bilig
SPRING 2023/ISSUE 105
01-38

Araştırma Makalesi / Research Article

How Does Macroeconomic and Socio-political Index Affect the Real GDP per Qualified Worker? Evidence from Turkic Republics*

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Abstract

In this study, we concentrated on the socioeconomic factors affecting the level of real GDP per qualified worker. For this purpose, we have used the macroeconomic and socio-political performance index for Turkic Republics. By using these newly established indices, determinants of the level of real GDP per qualified worker are analyzed for the first time in the literature. From the empirical investigation, we found that certain threshold levels significantly affect the real GDP level per qualified worker. Therefore, the policymakers of these countries should seriously consider these threshold levels for macroeconomic and socio-political performance index for conducting a well-organized policy for the prosperity of their countries.

Keywords

Macroeconomic Performance Index, Socio-political Performance Index, Openness, Capital, Real GDP per Qualified Worker.

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* Date of Arrival: 26 May 2022 – Date of Acceptance: 12 December 2022
You can refer to this article as follows:
Çelik, Eşref Uğur et al. "How Does Macroeconomic and Socio-political Index Affect the Real GDP per Qualified Worker? Evidence from Turkic Republics." *bilig*, no. 105, 2023, pp. 01-38.

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Introduction

Socio-political and macroeconomic indicators and economic problems that have been proposed in recent studies have begun to be examined in more detail. While the sources of economic growth were linked only to macroeconomic variables in previous literature, it has been shown in new studies that they can be affected by different variables such as institutions, religion, and other related variables. In addition to this, the importance of indices formed from such different variables has started to increase. Indices created from social and economic variables better describe the movements of economic variables, and thus, leading indicators that policymakers can follow can be prepared. This study will use two indices created for the Turkic Republics[1]. Macroeconomic performance and socio-political indices[2] will be used to examine the effects on the productivity of trained human resources. As it is known, in the recent growth literature, examining the productivity of trained human resources, which is one of the essential internal factors of growth, is a vital tool for explaining economic growth. Within the framework of this question, which constitutes the central motivation axis of this study, results will help the Turkic Republics' policymakers issue effective policies. In addition, examining human capital, an essential determinant of economic growth, with these indices will contribute to the macroeconomics literature. Therefore, it is helpful to explain the details of socio-economic and macroeconomic performance indices.

Carrying short-term gains in economies to long-term importance is essential in ensuring sustainability. Per capita income increases can be achieved in the short term with cyclical policies. In order to make income increases permanent, it is useful to consider proactive policies and apply the policies brought by the day. Ensuring macroeconomic stability is one of the leading conditions to ensure a sustainable increase in welfare. What is meant by not being able to provide macroeconomic stability can be perceived as the sustainability of instant gains in macroeconomic indicators (such as growth, inflation, and unemployment). Again, one of the macroeconomic variables may impose a burden on the other. Therefore, it is difficult to achieve simultaneous gains in all macroeconomic variables. This situation reveals the difficulties of ensuring macroeconomic stability. The gains made in macroeconomic variables can create compromises within themselves, as

well as have an impact on other channels. Factors such as the rule of law, freedom of expression, democracy, and income distribution can be given as examples of such channels. Although such factors do not appear to be related to the economic operation, they can significantly impact the quality and functionality of the operation. This situation reveals the importance of realizing socio-political developments and ensuring macroeconomic stability when carrying per capita income increases in the long term.

The macroeconomic performance index (MPI) has been created to measure the macroeconomic stability that can increase per capita income in Turkic Republics. Although the index consists of macroeconomic variables, it offers the opportunity to make a holistic assessment by considering the gains and losses in the variables. The socio-political performance index (SPI) has also been developed to measure socio-political development, an influential factor in reinforcing per capita income growth. With SPI, Turkic Republics' functioning, inclusiveness, and development of political institutions can be monitored. The analyses revealed that macroeconomic stability, socio-political development, openness, and capital per employee negatively affect output per employee up to a certain threshold. In addition, when the threshold value for the specified variables is exceeded, the reflections of the positive effect on output per employee begin to show themselves.

On the other hand, time is needed to reach and cross a certain threshold. This is an important indicator for both voters and policymakers. In order to be able to jump a threshold in increasing welfare, the quality of growth comes to the fore. It is essential to overcome productivity problems to make progress in the quality of growth. Therefore continuously increasing the total factor productivity in a country, it is essential to provide innovations and developments in education, health, and technology. Such developments can broaden the quality of the product range in countries. Although the increase in the quality of the goods and services produced may contribute to the increase in output per employee, it may not be sufficient to create a holistic effect. Countries need to be able to make accurate and sincere signaling decisively for the quality increases that can be achieved in the product structure to be continuous. To be able to create a stable and reliable port and improve the investment environment, the first pillar of signaling is the economic side. In this context, countries need to be able to implement

rule-based and dynamic policies in order to achieve stability. These policies should be transparent, predictable, and auditable. In particular, the audit side should operate independently of politics. It is essential to ensure the rule of law, freedom of expression, and property rights on the reliability side. The expansion of democracy and freedoms can reduce uncertainties on the one hand and increase competition on the other hand. More clearly, socio-political developments may become the key to economic development over time.

In the empirical application section of the study, preliminary tests were carried out to select the most suitable model for the data. As a result of these tests, the nonlinear panel data model, which suggests using a model with threshold effects, is chosen as the most appropriate model. As a result of these models, it has been observed that the productivity of human capital increases when certain thresholds are exceeded in the macroeconomic performance and socio-political variables of Turkic Republics. In order to better examine these effects, a new section called index methodology is included, and information will be given about the economic and political developments of the countries under investigation.

The following part of the study constitutes literature review in the second section, index methodology in the third section, empirical investigation in the fourth section and conclusion in the last section.

Literature Review

There are a limited number of studies examining the macroeconomic, socio-political or institutional performances of the Turkic Republics together. However, with the increasing importance of the Turkic Republics in recent years, the economic and socio-political performances of this country group have begun to be examined in more detail.

Yorucu's study examined the regional income convergence between the years 1992-2010 for the Turkic Republics of Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. In the study, beta and sigma convergence tests were applied to evaluate income and institutional convergence. While the results of the analysis show that income convergence has occurred for Azerbaijan, Kazakhstan and Turkmenistan, no convergence at the institutional level can be mentioned for any country.

Tunay's study used panel VAR and panel causality tests for Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, and Türkiye to attempt to explain the potential consequences of macroeconomic imbalances between the years 2000 and 2014. The research findings show that macroeconomic imbalances have a detrimental impact on economic functioning and that nations are sensitive to external shocks. It is advised to take a long-term approach that will improve the efficiency of production factors, decrease foreign dependence through R&D investments, and minimize excessive consumer expenditures in order to prevent such a volatile structure and to minimize macroeconomic imbalances.

In Eyüboğlu's study, the TOPSIS approach was used to examine the macroeconomic performance of Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan between 2004 and 2013. In accordance with the findings of analysis, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan all experienced successful macroeconomic performance throughout a ten-year period while Tajikistan and Kyrgyzstan did not.

The study of Uludağ and Ümit used the DEMATEL and COPRAS methods to assess the macroeconomic and production performances of Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan, and Türkiye from 2008 to 2016. The findings of the investigation indicated that Turkmenistan and Türkiye, both of which have strong macroeconomic performances, are the nations with the lowest levels of value-added output, while Uzbekistan and Kazakhstan, both of which have weak economies, have the greatest levels. In addition, the study emphasized the importance of Turkic Republics placing emphasis on industrial activities and R&D investments in order to achieve both successful macroeconomic performance and value-added production.

The goal of Ozek's study is to determine whether there is any connection between political stability and economic growth in Turkey, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan for the years 2002 to 2018. Panel unit root co-integration test, panel VAR causality test and Kose and Emirmahmutoglu Panel causality tests were applied. The analysis results generally show that macroeconomic indices including trade openness, exchange rate, inflation, and unemployment rates are likely to be influenced by political stability.

Index Methodology

The performances of the countries' economies are generally of great importance in terms of the course and position of the countries. Because of this situation, countries attach particular importance to evaluating their economies. For many years, macroeconomic indicators such as growth rate, inflation rate, or unemployment rate have been used for such evaluations. Such evaluations can be carried out by considering the relevant indicators individually or creating an index that provides a holistic perspective. Although evaluating the selected variables individually is useful for seeing specific points, it is insufficient to see the whole. For this reason, it has been seen that evaluations have been made through indices for a long time (see Okun, *The Political Economy of Prosperity*; Barro). For this reason, it has been decided to create macroeconomic and socio-political performance indices to carry out the evaluations of the economies.

Macroeconomic Performance Index

When evaluating the economies of the countries in the Turkic Republics, it was decided to create an index based on the above determinations instead of taking macroeconomic indicators one by one. The index called macroeconomic performance index (MPI) consists of four variables. The growth rate was chosen as the first indicator of the index. The reason for making this choice is that the growth rate is one of the most fundamental variables that will show the macroeconomic course.

Inflation is also significant in terms of showing the ability of administrations to manage the economy (Fischer 487 cited in İsmihan 129). People at all levels of society follow inflation rates rigorously. This is because inflation directly affects the purchasing power of people. Based on the combination of all these determinations, it was decided to include the inflation rate as the second variable in the index.

Unemployment is one of the most fundamental problems in economies. Unemployment can cause heavy costs to both national economies and societies. In addition, unemployment indicates that the labor force is not used actively and reveals that the resource is inefficient (Mankiw 208). For these reasons, the unemployment rate is included as the third variable in the index.

The deficits given in the current account balance show the foreign exchange needs of the countries on one side and the foreign dependency levels of the countries on the other. Moreover, in cases where the financing of the deficit in the current account balance is unsustainable, the countries' economies become more fragile (Çolak and Aktaş 98). Considering the importance of these determinations, the ratio of current account balance to GDP was chosen as the last variable in the index.

All variables used in MPI are listed below (see Figure 1). The data of the variables used in MPI were obtained from the World Bank – World Development Indicators and IMF – World Economic Outlook databases.

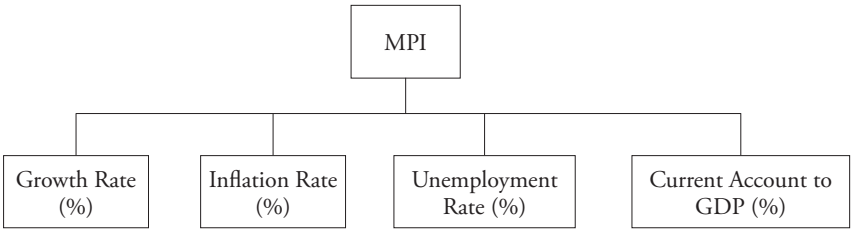

Figure 1. Macroeconomic performance index - variables

After determining the variables to be used in MPI, it was decided to use the human development index (HDI) calculation method in calculating the index. The method used in HDI allows the data to be normalized, allowing the variables used in the index to take values between 0 and 100 (for details of the method used for HDI see. (UNDP) and Figure 2). While the increase in the index value indicates that steps have been taken to ensure macroeconomic stability, the decreases in the index value can be interpreted as a deterioration in the macroeconomic performance. Apart from that, MPI for countries is calculated by giving equal weight to each variable. Results for MPI is shown in Figure 4.

$$\frac{x - x_{min}}{x_{max} - x_{min}}$$

Here x is the actual value, x_{min} = the minimum value of the variable x, and x_{max} = the maximum value of the variable x.

Figure 2. Human development index (HDI) method

Socio-political Performance Index

It is seen that most of the economic evaluations for countries focus on macroeconomic indicators in the previous literature. In addition, it is useful to investigate the different perspective of the economic evaluation. In addition to the performances displayed in macroeconomic indicators, it cannot be ignored that institutional factors, social events, or political developments also play a role in the functioning mechanism of economies. Furthermore, the importance of institutional developments in ensuring the continuity of economic functioning cannot be denied (Rodrik and Subramanian). More clearly, it would be beneficial to focus on indicators that can represent institutional or socio-political characteristics and macroeconomic factors during the analysis of economies. For these reasons, it may not be appropriate to evaluate the economy alone with the macroeconomic performance index created with the help of macroeconomic indicators in the study. Therefore, it has been decided to create a new index (socio-political performance index - SPI) to measure socio-political quality. The starting point of the SPI constitutes the idea of collectively monitoring the country's institutional, social, and political developments. Even though many sources are available in selecting components to be used in SPI, there are difficulties in accessing data for the countries included in the study. For this reason, the data of the variables planned to be included in the SPI were obtained from the Varieties of Democracy (V-Dem) data set. Variables for SPI It is shown in Figure 3.

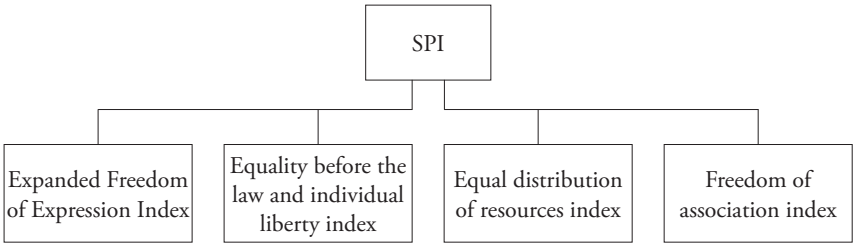

Figure 3. Socio-political performance index - variables

The first indicator used in the SPI, the expanded freedom of expression index, measured the extent to which governments respect the freedom of the press and media, the freedom of individuals to discuss political issues, and the academic-cultural freedom of expression (Coppedge et al. 52). With the index of equality before the law and individual liberty index, which is

the second indicator, it is also aimed to measure the extent to which the laws are applied transparently and impartially, as well as to measure the access of individuals to justice, the reliability of their property rights, the freedom of work, free movement and belief (Coppedge et al. 55). The countries' third indicator that measures equality in the distribution of resources (especially equality of opportunity in education and health) is the index of equal distribution of resources. The fourth indicator, freedom of association index, measures how political parties and non-governmental organizations are allowed to carry out their activities (Coppedge et al. 51). Following the selection of the SPI's variables, the human development index (HDI) computation technique was chosen to calculate the index. The method used in HDI allows the data to be normalized, allowing the variables used in the index to take values between 0 and 100. While the increase in the index value indicates the increase in the quality and inclusiveness of the institutions, the decrease in the index value indicates that there are deteriorations in the socio-political structure. Apart from that, SPI for countries is calculated by giving equal weight to each variable. The results are shown in Figure 5.

The Economic Performance of Turkic Republics throughout the Sample Period

The successful economic performances of the countries are primarily due to the flourishing of macroeconomic arrangements. In addition, factors such as trust in property rights within countries, degrees of freedom of expression and press freedom, and a fair and independent judiciary are also directly influential on economic performance (Acemoglu and Robinson; Rodrik and Subramanian). On the other hand, since politicians are worried about being re-elected, they often turn to practices to save the day instead of the policies they specify during election periods. For the solution of an economic problem that arises within the country, policies are focused only on the solution of that problem, but the potential adverse effects of these policies on other segments are not taken into account. To put it more clearly, the unprepared and unplanned steps taken to recover macroeconomic indicators mostly reflect negatively on socio-political indicators. Arthur Okun also emphasized trade-offs between economic gains and equality (Okun, *Equality and Efficiency: The Big Trade-Off* 120). For these reasons, while examining the performances of the economies of the countries, the socio-political aspects as well as the macroeconomic indicators should be focused on.

There was average vision for the Turkic Republics in terms of growth performance between 1992-2019, and the annual average growth rate was 4.13%. A more negative picture was seen in the inflation rates in the 1992-2019 period, and the annual average inflation rate was 42.99% for the Turkic Republics. The average unemployment rate of the Turkic Republics in the 1992-2019 period was 7.97%. When the ratio of the current account balance to GDP in the Turkic Republics was examined, a deficit of 3.63% was mentioned on average for the years 1992-2019. The macroeconomic performance index (MPI) created using these indicators reveals that the Turkic Republics performed slightly above the average between 1992 and 2019 and the annual average MPI was 66.40. On the other hand, the socio-economic performance index (SPI) remained below the average performance in the same period and the annual average SPI was 38.85. More detailed information about the periods identified in Table 7, Figure 4 and Figure 5.

Empirical Investigation

Empirical Model

Focusing only on economic variables in evaluating long-term economic performance is a problem. Therefore, this approach reveals that the socio-political environment of individuals in economies is not directly taken into account. However, the previous literature did not consider this lack of information. Thus, we have considered these issues in our model proposal to remedy this deficiency. Hence, we have included the macroeconomic and socio-political performance indices on efficiency.

$$YH_{i,t} = \mu_i + \beta_1 MPI_{i,t-1} + \beta_2 SPI_{i,t-1} + \beta_3 OPEN_{i,t-1} + \beta_4 KH_{i,t-1} + u^*_{i,t} \qquad (1)^3$$

Methodology and the Empirical Analysis

Unit Root Test for Identification for Integration Orders and Stochastic Behaviour

Panel unit root tests, including linear, nonlinear, and time-varying structures in deterministic parts, were used to determine and analyze the stochastic behavior of the data. Since the methodology sections are very long, we will explain these models in the Appendix. Panel unit root test results are given in Table 1 and Table 2 below.

Table 1
Unit Root Tests

IPS			
	Intercept	Intercept & Trend	Status
YH	-0.859	-2.718**	Stationary
MPI	-2.570**	-2.163	Stationary
SPI	-1.321	-2.057	Unit Root
KH	-0.940	-2.209	Unit Root
OPEN	-2.464**	-2.996*	Stationary
UO			
	Intercept	Intercept & Trend	Status
YH	-0.906	-3.355*	Stationary
MPI	-2.738*	-2.025	Stationary
SPI	-2.056	-3.298*	Stationary
KH	-1.208	-2.191	Unit Root
OPEN	-2.849*	-2.854*	Stationary
EO			
	Intercept	Intercept & Trend	Status
YH	1.821	8.415*	Stationary
MPI	4.547**	3.720	Stationary
SPI	3.326	11.975*	Stationary
KH	2.871124	7.002085**	Stationary
OPEN	7.209602*	5.338266**	Stationary
CEO			
	Intercept	Intercept & Trend	Status
YH	1.813809	5.134034*	Stationary
MPI	5.053378*	3.113145	Stationary
SPI	3.569537*	4.572720*	Stationary
KH	1.889006	4.433663*	Stationary
OPEN	4.330669**	5.066344*	Stationary

OSS

	Intercept	Intercept & Trend	Status
YH	-1.903137	-3.278277	Unit Root
MPI	-2.762346	-3.833991*	Stationary
SPI	-2.988541**	-3.444753	Stationary
KH	-2.105543	-3.333177	Unit Root
OPEN	-3.095129*	-3.770094**	Stationary

OHS

	Model A	Model B	Model C	Status
YH	-4.172751*	-3.684145**	-3.643893	Stationary
MPI	-3.135461**	-3.930171*	-	Stationary
SPI	-1.933411	-	-4.310058***	Stationary
KH	-	-3.404764	-3.709594	Unit Root
OPEN	-3.652864*	-4.176144*	-4.439870**	Stationary

OCE

	Model A	Model B	Model C	Status
YH	12.151613*	7.674829***	7.036854	Stationary
MPI	6.220475*	8.677861*	-	Stationary
SPI	3.780246	-	11.754471**	Stationary
KH	-	6.203410	7.521194	Unit Root
OPEN	8.415909***	9.410973***	10.090020***	Stationary

Note: *, **, and *** indicates the %10, %5 and %1 significance level. UO indicates Ucar and Omay test using ESTAR function in testing process which is classified as state dependent nonlinearity. EO indicates Emirmahmutoglu and Omay test using AESTAR function in testing process which is classified as state dependent nonlinearity. CEO indicates Çorakcı et al. test using TAR function in testing process which is classified as state dependent nonlinearity. OSS indicates Omay, Shahbaz, et al. test using Fourier function in testing process which is classified as time varying (multiple smooth structural break) nonlinearity. OHS indicates Omay, Hasanov, et al. test using LSTR function in testing process which is classified as time varying (one smooth, moderate and sharp structural break) nonlinearity. OCE indicates Omay, Çorakcı, et al. test using LSTR and ESTAR function in testing process which is classified as hybrid (state dependent nonlinearity around one smooth, moderate and sharp structural break) nonlinearity.

Table 2
Summary Table for Unit Root Testing

	UO	EO	CEO	OSS	OHS	OCE
YH	√	√	√	x	√	√
MPI	√	√	√	√	√	√
SPI	√	√	√	√	√	√
KH	x	√	√	x	x	x
OPEN	√	√	√	√	√	√
Status	ESTAR	AESTAR	TAR	Fourier	LSTR	LSTR-ESTAR
	State Dependent	State Dependent	State Dependent	Time Dependent	Time Dependent	Hybrid

√: Stationary, x: Unit Root

As can be seen from the Table 1 and Table 2, state dependent nonlinearity is better fit the data under investigation. Therefore, our data has witnessed nonlinearity. As can be seen from Table 1 and the summary in Table 2 individual data exhibits an extreme nonlinear behavior. Depending on the data's nonlinear stochastic characteristics, we decided to test whether the nonlinearity is the main features of the model under investigation by employing the linearity test. We employed this nonlinearity test in the first stage to linear panel data estimation residual terms. Therefore, we can conclude from this estimation that we have remaining nonlinearity in the estimated model. This model misspecification was then identified by using the nonlinear unit root tests. In the nonlinear unit root test phase, we employed many different structures of nonlinearity. The first crucial nonlinear structure is state-dependent nonlinearity. This state-dependent nonlinear structure characterizes a symmetric exponential smooth transition model and then an asymmetric exponential smooth transition model. The important feature of the ESTAR model is to capture size nonlinearity where the small arbitrage does not lead to a mean reverting process. However, the large deviations provide a globally stationary process (Ucar and Omay). Omay, Shahbaz, et al.'s study explains the details of this process very well. Using the AESTAR model (Emirmahmutoglu and Omay test), we further checked whether this size nonlinearity may include an asymmetry in its

process. The unit root test results have shown that the AESTAR process better describes the stochastic process of the data under investigation.

On the other hand, we have used threshold nonlinearity (TAR), which includes this kind of asymmetric behavior. Çorakcı et al.'s study explains this process using the logistic smooth transition structure and inherited sign nonlinearity. Sign nonlinearity explains the business's cycle behavior or conjectures that shape all other economic variables. Therefore, this nonlinearity better describes economic behaviors in some economic data than exponential smooth transition, which better describes the financial variables. The time-dependent nonlinear test Omay, Shahbaz, et al. and Omay, Hasanov, et al. use Fourier and logistic smooth transition functions, respectively. Omay, Shahbaz, et al.'s study test was designed for multiple smooth breaks, whereas the Omay, Hasanov, et al.'s study was designed for one-time smooth sharp and moderate breaks. Both tests have their advantages with respect to each other. However, both tests have been performed relatively well for finding the stationary of the data under investigation; the state-dependent tests power against both tests when we look at the result in Table 2. Thus, depending on the unit root test results, we prefer to use the state-dependent nonlinear model where we can impose logistic or exponential smooth transition behavior together. A polynomial function is the best and easiest way to impose such complex nonlinear behavior on the model. One of the model types in which the polynomial model is examined is the Panel Smooth Transition Regression (PSTR) model. Determination tests of the model to be applied with the testing method known as linearity or homogeneity test are carried out step by step. In the next part of the study, the model estimation phase will be started by making use of this structure of the PSTR model.

Following the results which we obtained in Table 1 and Table 2, we further investigate the nonlinear behaviour of the data by using linearity tests. For this reason, we follow the steps which are proposed by Teräsvirta et al.'s study. In the next section we briefly explain the Specification and Estimation of Nonlinear Heterogeneous Panel Model.

Specification and Estimation of Nonlinear Heterogeneous Panel Model

In this study, we will follow the Panel Smooth Transition Regression (PSTR) identification process to obtain the nonlinear panel estimates of our study.

For this purpose, we conduct all the steps of the PSTR identification process to find the best model for our nonlinear panel estimation. Therefore, we will briefly explain the PSTR model and the identification process.

Panel Smooth Transition Regression PSTR allows for a small number of extreme regimes where transitions in-between are smooth (González et al.). Let us first consider the simplest case with two extreme regimes:

$$y_{it} = \mu_i + \beta_0^{'} x_{it} + \beta_1^{'} x_{it} F(s_{it}, \gamma, c) + u_{it} \tag{2}$$

for $i = 1,...,N$, and $t = 1,...,T$, where N and T denote the cross-section and time dimensions of the panel, respectively. The dependent variable y_{it} is a scalar and denotes output per worker for the seven Turkic Republics countries. In this study, the independent variable k-dimensional vector x_{it} of time-varying exogenous variables are selected to be MPI (MPI_t), SPI (SPI_t), KH (KH_t), and OPEN ($OPEN_t$). μ_i Represents the fixed individual effects, and finally μ_{it} are the errors. Transition function $F(s_{it}; \gamma,c)$ is a continuous function of observable variable s_{it}. It is normalized to lie between 0 and 1, which denote the two extreme values for regression coefficients (González et al.). Following Granger and Terasvirta, they consider the following logistic transition function for the time series STAR models:

$$F(s_{it};\gamma,c) = \left(1 + \exp\left(-\gamma \prod_{j=1}^{m} (s_{it} - c_j)\right)\right)^{-1} \text{ with } \gamma > 0 \text{ and } c_m \geq ... \geq c_1 \geq c_0 \tag{3}$$

where $c = (c_1,...,c_m)'$ is an m-dimensional vector of location parameters, and the slope parameter γ denotes the smoothness of the transitions. A value of 1 or 2 for m, often meets the common types of variation. In cases where $m = 1$, low and high values of s_{it} correspond to the two extreme regimes. Given that $\gamma \rightarrow \infty$, the logistic transition function $F(s_{it}; \gamma,c)$ becomes an indicator function $I[A]$, which takes a value of 1 when event A occurs and 0 otherwise. Thus, the PSTR model reduces to Hansen's two-regime panel threshold model. Whereas for $m = 2$, $F(s_{it}; \gamma,c)$ takes a value of 1 for both low and high s_{it}, minimizing at $(\frac{c_1+c_2}{2})$. In that case, if $\gamma \rightarrow \infty$, $F(s_{it}; \gamma,c)$ reduces into a three-regime threshold model. Indeed given

$\gamma \rightarrow 0$, the transition function $F(s_{it}; \gamma, c)$ will reduce into a homogenous or linear fixed effects panel regression for any value of m[2].

The empirical specification procedure for PSTR models consists of following steps González et al.; however, we have changed their identification strategy into polynomial nonlinear panel estimation strategy with slight changes:

1. Specify an appropriate linear (homogenous) panel estimation model for the series under investigation.

2. Test the null hypothesis of linearity (homogeneity) against the alternative of PSTR or a similar type of nonlinearity. If the linearity is rejected, the 3rd stage of the procedure will be continued. Here we have used the linearity test for the homogenous panel estimation residuals.

3. Estimate the parameters in the selected nonlinear panel data model. In the first step, we will try the square type of nonlinearity which produces an exponential smooth transition type of function.

4. Evaluate the square type of nonlinearity in the panel data model using diagnostic tests. If the model is sustained concerning the cubic form of nonlinearity using the F test, continue with the five stages. If it is not sustained or does not pass the diagnostic check, modify the model if necessary.

5. Use the model for descriptive purposes.

Linearity (Homogeneity) tests are necessary for the estimation of PSTR models which contain unidentified nuisance parameters. To overcome this problem, one may replace the transition function $F(s_{it}; \gamma, c)$ by its first-order Taylor expansion around $\gamma = 0$ following (Luukkonen et al.). This will yield the following auxiliary regression:

$$y_{i,t} = \mu_i + \beta_0^{'*} x_{i,t} + \beta_1^{'*} x_{i,t} s_{i,t} + \ldots + \beta_m^{'*} x_{i,t} s_{i,t}^m + u_{i,t}^* \quad (4)$$

where $\beta_1^*, \ldots, \beta_m^*$ are the parameter vectors. Consequently, testing $H_0 : \gamma = 0$ in (2) is equivalent to testing the null hypothesis $H_0^*: \beta_1^* = \ldots = \beta_m^* = 0$ in (4). This test can be done by an *LM* test (see Table 3).

Table 3
Linear Model Estimation

Variable	Coefficient
MPI	-0.005 ** (0.002)
SPI	-0.001 (0.001)
OPEN	-0.003 *** (0.001)
KH	1.027 *** (0.012)
constant	1.853*** (0.204)
F	1954.29 ***
R^2	0.97

Note: *, **, and *** indicates the %10, %5 and %1 significance level.

Denoting the panel sum of squared residuals under H_1 as SSR_0 (which is the two-regime PSTR model), the corresponding *F*-statistic is then defined by:

$$LM_F = \frac{\left(SSR_0 - SSR_1\right)/mk}{SSR_0/\left(TN - N - m(k+1)\right)} \tag{5}$$

with an approximate distribution of $F\ (mk, TN - N - m(k+1))$. A set of candidate transition variables are tested to detect the one for which linearity is strongly rejected. Besides, linearity tests also serve to determine the appropriate order of m of the logistic transition function in the equation (3). We have used the residuals from the homogenous panel data estimation and the heterogeneous individual country test results (see Table 4).

Table 4
Linearity Test Results for Individual and Panel (Luukkonen et al.)

Country	LM test
Azerbaijan	3.312 **
Kazakhstan	2.860 **
Kyrgyzstan	1.872
Tajikistan	6.294 ***
Türkiye	4.805 ***
Turkmenistan	5.205 ***
Uzbekistan	3.160 **
Heterogeneous Panel	3.930 **
Homogenous Panel	2.661 ***

Note: *, **, and *** indicates the %10, %5 and %1 significance level.

As shown in Table 4, individual heterogonous F-test results show that the relationship between dependent and independent variables must be modeled nonlinearly except in Kyrgyzstan. For common nonlinearity, we used the group mean estimation of heterogeneous and homogenous panel settings for the last two rows of Table 4. The F test statistics show us that nonlinear panel estimation must be used. Following our identification procedure, we proceed with stage 3 as we have given in the identification processes that first of all, we have to use the square polynomial for selecting the nonlinear dynamics. Therefore, we will identify a better nonlinear structure for our nonlinear panel estimation from a specific to general identification procedure.

The nonlinear estimation phase of the panel smooth transition model is started with the linear model; hence in the first stage, we have estimated the linear fixed effect panel data model in Table 3. This linear fixed effect nonlinear estimation is a base for the nonlinearity test. However, we have used a different approach than PSTR models by applying the homogeneity test to the estimated linear fixed effect residuals. Therefore, in Table 4, we documented the individual country test as well as the homogenous and heterogeneous panel data estimation linearity test results. The test results, which are documented in Table 4, show evidence that a highly nonlinear

structure is inherited in the sample. Therefore, the nonlinear panel unit root tests results obtained in Table 1 and summarized in Table 2 are consistent with the results acquired in Table 4. This consistent result sheds better light on the model selection we decided on above. The polynomial panel data model can capture highly nonlinear structures using classical regression techniques without further complexity. Therefore, we are proceeding with the nonlinear polynomial data estimation with evidence obtained in Table 1 through Table 4.

The following model is a square polynomial nonlinear panel data model:

$$y_{i,t} = \mu_i + \beta_0^{'*} x_{i,t-1} + \beta_1^{'*} x_{i,t-1}^2 s_{it} + u_{it}^* \tag{6}$$

More specifically, the model with the relevant variable is as follows:

$$YH_{i,t} = \mu_i + \beta_1 MPI_{i,t-1} + \beta_2 MPI_{i,t-1}^2 + \beta_3 SPI_{i,t-1} + \beta_4 SPI_{i,t-1}^2 + \beta_5 OPEN_{i,t-1} + \beta_6 OPEN_{i,t-1}^2 + \beta_7 KH_{i,t-1} + \beta_8 KH_{i,t-1}^2 + u_{i,t}^* \tag{7}$$

This polynomial form is an approximation of exponential smooth transition (ESTAR) by using the Hendry methodology from specific to general then, we will use the cube form and see whether the Logistic smooth transition model is more suitable for our model. Therefore, the square polynomial nonlinear panel estimation is as conducted.

In Table 5, we have estimated the identified square polynomial panel data estimation depending on the tests provided in Table 1 to Table 4. This estimated polynomial panel data model displays the nonlinear relation between dependent variable YH and independent variables MPI, SPI, OPEN, and KH. The signs and significance obtained in Table 5 for the model depicted that the square model characterizes the relationship among the variables well. Therefore, we are left only one step to make inferences from this model to have a misspecification test.

For diagnostic purposes, we used the cube form of the nonlinear panel model and the F test to determine whether we have better estimates or nonlinear forms for our model. This stage of the identification process is named as remaining nonlinearity in PSTR model identification**.**

$$y_{i,t} = \mu_i + \beta_1^{'*} x_{i,t-1} + \beta_2^{'*} x_{i,t-1}^2 + \beta_3^{'*} x_{i,t-1}^3 + u_{i,t}^* \tag{8}$$

More specifically the model with the relevant variable is as follows:

$$YH_{i,t} = \mu_i + \beta_1 MPI_{i,t-1} + \beta_2 MPI_{i,t-1}^2 + \beta_3 MPI_{i,t-1}^3 + \beta_4 SPI_{i,t-1} + \beta_5 SPI_{i,t-1}^2 + \beta_6 SPI_{i,t-1}^3 + \beta_7 Open_{i,t-1} + \beta_8 Open_{i,t-1}^2 + \beta_9 Open_{i,t-1}^3 + \beta_{10} KH_{i,t-1} + \beta_{11} KH_{i,t-1}^2 + \beta_{12} KH_{i,t-1}^3 + u_{i,t}^* \tag{9}$$

Table 6
Diagnostic Check for square polynomial

Country	Wald square	Wald Cube
Azerbaijan	7.35 ***	4.32 **
Kazakhstan	3.20 **	2.36
Kyrgyzstan	11.73 ***	1.01
Tajikistan	2.85 *	1.35
Türkiye	4.24 **	0.98
Turkmenistan	13.44 ***	2.66 *
Uzbekistan	2.66 *	14.68 ***
Group Mean	6.49*	3.9 *

Note: *, **, and *** indicates the %10, %5 and %1 significance level.

As can be seen from Table 6, square form of the polynomial has a better F test with all the countries in the sample except for Uzbekistan. Moreover, Kazakhstan, Kyrgyzstan, Tajikistan, and Türkiye's F test value for selecting between square form polynomial with respect to cubic form is insignificant, which shows us that square form is better for these countries. For Azerbaijan and Turkmenistan, the contribution of the cube is decreasing, which shows us that the influence is negligible. Only Uzbekistan was significantly affected by the cube component of the polynomial. However, to find a common nonlinear dynamic, it is better to confine the model to a square polynomial form. There may be an alternative where we neglect Uzbekistan from the sample, but still, we are using the heterogeneous panel structure; skipping Uzbekistan will not differ too much in our estimates. Therefore, we decided to include Uzbekistan in the sample.

When the macroeconomic performance index (MPI) exceeds the threshold value of 52.676, the significant negative effect has been passed to the significant positive effect. The index of 52.676 is at approximately the midpoint. A one-unit change in the MPI until it reaches the threshold value causes a decrease in the productivity of -0.017 units of human resources productivity. The low macroeconomic performance may have reduced the productivity of qualified human resources for two reasons. Firstly, it may have reduced their contribution to production in factories with low-capacity utilization due to the low productivity in the macroeconomy. The second main reason is that the low economic conditions reduce job satisfaction and purchasing power, causing a decrease in the productivity of the qualified workforce. After the threshold value is passed, these adverse effects disappear, and each increase in the MPI creates a productivity increase of 0.00017. According to the "feedback" theory, the increase in the productivity of the skilled labor force, which is the basic element of economic growth, will increase growth and thus macroeconomic performance. For this reason, it would be beneficial for policymakers of the Turkic Republics, whose MPI is below 52.676, to make macro-prudential and long-term plans to increase the index. They can elevate this self-sustaining process and thereby increase economic well-being.

When the sociopolitical performance index (SPI) exceeds the threshold value of 41.666, the statistically significant negative effect turns into a statistically significant positive effect. Until the SPI reaches the threshold value, a 1-unit increase in this index creates 0.005 units decrease in productivity. After the threshold value is exceeded, this effect turns positive, and a 1-unit increase in the SPI creates 0.0006 units increase in productivity. It is seen that the developments in the sociopolitical environment have contributed to the increase in per capita production by reducing the level of polarization in the society and creating a more liberal environment after a certain threshold has passed. In other words, it is seen that the quality of institutions increases as property rights, freedom of expression, and equality of opportunity expand in Turkic Republics. The reflection of this situation shows that the improvements in the socio-political structure after exceeding a certain threshold will positively contribute to economic growth sustainability.

Contrary to other variables, the external openness variable increases productivity until it reaches the threshold value and shows a decreasing effect on productivity

after the threshold value. The threshold value for this variable is 97. Accordingly, it increases the efficiency by 0.00194 units until it reaches the outward opening threshold. After the threshold value is exceeded, this effect causes a decrease of 0.00001 units. When the openness rate is low, when the country's economy is relatively closed to the outside, it is not possible to buy products from abroad. In other words, imports are at low levels. While imports are low, worker productivity is high, meaning the country has to produce itself. In other words, import substitution is made. The fact that the openness ratio starts to increase beyond the threshold; that is, when the import levels rise excessively, indicates the decrease in the production level in the country. In other words, it points out that the real sector in the country has contracted, and labor productivity has begun to decline. The threshold value for the variable KH is 6.613 units. Like MPI and SPI variables, this variable creates a negative effect until it reaches the threshold value and a positive effect after exceeding it. Accordingly, a one-unit increase in the variable KH creates a decrease of 1.82885 units until the threshold value is reached, and after exceeding the threshold value, it causes an increase of 0.13826 units. This situation indicates that positive results can be obtained in outputs per employee at the point of maintaining patient and stable capital investments in Turkic Republics.

Conclusion

Economic performance reviews are often handled through macroeconomic variables. On the other hand, long-term gains are at the core of economic performance. To monitor such economic returns, it is necessary to go beyond it with macroeconomic indicators. In order to make long-term signaling correctly, it is necessary to observe the developments on the side of governance and institutions (in other words, in the socio-political structure) while concentrating on the factors that will ensure macroeconomic stability.

In this study, we examined how the productivity of the skilled workforce is affected by socio-political and macroeconomic performance indices. As a result of the polynomial panel data estimation, we made in the Turkic Republics that we selected as the study group, a threshold of 52.676 was encountered in the MPI. It was mentioned that there is a negative feedback effect in Turkic Republics' economies below this threshold value. Policymakers emphasized that long-term economic precautionary policies should increase this negative feedback effect.

Similar results are also valid for the socio-political structure. In order for the SPI, which is an indicator of the socio-political structure, to affect the output per employee positively, a specific threshold value (SPI=41.666) must be passed. To ensure effective performance of the institutions in Turkic Republics, clear, examinable, and rule-based policies must be implemented. Also, the production capacity, which includes investments in human capital and technology, can be improved by taking crucial steps (such as securing property rights, the rule of law, and independence of the judiciary) to enhance the investment atmosphere in Turkic Republics and achieve effective economic development.

Macroeconomic values are the main means to reviewing economic performance, at the center of which are long-term gains. Macroeconomic indicators do not suffice for these long-term economic outcomes to be monitored. It is essential to concentrate not only on the factors that will guarantee macroeconomic stability, but also on the surveillance of the developments in the socio-political structure. In this axis, to increase the output per employee sustainably in Turkic Republics, the importance of consolidating the socio-political structure and providing macroeconomic stability cannot be denied. Although the studies' analyses confirm the validity of such determinations, they have positive or negative effects on the level of output per employee depending on the level of macroeconomic and socio-political gains. More clearly, in this study, we examined how the productivity of the skilled workforce is affected by socio-political and macroeconomic performance indices. As a result of the polynomial panel data estimation that we made in the Turkic Republics selected as the study group, a threshold of 52.676 was encountered in the MPI. It was mentioned that there is a negative feedback effect in Turkic Republics' economies below this threshold value. Policymakers emphasized that long-term economic precautionary policies should increase this negative feedback effect. Similar results are also valid for the socio-political structure. In order for the SPI, which is an indicator of the socio-political structure, to affect the output per employee positively, a particular threshold value (SPI=41.666) must be passed. It will yield useful results to adopt policies that are controllable, lucid, and rule-based, which leads the institutions in Turkic Republics to operate efficiently. Furthermore, securing property rights, the rule of law, and independence of the judiciary are factors that will enhance the

investment conditions in Turkic Republics, and they are the key actions to be taken in order to improve the production capacity, which, in turn, will help with a more effective economic advancement.

The threshold value must be exceeded to affect the output in macroeconomic performance in Turkic Republics positively; considering the averages between 1992 and 2019, only Türkiye has been able to go beyond the threshold value. The countries that could exceed the threshold value determined by the socio-political performance were Kazakhstan, Kyrgyzstan, Tajikistan, and Türkiye. On the other hand, the degree of exceedance of the threshold value is not far beyond the threshold value. This situation emphasizes the necessity of applying the economic and governance policies for output increases per employee in Turkic Republics, going beyond saving the day with continuity and patience.

Contribution Rate Statement

The authors' contribution rates in this study are equal.

Conflict of Interest Statement

There is no conflict of interest with any institution or person within the scope of this study. There is no conflict of interest between the authors.

Notes

1 Turkic Republics were selected following the Tunay study: Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Türkiye, Turkmenistan and Uzbekistan.
2 Details of macroeconomic performance and socio-political indices can be found in the Çelik study.
3 See the variables details in the Appendix.
4 For more detailed discussion, see (González et al.).

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Appendix

Data Definitions and Sources

Y (output) is measured by real GDP. GDP series were provided by World Bank - World Bank – World Development Indicators

H (human capital) was obtained as follows, H= h.L, where h is the h is the average education level per employee and L is the number of employed persons. Average education level per employee series were obtained by UNDP and number of employed persons' series provided by Penn World Table and Total Economy Database.

YH (= LN(Y/H)) represents output per human capital at logarithmic level.

MPI (macroeconomic performance index) were obtained from the World Bank – World Development Indicators and IMF – World Economic Outlook databases.

SPI (socio-political performance index) were provided by the Varieties of Democracy (V-Dem)

OPEN (openness) was obtained as follows, $(\frac{Export + Import}{GDP}.100)$. Openness series were obtained by IMF – World Economic Outlook databases.

K (physical capital stock) series provided by UN Stats.

KH (= LN(K/H)) represents physical capital stock per human capital at logarithmic level.

Nonlinear Panel Unit Root Tests

Structure	**State Dependent**	
Name of the tests	**UO (2009)** (Ucar and Omay)	**EO (2014)** (Emirmahmutoglu and Omay)
Function	ESTAR (1)	AESTAR (1)
Testing Model	$\Delta y_{i,t} = \alpha_i + \phi_{1i} y_{i,t-1} G(.)$	$\Delta y_{i,t} = \alpha_i + G(.)\left[S(.)\rho_{i,1} + (1 - S(.)\rho_{i,2})\right] y_{i,t-1}$
Functional Forms	$G(y_{i,t-1};\gamma_i) = \left[1 - e^{\left(-\gamma_i y_{i,t-1}^2\right)}\right]$	$G(y_{i,t-1};\gamma_i) = \left[1 - e^{\left(-\gamma_i y_{i,t-1}^2\right)}\right]$ $S(y_{i,2,t-1};\gamma_{i,2}) = \left[1 - e^{\left(-\gamma_{i,2} y_{i,t-1}\right)}\right]^{-1}$
Linearized Versions	$\Delta y_{i,t} = \alpha_i + \phi_{1i} y_{i,t-1}^3$	$\Delta y_{i,t} = \alpha_i + \phi_{1i} y_{i,t-1}^3 + \phi_{2i} y_{i,t-1}^4$

Structure	**Structural Break**	
Name of the tests	**OHS (2018)** (Omay, Hasanov, et al.)	**OOS (2021)** (Omay, Shahbaz, et al.)
Function	LSTR	Fourier
Testing Model	$\Delta y_{i,t} = \alpha_i + \theta_1(t) + \phi_{1i} y_{i,t-1}$	$\Delta y_{i,t} = \alpha_i + \theta_2(t) + \phi_{1i} y_{i,t-1}$
Functional Forms	$F(t;\gamma_{i,3},\tau_i) = \left[1 + e^{\gamma_{i,3}(t-\tau_i-T)}\right]$ A) $\theta_1(t) = a_0 + a_1 F(.)$ B) $\theta_1(t) = a_0 + a_1 F(.) + b_0 t$ C) $\theta_1(t) = a_0 + a_1 F(.) + b_0 t + b_1 t F(.)$	$\theta_2(t) = \beta_1 + \beta_2 \sin(.) + \beta_3 \cos(.)$ $\sin(.) = \sin\left(\frac{2\pi k t}{T}\right)$, $\cos(.) = \cos\left(\frac{2\pi k t}{T}\right)$

Structure	**State Dependent**	**State and Time Dependent Hybrid**
Name of the tests	**CEO (2017)** (Çorakcı et al.)	**OCE (2017)** (Omay, Çorakcı, et al.)
Function	Threshold AR process (TAR)	LSTR trend Remaining part TAR
Testing Model	$\Delta y_{i,t} = \alpha_i + \rho_{1,i} I_i y_{i,t-1} + \rho_{2,i}(1 - I_i)_i\, y_{i,t-1}$	$\Delta y_{i,t} = \alpha_i + \theta_1(t) + \rho_{1,i} I_i y_{i,t-1} + \rho_{2,i}(1 - I_i)_i\, y_{i,t-1}$
Functional Forms	*if* $I_i = 1 \rightarrow \tau_i > 0$ *else* $I_i = 0 \rightarrow \tau_i < 0$	**Nonlinear Trend** $F(t;\gamma_{i,3},\tau_i) = \left[1 + e^{\gamma_{i,3}(t-\tau_i-T)}\right]$ A) $\theta_1(t) = a_0 + a_1 F(.)$ B) $\theta_1(t) = a_0 + a_1 F(.) + b_0 t$ C) $\theta_1(t) = a_0 + a_1 F(.) + b_0 t + b_1 t F(.)$ **Stochastic Part** *if* $I_i = 1 \rightarrow \tau_i > 0$ *else* $I_i = 0 \rightarrow \tau_i < 0$

Table 5
Polynomial Panel Estimation

Country	MPI	MPI²	SPI	SPI²	OPEN	OPEN²	KH	KH²	Constant
Azerbaijan	-0.02036 (0.01429)	0.00027 ** (0.00011)	-0.00922 (0.00830)	0.00014 (0.00008)	0.00663 (0.00884)	-0.00003 (0.00006)	-0.72723 * (0.36444)	0.13896 *** (0.03910)	6.61717 *** (0.81210)
Kazakhstan	0.00024 (0.00385)	0.00003 (0.00003)	-0.00261 * (0.00138)	0.00000 (0.00001)	0.00357 (0.0028)	-0.00003 * (0.00002)	-2.74643 ** (1.16163)	0.14391 ** (0.05379)	25.21095 *** (6.21159)
Kyrgyzstan	-0.04259 *** (0.00873)	0.00034 *** (0.00007)	-0.00631 (0.00403)	0.00007 (0.00004)	0.01780 ** (0.00642)	-0.00009 ** (0.00003)	-2.71255 ** (1.02917)	0.18342 *** (0.06330)	20.09847 *** (4.21384)
Tajikistan	-0.04259 * (0.02162)	0.00038 ** (0.00017)	-0.00822 (0.01101)	0.00007 (0.00010)	0.00116 (0.01088)	-0.00004 (0.00005)	-0.61677 (3.54348)	0.04980 (0.28844)	10.67665 (10.19983)
Türkiye	-0.01236 (0.01394)	0.00008 (0.00011)	-0.00238 ** (0.00096)	0.00003 *** (0.00000)	-0.01096 ** (0.00521)	0.00010 (0.00007)	-1.04459 (1.81435)	0.08676 (0.11665)	12.85251 (7.27984)
Turkmenistan	0.00734 (0.00732)	0.00001 (0.00005)	-0.00416 (0.00244)	0.00007 ** (0.00002)	0.00065 (0.00257)	-0.00000 (0.00001)	-3.66724 *** (0.58106)	0.29643 *** (0.04166)	18.46424 *** (2.06960)
Uzbekistan	-0.01505 ** (0.00695)	0.00010 ** (0.00005)	-0.00250 (0.00447)	0.00001 (0.00006)	-0.00524 (0.00714)	0.00004 (0.00008)	-1.28716 (2.40437)	0.06853 (0.09724)	20.06772 (14.89243)
Group Mean	-0.01791 *	0.00017 *	-0.0050 **	0.00006 **	0.00194 **	-0.00001 **	-1.82885 *	0.13826 *	16.28395
Threshold Value	52.676		41.666		97.0		6.613		

Note: *, **, and *** indicates the %10, %5 and %1 significance level.

Table 7
Summary Tables: Macroeconomic and Socio-political Performance in Turkic Republics

	Azerbaijan						Kazakhstan					
Periods	**Growth Rate (%)**	**Inflation Rate (%)**	**Unemployment Rate (%)**	**Current Account to GDP (%)**	**MPI**	**SPI**	**Growth Rate (%)**	**Inflation Rate (%)**	**Unemployment Rate (%)**	**Current Account to GDP (%)**	**MPI**	**SPI**
1992-1995	-18.33	833.25	4.95	-11.88	34.52	56.91	-10.02	732.6	5.16	-17.33	42.49	86.75
1995-1998	5.64	11	8.6	-23.53	44.15	31.3	0.09	19.45	12.52	-3.5	57.34	62.2
1998-2001	9.46	5.62	10.9	-12.35	48.8	30.89	8.57	13.58	12.44	-2.7	66.21	56.65
2001-2004	9.63	6.79	9.53	-17.7	50.21	23.88	9.57	11.14	9.23	-2.65	77.02	49.63
2004-2007	29.09	15.62	7.05	4.1	70.92	13.63	9.76	18.29	7.89	-2.88	78.71	42.95
2007-2010	8.34	5.6	5.89	28.08	77.77	12.58	3.9	14.81	6.55	-1.5	77.69	40.79
2010-2013	2.66	8.18	5.3	23.1	73.29	11.35	6.06	11.42	5.41	2.03	82.7	30.8
2013-2016	0.22	1.05	4.96	6.63	67.43	13.26	2.16	6.97	5.04	-1.4	78.93	21.39
2016-2019	1.4	9.14	4.94	5.6	66.42	12.37	4.23	9.34	4.88	-3.28	78.69	13.47
1992-2019	4.69	37.02	6.8	0.55	59.19	23.78	3.64	41.14	7.51	-3.87	70.63	45.33

	Türkiye						Turkmenistan					
Periods	**Growth Rate (%)**	**Inflation Rate (%)**	**Unemployment Rate (%)**	**Current Account to GDP (%)**	**MPI**	**SPI**	**Growth Rate (%)**	**Inflation Rate (%)**	**Unemployment Rate (%)**	**Current Account to GDP (%)**	**MPI**	**SPI**
1992-1995	3.45	85.79	8.42	-0.63	63.34	53.25	-7.99	915.19	4	0	54.91	71.23
1995-1998	5.76	98.62	7	-0.58	68.8	55.36	0.41	176.77	10.45	-13.55	48.03	39.6
1998-2001	-0.84	52.19	7.37	-0.35	62.88	66.77	8.64	26.19	11.78	-9.4	57.59	21.42
2001-2004	7.32	24.01	10.03	-1.08	65.97	89.13	2.82	23.49	9.4	2.93	65.39	13.92
2004-2007	6.98	7.55	9.77	-4.65	68.06	90.85	11.68	9.49	7.01	9.23	79.48	16.47
2007-2010	1.33	8.13	10.45	-4.5	58.45	81.97	9.94	21.5	4.68	0.63	79.86	32.72
2010-2013	8.13	7.3	9.08	-6.45	67.25	75.02	11.98	7.32	4.07	-5.48	79.36	37.19
2013-2016	4.78	7.79	9.92	-4.05	66.24	47.23	7.65	-3.15	4.14	-12.3	73.8	39.51
2016-2019	3.75	13.75	11.56	-2.45	60.55	7.62	6.33	1.32	4.22	-5.95	75.86	50.62
1992-2019	4.48	30.07	9.34	-2.75	64.52	61.92	5.54	57.99	6.49	-2.87	68.66	37.11

	Uzbekistan					
Periods	**Growth Rate (%)**	**Inflation Rate (%)**	**Unemployment Rate (%)**	**Current Account to GDP (%)**	**MPI**	**SPI**
1992-1995	-2.82	805.79	5.73	-2.65	41.24	50.44
1995-1998	3.72	61.23	10.67	-2.55	53	32.15
1998-2001	4.1	45.54	12.51	0.83	58.43	23.62
2001-2004	5.21	28.82	9.66	3.8	71.93	14.91
2004-2007	7.95	22.26	6.58	7	88.24	5.28
2007-2010	8.22	30.24	5.07	5.95	90.34	6.16
2010-2013	7.31	16.27	5.05	3.63	85.4	7.73
2013-2016	6.67	11.13	5.1	1.85	81.88	9.91
2016-2019	5.15	21.25	5.67	-2.5	71.24	35.43
1992-2019	5.01	59.89	7.26	1.35	70.22	6

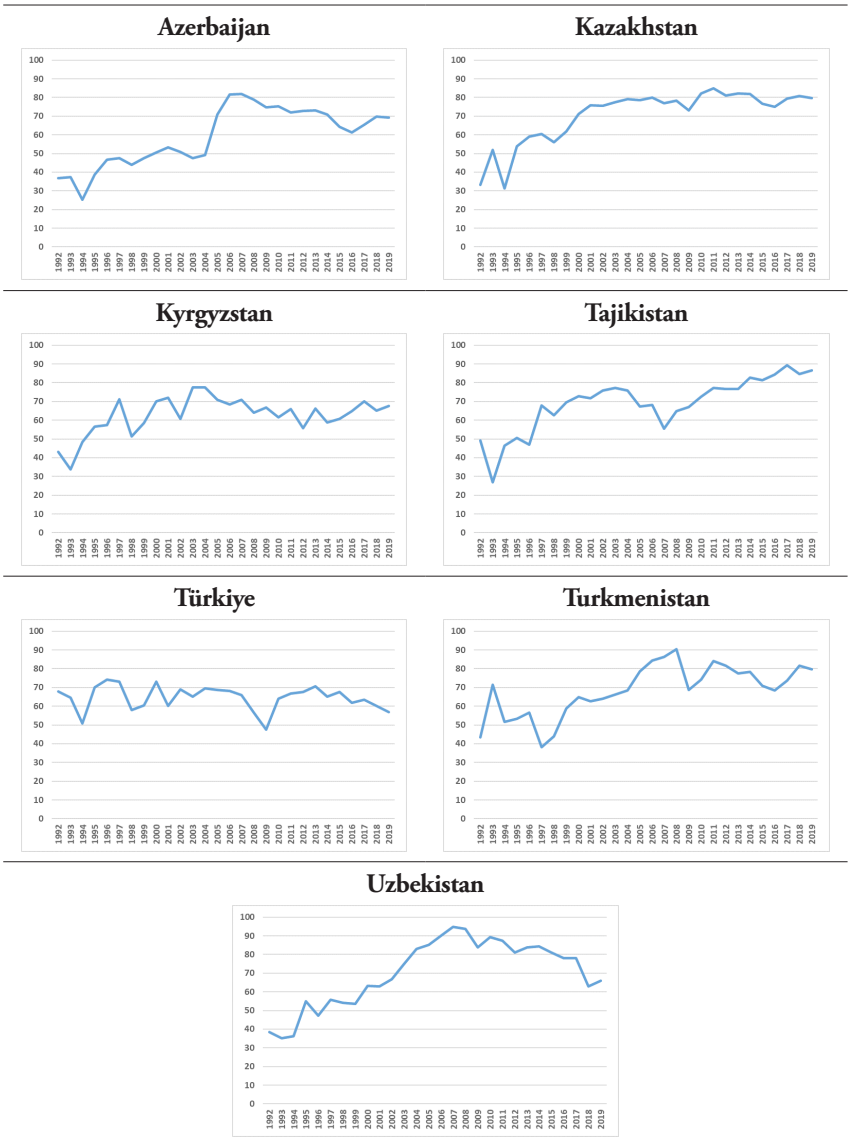

Figure 4. Macroeconomic performance details of Turkic Republics

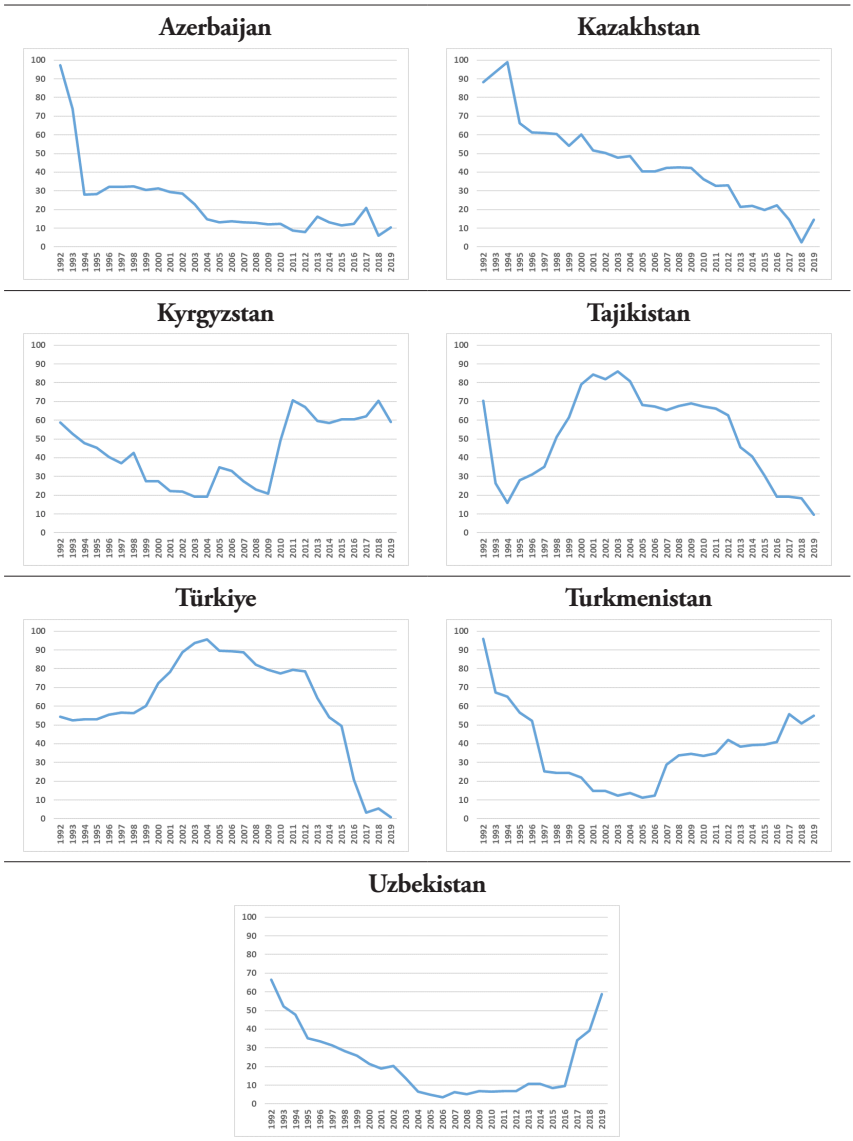

Figure 5. Socio-political performance details of Turkic Republics

Makroekonomik ve Sosyo-politik Endeks Nitelikli Çalışan Başına Reel GSYH'yi Nasıl Etkiler? Türk Cumhuriyetleri'nden Kanıtlar*

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Öz

Bu çalışmada, nitelikli çalışan başına reel GSYH düzeyini etkileyen sosyoekonomik faktörler üzerinde durulmuştur. Bu amaçla Türk Cumhuriyetleri için makroekonomik ve sosyo-politik performans endeksleri oluşturulmuştur. Yeni oluşturulan bu endeksler kullanılarak, nitelikli çalışan başına düşen reel GSYH düzeyinin belirleyicileri literatürde ilk kez analiz edilmektedir. Ampirik sonuçlar, belirli eşik düzeylerinin nitelikli çalışan başına reel GSYH düzeyini önemli ölçüde etkilediğini göstermektedir. Sonuç olarak, çalışmada yer verilen ülkelerin politika yapıcıları, ülkelerinin refahı açısından iyi organize edilmiş politikalar yürütmek için makroekonomik ve sosyo-politik performans endekslerin eşik değerlerini ciddi şekilde göz önünde bulundurmalıdır.

Anahtar Kelimeler

Makroekonomik Performans Endeksi, Sosyo-politik Performans Endeksi, Dışa Açıklık, Sermaye, Nitelikli Çalışan Başına Reel GSYH.

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* Geliş Tarihi: 26 Mayıs 2022 – Kabul Tarihi: 12 Aralık 2022
Bu makaleyi şu şekilde kaynak gösterebilirsiniz:
Çelik, Eşref Uğur vd. "How Does Macroeconomic and Socio-political Index Affect the Real GDP per Qualified Worker? Evidence from Turkic Republics." *bilig*, no. 105, 2023, ss. 01-38.

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Как макроэкономический и социально-политический индекс влияет на реальный ВВП на одного квалифицированного работника? Данные по Тюркским республикам*

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Аннотация

В данном исследовании мы сосредоточились на социально-экономических факторах, влияющих на уровень реального ВВП на одного квалифицированного работника. Для этой цели мы использовали индекс макроэкономических и социально-политических показателей тюркских стран. С использованием этих вновь установленных индексов впервые в литературе анализируются детерминанты уровня реального ВВП на одного квалифицированного работника. В результате эмпирического исследования мы обнаружили, что определенные пороговые уровни существенно влияют на реальный уровень ВВП на одного квалифицированного работника. Поэтому политикам этих стран приходится

* Поступило в редакцию: 26 мая 2022 г. – Принято в номер: 12 декабря 2022 г.
Ссылка на статью:
Çelik, Eşref Uğur et al. "How Does Macroeconomic and Socio-political Index Affect the Real GDP per Qualified Worker? Evidence from Turkic Republics." *bilig*, no. 105, 2023, pp. 01-32.

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серьезно рассматривать эти пороговые уровни индекса макроэкономических и социально-политических показателей для проведения хорошо организованной политики на благо своих стран.

Ключевые слова
Индекс макроэкономической эффективности, индекс социально-политической эффективности, открытость, капитал, реальный ВВП на квалифицированного работника.