, Breitung and MADF panel unit root tests were performed to test the stationary of the series. Then, Gengenbach, Urbain, and Westerlund and DOLSMG panel cointegration tests were used to determine short and long term relationships. Next, the Dumitrescu-Hurlin panel causality test was applied to determine the causality relationship between the variables.

Unit root tests show that the series used in the study were not stationary at the level and became stationary when their first order differences were taken. Empirical findings reveal a strong cointegration relationship between trade liberalisation, financial development, and economic growth. It was understood that trade liberalisation positively affected economic growth, and financial development negatively affected economic growth in the long term for the whole panel. When countries analyse the long-term coefficients, it is observed that there is a positive relationship between trade liberalisation and economic development in Azerbaijan, Turkey, and Turkmenistan, and there is a negative relationship in Kyrgyzstan. At the same time, there is no significant relationship between Kazakhstan and Uzbekistan. It is understood that there is a positive relationship between Kazakhstan and Kyrgyzstan between financial development and economic growth. There is a negative relationship between Turkey and Turkmenistan, and there is no significant relationship between them Azerbaijan and Uzbekistan. Also, according to panel causality test results, it was understood that there was no causal relationship between variables.

For trade liberalisation to positively affect economic growth, it is suggested that Kyrgyzstan reduce the foreign dependency on intermediate material, raw material, and energy imports and reach a level that can compete abroad. However, it is seen that financing the current account deficit with speculative capital inflows led to an economic contraction in Turkey and Turkmenistan. Turkey and Turkmenistan need to increase confidence in their financial markets by increasing financial transparency and accountability. In this context, it is recommended that develop the financial system and improve its functioning in Turkey and Turkmenistan to maintain the desired level of economic growth.

This study has some limitations. The study results cannot be generalised, because different countries have different economic features. The model was specified to test the links among only three variables. So, introducing more variables may provide different results.

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