Sosyoekonomi

2025, Vol. 33(65), 295-314

RESEARCH ARTICLE

ISSN: 1305-5577
DOI: 10.17233/sosyoekonomi.2025.03.14
Date Submitted: 05.10.2024
Date Revised: 22.01.2025
Date Accepted: 10.06.2025

Validity of the Unemployment Hysteresis Hypothesis in the Turkic Republics: Lee and Tieslau (2019) Panel Unit Root Test with Two Breaks

İdris YAĞMUR *(https://orcid.org/0000-0002-9743-2189), Manisa Celal Bayar University, Türkiye; idris.yagmur@cbu.edu.tr*

Türk Cumhuriyetlerinde İşsizlik Histerisi Hipotezinin Geçerliliği: Lee ve Tieslau (2019) İki Kırılmalı Panel Birim Kök Testi

Abstract

This study aims to test the validity of the unemployment hysteresis hypothesis in the Turkic Republics (Azerbaijan, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan) with annual data covering the period 1991-2023. For this purpose, Lee and Tieslau's (2019) two-break panel unit root test was used as a method in the analysis part of the study. In the study, general, female, male, youth, young female and young male unemployment rates of six (6) countries were analysed separately. When the panel unit root results of Lee and Tieslau (2019) unemployment rates are analysed, according to the LM statistic results calculated for Azerbaijan, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan, it is seen that there is no hysteresis effect in all countries. Therefore, the unemployment hysteresis hypothesis does not apply to the Turkic Republics during the relevant period.

Keywords : Unemployment Hysteresis Hypothesis, Turkish Republics, Lee and Tieslau (2019) Panel Unit Root Test with Two Breaks.

JEL Classification Codes : C01, C12, C33.

Öz

Bu çalışmanın amacı, 1991-2023 dönemini kapsayan yıllık veriler ile Türk Cumhuriyetlerinde (Azerbaycan, Özbekistan, Türkiye, Türkmenistan, Kırgızistan ve Kazakistan) işsizlik histerisi hipotezinin geçerliliğini test etmektir. Bu amaçla çalışmanın analiz kısmında yöntem olarak Lee ve Tieslau (2019) iki kırılmalı panel birim kök testi kullanılmıştır. Çalışmada altı (6) ülkenin; genel, kadın, erkek, genç, genç kadın ve genç erkek işsizlik oranları ayrı ayrı analiz edilmiştir. Lee ve Tieslau (2019) işsizlik oranları panel birim kök sonuçları analiz edildiğinde; Azerbaycan, Özbekistan, Türkiye, Türkmenistan, Kırgızistan ve Kazakistan ülkeleri için hesaplanan LM istatistik sonuçlarına göre, ülkelerin tamamında histeri etkisinin olmadığı görülmektedir. Dolayısıyla ilgili dönemde Türk Cumhuriyetlerinde işsizlik histerisi hipotezi geçerli değildir.

Anahtar Sözcükler : İşsizlik Histerisi Hipotezi, Türk Cumhuriyetleri, Lee ve Tieslau (2019) İki Kırılmalı Panel Birim Kök Testi.

1. Introduction

Unemployment ranks first among macroeconomic indicators (Alkaya & Işık, 2022: 498). Unemployment is defined as the inability to find a job despite possessing the necessary skills and abilities and actively seeking employment (Atamer et al., 2023: 284). The problem of unemployment can arise for many different reasons. Economic and financial events, cyclical fluctuations, structural issues, high labour costs and technological progress can lead to unemployment (Atgür, 2021: 1468). Therefore, the phenomenon of unemployment is a significant problem worldwide (Aysu & Dökmen, 2011: 181).

With the structural changes occurring in the economies of countries, differences may arise in the unemployment situation, especially after the crisis period. Two main approaches, the natural rate approach and the unemployment hysteresis approach, have been proposed in the literature on the return of the unemployment rate to its previous level following these structural changes (Akkuş & Topuz, 2019: 70).

Since the early 20th century to the present, unemployment rates, which increased in many countries during the 1929 Depression, the 1973 oil crisis, the 2008 financial crisis, and pandemic periods, have slowly returned to their previous levels in the post-crisis periods (Daştan, 2024: 28-29). This trend in unemployment rates has led to the questioning of the natural rate of unemployment hypothesis, which, according to the view put forward by Phelps (1967) and Friedman (1968), asserts that unemployment rates tend to return to their natural level after a period of recession (Tokatlıoğlu et al., 2014: 299). However, the increase in unemployment rates, especially in European countries due to the 1973 oil crisis, has led to the emergence of theoretical and empirical studies that focus on re-explaining the natural rate of unemployment hypothesis (Baştav, 2019: 32). Among the studies that emerged, especially the work of Blanchard and Summers (1986), who put forward the unemployment hysteresis hypothesis, made a significant contribution to the literature. Unlike the natural rate hypothesis, which suggests that unemployment rates tend to return to their natural level after a period of recession, the unemployment hysteresis hypothesis argues that recession will have permanent effects on unemployment rates. Therefore, the impact of a shock on unemployment will be pretty permanent, and there will be no tendency to return to the equilibrium level (Papell et al., 2000: 3-4).

Blanchard and Summers (1986) attempted to explain the persistence of this effect by proposing the insiders-outsiders, physical, and human capital approaches. After economic shocks, the number of unemployed remains unchanged. The duration of unemployment is prolonged due to factors such as the determination of new wage levels between employees (insiders) and firms, who are driven by the fear of job loss, as well as the lack of involvement of unemployed individuals (outsiders) in the process and rigid wage bargaining. This is captured by the insiders-outsiders model, which centres on the lack of interest of employed workers in unemployed individuals. The explanation of the hysteresis hypothesis with physical capital is as follows: In the event of a negative shock in the economy, actors decide to reduce their capital stocks, which in turn reduces the demand for the required labour

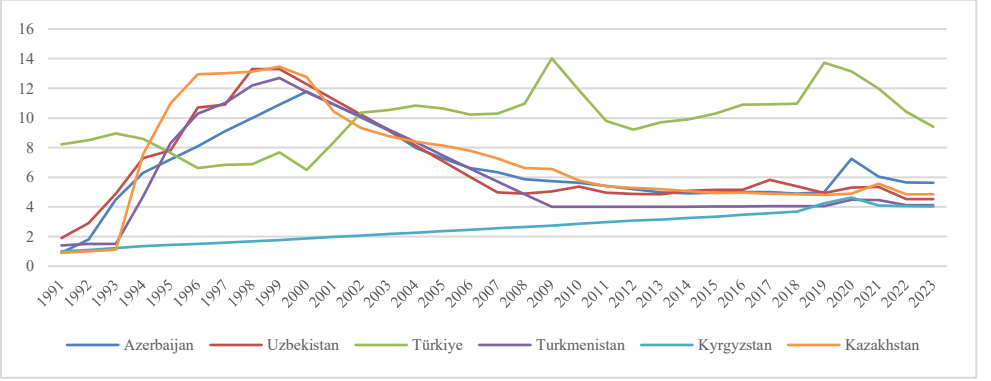
factor. The decrease in labour demand will lead to a higher unemployment rate, making the solution to the problem more difficult in the long run. When an economic shock occurs, some of the working individuals become unemployed. The decrease in the chances and hopes of unemployed individuals to find a job due to the decline in their skills and knowledge is explained by the human capital approach. In this case, unemployment in the economy becomes permanent and difficult to overcome (Ataklı-Yavuz et al., 2024).

The natural rate approach suggests that unemployment series follow a stationary process, while the unemployment hysteresis approach suggests that unemployment series follow a non-stationary process (Bakas & Makhlouf, 2020: 1-2). Therefore, whether there is a hysteresis effect on unemployment rates is analysed using unit root tests (Cheng, 2022: 230-231). With the stationarity properties of unemployment rates, economic theories can be explained, and policymakers can formulate appropriate policies. However, if a series does not follow a stationary process, shocks that may arise, in other words, decreases or increases in unemployment rates, may lead to permanent effects, whereas if a series follows a stationary process or tends to return to its natural level, shocks in this series lead to instant and temporary effects (Caporale et al., 2022: 1-2). Therefore, when unemployment series contain unit roots, since they cannot return to their natural equilibrium level due to an exogenous shock, shocks will alter the course of unemployment rates, making it necessary for policymakers to intervene.

In 1991, with the collapse of the Union of Soviet Socialist Republics (USSR), Azerbaijan, Uzbekistan, Turkmenistan, Kyrgyzstan and Kazakhstan declared their independence (Saraç et al., 2023: 368). With the dissolution of the USSR, there were severe fluctuations in the unemployment rates of the Turkic Republics. In 1998, the economic crisis in Russia had a negative impact on Türkiye and Uzbekistan, leading to sudden increases in unemployment rates. After the countries declared their independence, they gained economic freedom, which led to changes in their production structures and market shares. With the dissolution of the USSR, the economic order established by its member countries was disrupted, and this situation negatively impacted export and import volumes. Various problems were encountered in the production and sales processes, and the growth rates of countries were also negatively affected by this situation (Akcan, 2019: 627-628).

General unemployment data for the Turkic Republics, covering the period from 1991 to 2023, were obtained from the World Bank database, and Figure 1 was created using these data.

Figure: 1
General Unemployment Rates of Turkic Republics



Source: World Bank, 2024.

Figure 1 shows the general unemployment rates of the Turkic Republics. When the general unemployment rates in the figure are analysed, it is seen that Kyrgyzstan's unemployment data shows a more stable increase, while the unemployment data of other countries follow a fluctuating course. After the declaration of independence, the unemployment data for Turkmenistan, Uzbekistan, and Kazakhstan exhibited an abnormal increase in the first five years, followed by a decline after 1998. According to the average data of the Turkic Republics for the period 1991-2023, Türkiye has the highest unemployment rate at 9.84%, followed by Kazakhstan (7.01%), Uzbekistan (6.77%), Azerbaijan (6.54%), Turkmenistan (6.05%), and Kyrgyzstan (2.60%). Therefore, Turkic Republics need to support unemployed individuals with active labour market policies to minimise unemployment rates. Active labour market policies are an essential tool that has a direct impact on the duration of unemployment. Practices such as on-the-job training and vocational counselling services enhance the skills of unemployed individuals and increase their chances of finding employment. Thus, the duration of unemployment is shortened, and individuals participate in economic life more rapidly. The effectiveness of these policies may vary depending on economic conditions, sectoral structure and other factors (Kapar, 2005: 343-345). Since the level of unemployment duration is an essential indicator of a country's economic health and the functioning of the labour market, active labour market policies need to be continuously evaluated and improved.

The primary objective of this study is to examine the validity of the unemployment hysteresis hypothesis for the Turkic Republics using annual data spanning the period from 1991 to 2023. Since 1991, Azerbaijan, Uzbekistan, Turkmenistan, Kyrgyzstan, and Kazakhstan declared their independence after the collapse of the USSR; therefore, the data are included in the analysis from 1991 onwards. For this purpose, Lee and Tieslau's (2019) two-break panel unit root test is used as a method in the analysis part of the study. There are few studies on the Turkic Republics in the literature. In this respect, it is believed to

contribute to the literature, thanks to the country group and the current methodology employed in the analysis.

This study consists of five (5) main sections. Following the introduction, a literature review is presented on the validity of the unemployment hysteresis hypothesis. This is followed by a section that explains the dataset and methodology, presents the findings obtained from the econometric analysis, and concludes with a section that summarises the study's conclusions and includes policy recommendations.

2. Literature

Both direct and indirect socioeconomic and political factors influence unemployment rates. By testing the unemployment hysteresis hypothesis, it is possible to gain insight into the dynamics of unemployment. Unit root tests are generally used to test the validity of the unemployment hysteresis hypothesis. This leads to a continuous questioning of the hysteresis hypothesis. Since the unemployment hysteresis has an extensive literature, the literature section of the study chronologically includes recent, national and international empirical studies on the validity of the unemployment hysteresis hypothesis.

Table: 1
Summary of Empirical Literature on Unemployment Hysteresis

Author(s)	Year of Publication	Target Country(s)	Data Set	Methodology	Conclusion
Akcan	2019	Turkic Republics	1991-2016	Lin, Levin, Chu (LLC), Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) panel unit root tests	Unemployment hysteresis is valid.
Sigeze et al.	2019	European Union (EU) countries and Türkiye	1991-2016	Fourier KPSS panel stationarity test	Unemployment hysteresis is valid except in Latvia, Belgium, Cyprus and Sweden.
Bakas & Makhlouf	2020	OECD countries	1960-2013	Mandala-Wu (MW) test, Choi (CH) test, Im, Lee and Tieslau (IPS) test and Pesaran CIPS test	Unemployment hysteresis is valid.
Belke	2020	28 EU countries	2003:Q2 2019:Q1	Kapetanios, Shin and Snell (KSS) unit root test	Except for Hungary and Portugal, unemployment hysteresis is valid.
Bozgeyik	2020	E7 countries	1991-2018	Harvey et al. (2008), Zivot Andrews (ZA), Lee and Strazicich (LS) and Narayan and Popp (NP) unit root tests	Unemployment hysteresis is only valid in China.
Mike & Alper	2020	37 developed and 15 developing countries	2003:1 2017:3	Fourier ADF (FADF) unit root test	Unemployment hysteresis is valid.
Pata	2020	15 OECD countries	1991:Q1 2019:Q2	Fourier panel stationarity tests	Unemployment hysteresis is only valid in Germany, Türkiye and Spain.
Songur	2020	28 OECD countries	1980-2016	Fourier Panel KPSS unit root test	Unemployment hysteresis is valid.
Awolaja et al.	2021	19 Middle East and North Africa (MENA) countries	1991-2019	ADF, ADF-SB, CSR, Fourier-based and panel-based unit root tests	In 12 out of 19 MENA countries, unemployment hysteresis is valid.
Karabıyık	2021	Central and Eastern European countries	1996-2019	CADF-CIPS panel unit root test	Unemployment hysteresis is valid except in Poland, Slovenia and Estonia.
Komşu & Komşu	2021	BRICS-T countries	1991-2020	ADF, PP and ZA unit root tests	Except in China, unemployment hysteresis is valid.
Önal	2021	Türkiye	1988-2019	ADF, PP, KPSS and Ng-Perron unit root tests	Female unemployment rates contain more hysteresis than male unemployment rates.
Uğur & Atılgan	2021	BRICS-T countries	1991-2020	Panel LM unit root test	Unemployment hysteresis is valid.
Yıldız	2021	N-11 countries	1991-2019	Panel LM unit root test	Unemployment hysteresis is valid only in Indonesia.

Azazi	2022	Türkiye	2005:01 2022:05	ADF, PP and FADF unit root tests	Male unemployment rates contain more hysteresis than female unemployment rates.
Coparale et al.	2022	27 EU countries	2000:Q1 2020:Q4	Fractional integration method	Unemployment hysteresis is valid.
Doğaner	2022	EU countries	1991-2020	Harvey and Leybourne (2007) and Harvey et al. (2008), ADF, PP, LS, Leybourne et al. (1998), Harvey and Mills (2002), KSS, Sollis (2009), Kruse (2011) and Hepsağ (2021) unit root tests	In all tests, unemployment hysteresis is valid in Luxembourg.
Konat & Coşkun	2022	10 OECD countries	2000-2018	Pesaran et al. (2013) multifactor panel unit root test	Unemployment hysteresis is valid.
Türkmen & Özbek	2022	BRICS-T countries	1991-2020	Panel Fourier LM unit root test	Unemployment hysteresis is valid.
Üçler et al.	2022	Türkiye	2005:01 2022:01	ADF and PP unit root tests	The hysteresis effect in general unemployment data is higher than in youth unemployment data.
Arık	2023	Türkiye and Greece	1988-2021	FADF unit root test	Unemployment hysteresis is valid.
Atabey	2023	E7 countries	1991-2021	KSS, LS, FADF and Fourier KPSS unit root tests	Unemployment hysteresis is valid.
Atabey & Karakuş	2023	BRICS-T countries	1991-2021	Carrion-i-Silvestre et al. (2009), KSS and Fourier-based unit root tests	The hysteresis effect is particularly valid for youth and female unemployment rates.
Eryer & Konuk	2023	G8 countries	1991-2021	CADF unit root test	Unemployment hysteresis is valid.
Torun et al.	2023	Turkic Republics	1991-2019	PANKPSS stationarity test	Unemployment hysteresis is valid only for Türkiye's female unemployment rate and Azerbaijan's youth unemployment rate.
Yılmaz	2023	EU-15 and EU-28 countries	2001:Q1 2019:Q4	ADF, PP and FFFADF unit root tests	Unemployment hysteresis is valid.
Cuestas & Gil-Alana	2024	22 European countries	2003:Q2 2019:Q4	Fractional integration method	Hysteresis is more likely to affect males and those with middle levels of education.
Dadam & Viegi	2024	South Africa	2000:Q1 2019:Q4	Bayesian structural VAR model	Unemployment hysteresis is valid.
Ergül	2024	Türkiye	2014-2023	ADF, FADF and FFFADF unit root tests	Unemployment hysteresis is valid.
Karataş	2024	Türkiye	2014:1 2023:8	ADF, FADF and FFFADF unit root tests	Unemployment hysteresis is valid.

When empirical studies are analysed, the differences in the period intervals included in the analysis, the countries or country groups, and the methods used may lead to different findings regarding the validity of the unemployment hysteresis hypothesis. However, it is observed that the unemployment hysteresis is partially present in all studies analysed in the literature review.

3. Data and Methodology

To analyse the validity of the unemployment hysteresis hypothesis, the stationarity properties of the series must be determined. For this purpose, Lee and Tieslau's (2019) two-break panel unit root test is used as a method to test the unemployment hysteresis hypothesis in the Turkic Republics (Azerbaijan, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan). The reason why this test is preferred is that it provides results separately for each panel cross-section (country). In addition, the study by Nazlıoğlu et al. (2023: 94), which also employs this test, reveals that separate results and break dates are provided for each country. Since it allows for separate results for each country analysed within the panel, the descriptive statistics for each country are calculated and presented in Appendix 1 for a more comprehensive analysis of the study. The Lee and Tieslau (2019) study used in this

analysis is a Lagrange Multiplier (LM) based panel unit root test that allows for calculating separate results and break dates for each panel cross-section.

In the study, the variables representing general, female, male, young, young female, and young male unemployment rates were used as the dataset. The study spans the period from 1991 to 2023. Data are obtained from the World Bank database. Since Azerbaijan, Uzbekistan, Turkmenistan, Kyrgyzstan and Kazakhstan declared their independence with the collapse of the USSR in 1991, the starting year of the data was determined as 1991 and included in the analysis starting from this year.

3.1. Lee and Tieslau (2019) Panel Unit Root Test with Two Breaks

There are many Dickey-Fuller (DF) and LM-type panel unit root tests in the literature. While panel DF-type tests in the literature suffer from a disturbing parameter problem in the presence of level or trend shifts or both, LM-type tests may suffer from this problem when trend shifts occur (Lee & Tieslau, 2019: 2). Moreover, a panel root test that is free of problematic parameters should be used. Because it is not a practical solution to generate critical values for the test that do not depend on the problematic parameters of all combinations of break locations (Solarin & Stewart, 2021: 7). The Lee and Tieslau (2019) two-break panel unit root test is a version of the panel unit root test introduced to the literature by Im et al. (2005), which allows one and two breaks in the level and slope, developed to allow breaks in both the level and slope and, as desired, free of nuisance parameters.

Tam (2006) and Carrion-i-Silvestre and Surdeanu (2013) consider LM or GLS versions of panel unit root tests that allow for trend breaks with factor structure. However, while it is not clear that these tests are invariant to the disturbance parameter, which indicates the location of the trend break, the Lee and Tieslau (2019) approach adopts a simple transformation to obtain a modified test statistic whose asymptotic distribution depends on the size and location of the trend shifts. They use an LM-type unit root test that depends only on the number of breaks and not on their location or size, and then extend the testing procedure to a panel framework with heterogeneous trend shifts.

The Lee and Tieslau (2019) panel unit root test starts with the data generation process in equation 1 below (Lee & Tieslau, 2019: 2):

$$Y_{\mathrm{it}} = \mathrm{Z}'_{\mathrm{it}} a_{\mathrm{i}} + \mu_{it} \text{ with } \mu_{\mathrm{it}} = p_i \mu_{\mathrm{it-1}} + \varepsilon_{\mathrm{it}}, \mathrm{i} = 1, \ldots, \mathrm{N};\ \mathrm{t} = 1, \ldots, \mathrm{T}. \quad (1)$$

In the equation, (Y) denotes the series considered, (i) denotes each cross-section, (t) denotes each period, and ($\varepsilon_{\mathrm{it}}$) denotes the error terms that allow for varying variance for cross-section units. The following assumptions are associated with the regression in equation 1. ($\varepsilon_{\mathrm{it}}$) follows the classical assumptions of zero mean and constant variance. The null hypothesis implies a unit root for all (i). That is, H_0: $\rho_i = 1$ for all i = 1,...,N, and the alternative is H_1: $\rho_i < 1$ for at least one (i). (Z_{it}) represents a vector of potentially different exogenous terms for each (i). In this application, dummy variables are also added to (Z_{it}),

which can include both level and trend shifts. A model that allows for both level and trend breaks is denoted by Z_{it} = [1, *t*, D_{it}, DT_{it}^{*}]'. To allow for multiple breaks, we can employ additional dummy variables with Z_{it} = [1, *t*, $D_{it1}, \dots, D_{itR}$, $DT_{it1}^{*}, \dots, DT_{itR}^{*}$]', where D_{itr}= 1 for $t \geq T_{Bir}$+1, r = 1,…, R, and zero otherwise, and $DT_{itr}^{*} = t - T_{Bir}$ for t ≥ T_{Bi}+1, and zero otherwise.

The LM test regression consists of a two-step process. First, a trend-free series is obtained for each cross-sectional unit as in the equation.

$$\tilde{Y}_{it} = Y_{it} - \tilde{\psi}_i - \mathrm{Z}_{it}\tilde{\delta}_i. \tag{2}$$

The de-trending coefficient ($\tilde{\delta}_i$) in Equation 2 is obtained from the model using the first differences of Y_{it} and Z_{it}. (ΔY_{it} and ΔZ_{it}), where $\tilde{\psi}_i = Y_{i1} - Z_{i1}\tilde{\delta}$ is the restricted maximum likelihood estimate.

In the second step, unit root test statistics are obtained using the following regression.

$$\Delta Y_{it} = \delta_i' \Delta Z_{it} + \phi_i \tilde{Y}_{it-1} + e_{it}, i = 1, \dots, N;\ t = 1, \dots, T. \tag{3a}$$

Note that ΔZ_{it} includes an incentive dummy variable. $B_{it} = \Delta D_{it}$, which is also referred to as an impulse dummy variable. The impulse dummy variable will not affect the asymptotic distribution of the test, but should not be neglected in the test regression.

The true test regression is obtained by adding $\Delta \tilde{Y}_{it-p}$ to the lagged terms to correct for innovations that are correlated and heterogeneously distributed across series.

$$\Delta Y_{it} = \delta_i' \Delta Z_{it} + \phi_i \tilde{Y}_{it-1} + \textstyle\sum_{P=1}^{p} d_{ip}\ \Delta \tilde{Y}_{it-p} + e_{it}, i = 1, \dots, N;\ t = 1, \dots, T. \tag{3b}$$

The LM unit root test statistic for the cross-section unit (*i*) is expressed as the t-statistic for the hypothesis $\phi_i = 0$ in equation (3b). In contrast to Amsler and Lee's (1995) specification with cut-off points, the distributions of test statistics with cut-off points on slopes are λ_{ir^*}, $\lambda_{i1^*} = \frac{T_{Bi1}}{T}, \lambda_{ir^*} = \frac{T_{Bir} - T_{Bi,r-1}}{T}, r = 2, \dots, R$, and $\lambda_{i,R+1^*} = \frac{T - T_{BiR}}{T}$ (Lee & Strazicich, 2003: 1083). Moreover, by adopting an approach similar to Park and Sung (1994), it is possible to eliminate the dependence of the test statistic on insignificant parameters by the transformation in equation 4:

$$\tilde{Y}_{it}^{*} = \begin{cases} \frac{T}{T_{Bi1}}\tilde{Y}_{it} \text{ for } t \leq T_{Bi1} \\ \frac{T}{T_{Bi2}-T_{Bi1}}\tilde{Y}_{it} \text{ for } T_{Bi1} < t \leq T_{Bi2} \\ \vdots \\ \frac{T}{T-T_{BiR}}\tilde{Y}_{it} \text{ for } T_{BiR} < t \leq T \end{cases} \tag{4}$$

We then replace $\tilde{Y}_{it-1}$ with $\tilde{Y}_{it-1}^{*}$ in the test regression (3b) to obtain the following equation:

$$\Delta Y_{it} = \delta_t' \Delta Z_{it} + \phi_i \tilde{Y}^*_{it-1} + \sum_{p=1}^{p} d_{ip}\ \Delta \tilde{Y}_{it-p} + \varepsilon_{it}. \quad (5)$$

When $\tilde{\tau}_i^*$ is assumed as the t-statistic for $\phi_i = 0$ from the above regression, the asymptotic distribution of this test statistic is given as follows:

$$\tilde{\tau}_i^* \rightarrow -\frac{1}{2}\left[\sum_{r=1}^{R+1} \int_0^1 \underline{\mathcal{V}}_r(r)^2 dr\right]^{\frac{-1}{2}}. \quad (6)$$

The asymptotic distribution does not change concerning the trivial parameter λ. Therefore, the transformed unit root t-statistic no longer depends on the trivial parameter in the trend break model. Moreover, the t-statistic can be constructed by obtaining information about the location of the break. After the transformation, the distribution is the sum of R independent stochastic terms. Therefore, the asymptotic distribution of the test depends only on the number of trend breaks. With one trend break (R = 1), the distribution of the test is the same as that of the untransformed test using λ = 1/2, regardless of the actual location of the breaks, while with two trend breaks (R = 2), the distribution is the same as that of the untransformed test using λ_1 = 1/3 and λ_2 = 2/3. Generally, the same is true for the case of R with multiple breaks. The distribution $\lambda_r = r/(R + 1)$, r = 1, ..., R, which is the same as that of the untransformed test. Instead, only the critical values corresponding to R, the number of breaks, are needed.

When performing unit root tests, the correct location and number of breaks are required. The first reason is that unit root tests lose power under the stationary alternative hypothesis when the location or number of breaks is incorrect. Second, as argued by Perron (1989), when the stationary alternative is correct and a structural break is not considered, the usual augmented DF tests are biased against rejecting zero. This is also true for LM tests with trend breaks.

The new panel LM t-statistic, including trend shifts, is as follows:

H_0: $\phi_i = 0$ for all i

against the alternative hypothesis

H_1: $\phi_i < 0$ for some i.

The panel LM statistic for the above hypothesis can be obtained as the standardized version of the average test statistic below:

$$\overline{t} = \frac{1}{N} \sum_{i=1}^{N} \tilde{\tau}_i^*, \quad (7)$$

Here $\tilde{\tau}_i^*$ is the t-statistic for (5) $\phi_i = 0$ in the test regression. Although the distribution of $\bar{t}$ depends on T, it is independent of other parameters under the null hypothesis. The expected value and variance of $\bar{t}$ under the null hypothesis are denoted as $E(\bar{t})$ and $V(\bar{t})$. Although the simulation results confirm that the critical values are almost invariant to

different values of N in the data-generating process, the effect of the autocorrelation structure should not be ignored. Therefore, $\mathrm{E}(\bar{t})$ and $\mathrm{V}(\bar{t})$ for various combinations of N and T (sample size), P (intercept lag) and R (number of breaks) are calculated through stochastic simulations. As mentioned above, since the test statistics do not depend on the location of the breaks, there is no need to obtain different values of the means and variances at different break locations. This is the main feature of the proposed panel test statistic.

Formally, the panel test statistic is calculated by the following expression, and this standardised statistic follows an asymptotic standard normal distribution.

$$LM(\tilde{\tau}^*) = \frac{\sqrt{N}[\bar{t} - \tilde{E}(\bar{t})]}{\sqrt{\tilde{V}(\bar{t})}} \tag{8}$$

where $\tilde{\mathrm{E}}(\bar{t})$ and $\tilde{\mathrm{V}}(\bar{t})$ are the mean and variance of the mean and variance of $\bar{t}$, which depend on the parameter values of P (number of truncation lags) and R (number of breaks). These values are calculated using terms corresponding to the estimated parameter values of P and R:

$$\tilde{E}(\bar{t}) = \frac{1}{N}\sum_{i=1}^{N} E\left(\bar{t}(\tilde{R}_i, \tilde{P}_i)\right) \text{ and } \tilde{V}(\bar{t}) = \frac{1}{N}\sum_{i=1}^{N} Var\left(\bar{t}(\tilde{R}_i, \tilde{P}_i)\right), \tag{9}$$

where $\tilde{R}_i$ and $\tilde{P}_i$ denote the estimated values of R_i and P_i in the test regression for the i-th cross-sectional unit. In doing so, different numbers of breaks and break lags are allowed for different cross-sectional units. We maintain the assumption that the location and number of breaks can be consistently estimated for each cross-sectional unit. Any consistent estimation procedure can be used to determine these parameters. Therefore, the proposed panel statistic uses consistently estimated values of all parameters and is free of nuisance parameters (Lee & Tieslau, 2019: 1-4).

4. Empirical Findings

In this study, which tests the validity of the unemployment hysteresis hypothesis for the Turkic Republics (Azerbaijan, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan) with annual data covering the period 1991-2023, the general, female, male, youth, young female and young male unemployment rate variables are analysed separately using the Lee and Tieslau (2019) two-break panel unit root test. In this section of the study, the results of the Lee and Tieslau (2019) two-break panel unit root test applied to the variables are presented.

Table: 2
Lee and Tieslau (2019) General Unemployment Rate Panel Unit Root Test Results

Countries	LM Test Statistics	Time Break 1	Time Break 2	Optimal Lag
	General Unemployment Rate			
Azerbaijan	-4.904**	2002	2017	3
Uzbekistan	-7.877***	1998	2006	2
Türkiye	-5.792***	2007	2016	0
Turkmenistan	-9.189***	1997	2009	3
Kyrgyzstan	-56.441***	1995	2017	1
Kazakhstan	-16.471***	1999	2007	1

*Notes: ***, **, and * Critical values indicate 1%, 5% and 10% significance level, respectively. 1%, 5%, and 10% critical values are -5.365, -4.661 and -4.338, respectively (Lee & Tieslau, 2019).*

When the results of the Lee and Tieslau (2019) general unemployment rate panel unit root test are analysed, according to the LM test statistic results calculated for the Turkic Republics, Azerbaijan is significant at the 5% level, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan are important at the 1% level. These significance levels mean that the general unemployment series is stationary; in other words, it does not contain a unit root, and therefore, there is no hysteresis effect in all countries. According to the general unemployment rates, Kyrgyzstan is the country with the least hysteresis effect, followed by Kazakhstan, Turkmenistan, Uzbekistan, Türkiye and Azerbaijan. This test of Lee and Tieslau allows for two breaks. When the break dates are analysed, it is observed that the first break in the Turkic Republics occurred between 1995 and 2007, while the second break occurred between 2006 and 2017. When the break dates of the countries are analysed, it is found that there were breaks in the labor market in Azerbaijan in 2002 and 2017, in Uzbekistan in 1998 and 2006, in Türkiye in 2007 and 2016, in Turkmenistan in 1997 and 2009, in Kyrgyzstan in 1995 and 2017, and Kazakhstan in 1999 and 2007.

Table: 3
Lee and Tieslau (2019) Female Unemployment Rate Panel Unit Root Test Results

Countries	LM Test Statistics	Time Break 1	Time Break 2	Optimal Lag
	Female Unemployment Rate			
Azerbaijan	-4.859**	2002	2017	1
Uzbekistan	-5.276**	1995	2002	3
Türkiye	-5.336**	2008	2016	0
Turkmenistan	-9.268***	1997	2009	3
Kyrgyzstan	-58.258***	1995	2018	1
Kazakhstan	-19.756***	1999	2011	1

*Notes: ***, **, and * Critical values indicate 1%, 5% and 10% significance level, respectively. 1%, 5%, and 10% critical values are -5.365, -4.661 and -4.338, respectively (Lee & Tieslau, 2019).*

Table 3 presents the results of the panel unit root test for the female unemployment rate. When the data in the table is analysed, it is seen that the first break in the Turkic Republics was between 1995 and 2008, while the second break was between 2002 and 2018. According to the LM test statistic results, the LM test statistic values for Azerbaijan, Uzbekistan, and Türkiye are significant at the 5% level, while those for Turkmenistan, Kyrgyzstan, and Kazakhstan are significant at the 1% level. These significance levels mean that the calculated LM test statistic values are greater in absolute value than the critical table values at the significance levels; in other words, the series are stationary.

This result indicates that the unemployment hysteresis hypothesis does not apply to female unemployment rates in all the countries considered. Moreover, it is concluded that Kyrgyzstan is the country with the least hysteresis effect in female unemployment rates, while Azerbaijan is the country with the highest impact.

Table: 4
Lee and Tieslau (2019) Male Unemployment Rate Panel Unit Root Test Results

Countries	LM Test Statistics	Time Break 1	Time Break 2	Optimal Lag
	Male Unemployment Rate			
Azerbaijan	-4.919**	1998	2011	3
Uzbekistan	-4.776**	2002	2015	2
Türkiye	-5.706***	2007	2016	0
Turkmenistan	-9.169***	1997	2009	3
Kyrgyzstan	-57.949***	2011	2016	1
Kazakhstan	-13.528***	1999	2005	1

*Notes: ***, **, and * Critical values indicate 1%, 5% and 10% significance level, respectively. 1%, 5%, and 10% critical values are -5.365, -4.661 and -4.338, respectively (Lee & Tieslau, 2019).*

Table 4 presents the results of the Lee and Tieslau (2019) panel unit root test for the male unemployment rate. According to the data in the table, the first break in the Turkic Republics occurred between 1997 and 2011, while the second break took place between 2005 and 2016. According to the LM test statistic results, the LM test statistic values for Azerbaijan and Uzbekistan are significant at the 5% level, while those for Türkiye, Turkmenistan, Kyrgyzstan, and Kazakhstan are significant at the 1% level. Since these values are greater in absolute value than the table's critical values, it means that none of the series contains unit roots. In other words, since the male unemployment series is stationary at the level, it can be determined that the unemployment hysteresis hypothesis is not valid for male unemployment rates, as it is for female unemployment rates in the Turkic Republics.

Table: 5
Lee and Tieslau (2019) Youth Unemployment Rate Panel Unit Root Test Results

Countries	LM Test Statistics	Time Break 1	Time Break 2	Optimal Lag
	Youth Unemployment Rate			
Azerbaijan	-5.253**	1997	2003	2
Uzbekistan	-7.526***	1998	2006	2
Türkiye	-6.25***	2009	2016	0
Turkmenistan	-7.151***	1997	2010	1
Kyrgyzstan	-75.908***	2010	2016	3
Kazakhstan	-19.62***	1999	2009	1

*Notes: ***, **, and * Critical values indicate 1%, 5% and 10% significance level, respectively. 1%, 5%, and 10% critical values are -5.365, -4.661 and -4.338, respectively (Lee & Tieslau, 2019).*

When the data in Table 5, which includes the results of the Lee and Tieslau (2019) youth unemployment rate panel unit root test, are analysed, it is seen that Azerbaijan is significant at the 5% level, while Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan are significant at the 1% level. These significance levels indicate that the calculated LM test statistic results do not contain unit roots and are therefore stationary. Since the stationarity of the youth unemployment series implies that the hysteresis effect is not present in all countries, the unemployment hysteresis hypothesis does not apply to all countries considered in the analysis.

Table: 6
Lee and Tieslau (2019) Young Male Unemployment Rate Panel Unit Root Test Results

Countries	LM Test Statistics	Time Break 1	Time Break 2	Optimal Lag
	Young Male Unemployment Rate			
Azerbaijan	-5.056**	1998	2017	1
Uzbekistan	-4.589*	2002	2015	2
Türkiye	-5.791***	2007	2016	0
Turkmenistan	-7.632***	1997	2009	1
Kyrgyzstan	-138.023***	2010	2016	3
Kazakhstan	-14.88***	1998	2006	1

*Notes: ***, **, and * Critical values indicate 1%, 5% and 10% significance level, respectively. 1%, 5%, and 10% critical values are -5.365, -4.661 and -4.338, respectively (Lee & Tieslau, 2019).*

When the data in Table 6, which includes the results of the Lee and Tieslau (2019) panel unit root test for the young male unemployment rate, are analysed, it is found that Uzbekistan is significant at the 10% level, while Azerbaijan is significant at the 5% level, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan are significant at the 1% level according to the LM test statistic results calculated for the countries considered in the analysis. The fact that these values are greater than the table critical values in absolute value means that all series are stationary and do not contain a unit root. These results indicate that the unemployment hysteresis hypothesis is not applicable in the Turkic Republics, based on the unemployment rate of young males. Moreover, it is concluded that Kyrgyzstan is the country with the least hysteresis effect in young male unemployment rates, while Uzbekistan is the country with the highest impact.

Table: 7
Lee and Tieslau (2019) Panel Unit Root Test Results for Young Female Unemployment Rate

Countries	LM Test Statistics	Time Break 1	Time Break 2	Optimal Lag
	Young Female Unemployment Rate			
Azerbaijan	-4.929**	1997	2004	2
Uzbekistan	-4.86**	1995	2003	3
Türkiye	-6.267***	2009	2016	0
Turkmenistan	-6.934***	1997	2006	1
Kyrgyzstan	-24.041***	2011	2016	3
Kazakhstan	-18.817***	1999	2008	1

*Notes: ***, **, and * Critical values indicate 1%, 5% and 10% significance level, respectively. 1%, 5%, and 10% critical values are -5.365, -4.661 and -4.338, respectively (Lee & Tieslau, 2019).*

When the results of the Lee and Tieslau (2019) panel unit root test for the young female unemployment rate in Table 7 are analysed, it is found that Azerbaijan and Uzbekistan are significant at the 5% level, while Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan are significant at the 1% level. The fact that the calculated LM test statistic results are greater in absolute value than the critical values, in other words, the young female unemployment series is stationary and therefore does not contain a unit root, means that there is no hysteresis effect in the Turkic Republics. As in the other results, Kyrgyzstan is the country where the hysteresis effect is least pronounced, while Uzbekistan is the country where it is most pronounced. When the break dates are analysed, the first break in the Turkic Republics occurred between 1995 and 2011, while the second break occurred between 2003

and 2016. In conclusion, according to the results of the panel unit root test, the unemployment hysteresis hypothesis is not valid.

5. Conclusion and Policy Recommendations

Unemployment hysteresis implies that a recession in an economy may have lasting consequences on unemployment rates and that the unemployment rate may remain potentially high even when the economy returns to its normal level. For this purpose, the validity of the unemployment hysteresis hypothesis for the Turkic Republics (Azerbaijan, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan) with annual data covering the period 1991-2023 is analysed using the Lee and Tieslau (2019) two-break panel unit root test.

The differences in the period intervals, countries or country groups, and the methods used in the literature studies may lead to different results regarding the validity of the unemployment hysteresis hypothesis. However, it is observed that the unemployment hysteresis is partially present in all studies analysed in the literature review. Including the Turkic Republics in their analysis, Akcan (2019) found that the unemployment hysteresis is valid, while Torun et al. (2023) found that the unemployment hysteresis is valid only for Türkiye's female unemployment rate and Azerbaijan's youth unemployment rate. The results of this study, on the other hand, indicate that the unemployment hysteresis hypothesis is not applicable in Turkic Republics in general, nor among different genders. Therefore, it is believed that this study contributes to the literature by obtaining a different result from the existing findings, thanks to the countries included in the analysis, the period intervals, and the current methodology used.

In this study, the unemployment rates of females, males, youth, young females, and young males in six countries are analysed separately using Lee and Tieslau's (2019) two-break panel unit root test. When the results of the Lee and Tieslau (2019) panel unit root test are analysed, it is found that the LM test statistic values calculated for Azerbaijan, Uzbekistan, Türkiye, Turkmenistan, Kyrgyzstan and Kazakhstan are greater than the table critical values in absolute value, thus all series follow a stationary course, in other words, all series do not contain unit root. Therefore, it is determined that there is no hysteresis effect in all countries; therefore, the unemployment hysteresis hypothesis is not valid for the Turkic Republics during the period 1991-2023. In addition, the fact that the unemployment series in the Turkic Republics followed a stationary process and tended to return to its natural level in the relevant period indicates that the shocks that emerged in these series caused instantaneous and temporary effects. This result implies that the policies implemented in the Turkic Republics are stable. At the same time, according to the results of the Lee and Tieslau (2019) two-break panel unit root test, when the general, female, male, youth, young female and young male unemployment rates of 6 countries are compared, it is found that Kyrgyzstan is the country with the least unemployment hysteresis, while Kazakhstan ranks second and Turkmenistan ranks third. For the Turkic Republics to maintain this efficiency and effectiveness in the labour market, especially Türkiye, Uzbekistan, and Azerbaijan, they

should support unemployed individuals with active labour force programs while determining employment policies in the fight against unemployment. Policy makers should provide incentives and facilities to organisations that support employment to ensure the formation of a more resilient and qualified structure against possible economic adversities. Additionally, the policies implemented must be subject to continuous evaluation and revised as necessary. With the increase in employment opportunities, labour markets will become stronger, and the effect of unemployment hysteresis will be further reduced.

References

Akcan, A.T. (2019), "Türk Cumhuriyetlerinde İşsizlik Histerisi: Panel Veri Analizi", *Turkish Studies - Economics, Finance, Politics*, 14(3), 623-637.

Akkuş, Ö. & S.G. Topuz (2019), "İşsizlik Histerisinin Geçerliliği: Gelişmekte Olan En Kırılgan Beşli", *Sosyoekonomi*, 27(39), 69-80.

Alkaya, A. & P. Işık (2022), "Temel Makroekonomik Faktörler ve Nüfusun İşsizliğe Etkileri: OECD Ülkeleri Üzerine Panel Veri Analizi", *Sosyoekonomi*, 30(54), 497-539.

Amsler, C. & J. Lee (1995), "An LM Test for a Unit Root in the Presence of a Structural Change", *Econometric Theory*, 11(2), 359-368.

Arık, B. (2023), "Türkiye ve Yunanistan'da Cinsiyete Göre İşsizlik Histerisi: 1988-2021 Yılları Arası Karşılaştırmalı Fourier Analiz", *Bitlis Eren Sosyal Araştırmalar Dergisi*, 1(2), 67-81.

Atabey, A.Ö. & M. Karakuş (2023), "BRICS-T Ülkelerine Yönelik İşgücü Piyasalarında Histeri Etkisi: Güncel Yaklaşımlarla Zaman Serisi ve Panel Veri Analizleri", *JOEEP: Journal of Emerging Economies and Policy*, 8(2), 67-82.

Atabey, A.Ö. (2023), "E7 Ülkelerinde İşsizlik Histerisi: Doğrusal, Doğrusal Olmayan ve Fourier Birim Kök Testlerinden Kanıtlar", *Paradigma: İktisadi ve İdari Araştırmalar Dergisi*, 12(Özel Sayı), 27-41.

Ataklı-Yavuz, R. et al. (2024), "Unemployment Hysteresis by Gender and Youth in the EU: Evidence from New Factor PANIC Unit Root Tests with Breaks", *International Journal of Manpower*, 46(3), 446-471.

Atamer, M.A. et al. (2023), "Türkiye Ekonomisinde İşsizlik Histerisi Hipotezinin Geçerliliğinin Analizi: 1988-2020 Dönemi", *Ekonomi Politika ve Finans Araştırmaları Dergisi*, 8(2), 283-304.

Atgür, M. (2021), "Türkiye'de Doğal İşsizlik Oranı Hipotezinin Geçersizliği ve İşsizlikte Histerisis Hipotezinin Geçerliliği (1988-2018)", *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi*, 9(5), 1467-1481.

Awolaja, O.G. et al. (2021), "Unemployment Hysteresis in Middle East and North Africa Countries: Panel SUR-Based Unit Root Test with a Fourier Function", *Middle East Development Journal*, 13(2), 318-334.

Aysu, A. & G. Dökmen (2011), "An Investigation on the Relationship between Government Size and Unemployment Rate: Evidence from OECD Countries", *Sosyoekonomi*, 16(16), 179-190.

Azazi, H. (2022), "Türkiye'de Cinsiyete Dayalı İşsizlik Histerisinin Analizi", *Business & Management Studies: An International Journal*, 10(3), 858-865.

Bakas, D. & Y. Makhlouf (2020), "Can the Insider-Outsider Theory Explain Unemployment Hysteresis in OECD Countries?", *Oxford Economic Papers*, 72(1), 149-163.

Baştav, L. (2019), "Empirical Evidence on the US Labour Market Hysteresis: New Keynesian Wage Phillips Curve (1990-2014)", *Sosyoekonomi*, 27(40), 31-53.

Belke, M. (2020), "Genç ve Kadın İşsizliğinde Histeri ve Doğal Oran Hipotezlerinin Test Edilmesi: Avrupa Birliği Ülkeleri İçin Fourier Panel Birim Kök Testlerinden Kanıtlar", *Gümüşhane Üniversitesi Sosyal Bilimler Enstitüsü Elektronik Dergisi*, *11*(Ek), 56-73.

Blanchard, O.J. & L.H. Summers (1986), "Hysteresis and the European Unemployment Problem", *NBER Macroeconomics Annual*, 1, 15-90.

Bozgeyik, Y. (2020), "İşsizlik Histerisinin Geçerliliğin Sınanması: E7 Ülkelerine İlişkin Ampirik Bir Çalışma", *OPUS Uluslararası Toplum Araştırmaları Dergisi*, 15(26), 4316-4333.

Caporale, G.M. et al. (2022), "Unemployment Persistence in Europe: Evidence from the 27 EU Countries", *Heliyon*, 8(2), 1-7.

Carrion-i-Silvestre, J.L. & L. Surdeanu (2013), "Panel GLS Unit Root Tests and Common Factors", *Mimeo*, Department of Econometrics, Statistics and Spanish Economy, University of Barcelona.

Carrion-i-Silvestre, J.L. et al. (2009), "GLS-Based Unit Root Tests with Multiple Structural Breaks under Both the Null and the Alternative Hypotheses", *Econometric Theory*, 25(6), 1754-1792.

Cheng, K.M. (2022), "Doubts on Natural Rate of Unemployment: Evidence and Policy Implications", *The Quarterly Review of Economics and Finance*, 86, 230-239.

Cuestas, J.C. & L. Gil-Alana (2024), "Unemployment Hysteresis by Sex and Education Attainment in the EU", *Journal of the Knowledge Economy*, 15(1), 801-827.

Dadam, V. & N. Viegi (2024), "Investigating Unemployment Hysteresis in South Africa", *South African Journal of Economics*, 92, 1-23.

Daştan, M. (2024), "Türkiye'de Yaş ve Cinsiyete Göre Ayrıştırılmış İşsizlik Oranlarında Histeri Etkisinin Test Edilmesi: Yeni Nesil Otoregresif Sinir Ağları Birim Kök Testinden Kanıtlar", *Akdeniz İİBF Dergisi*, 24(1), 27-38.

Doğaner, A. (2022), "Avrupa Birliği Ülkelerinde İşsizlik Histerisi Hipotezinin Doğrusal ve Doğrusal Olmayan Birim Kök Testleriyle Tespiti: 1991-2020 Dönemi", *İstanbul İktisat Dergisi*, 72(2), 753-785.

Ergül, M. (2024), "Türkiye'de Cinsiyete Göre İşsizlik Histerisinin Geleneksel ve Fourier Testlerle Analizi", *Bulletin of Economic Theory and Analysis*, 9(1), 329-346.

Eryer, A. & T. Konuk (2023), "İşsizlik Histerisi Hipotezinin Geçerliliği: G8 Ülkeleri İçin Ekonometrik Bir Uygulama", *Erzincan Binali Yıldırım Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 5(1), 30-39.

Friedman, M. (1968), "The Role of Monetary Policy", *The American Economic Review*, 58(1), 1-17.

Harvey, D.I. & S.J. Leybourne (2007), "Testing for Time Series Linearity", *The Econometrics Journal*, 10(1), 149-165.

Harvey, D.I. & T.C. Mills (2002), "Unit Roots and Double Smooth Transitions", *Journal of Applied Statistics*, 20(5), 675-683.

Harvey, D.I. et al. (2008), "A Powerful Test for Linearity When the Order of Integration Is Unknown", *Studies in Nonlinear Dynamics & Econometrics*, 12(3), 1-24.

Hepsağ, A. (2021), "A Unit Root Test Based on Smooth Transitions and Nonlinear Adjustment", *Communications in Statistics-Simulation and Computation*, 50(3), 625-632.

Im, K-S. et al. (2005), "Panel LM Unit-root Tests with Level Shifts", *Oxford Bulletin of Economics and Statistics*, 67(3), 393-419.

Kapar, R. (2005), "Aktif İşgücü Piyasası Politikaları", *İstanbul Üniversitesi İktisat Fakültesi Mecmuası*, 55(1), 341-371.

Karabıyık, E.D. (2021), "Orta ve Doğu Avrupa Ülkeleri Ülkelerinde İşsizlik Histerisi İçin Ampirik Bir Analizi", *Uluslararası Yönetim İktisat ve İşletme Dergisi*, 17(3), 800-813.

Karataş, A.R. (2024), "Türkiye'de Farklı Boyutlarıyla İşsizlik Histerisinin Geleneksel ve Fourier Testlerle Analizi", *Dicle Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 14(27), 453-473.

Komşu, M.S. & U.C. Komşu (2021), "İşsizlik Histerisi: BRICS-T Ülkeleri Üzerine Bir İnceleme", *Osmaniye Korkut Ata Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 5(2), 74-85.

Konat, G. & M.F. Coşkun (2022), "Testing Unemployment Hysteresis with Multi-Factor Panel Unit Root: Evidence from OECD Countries", *Economy of Regions*, 18(3), 742-754.

Kruse, R. (2011), "A New Unit Root Test Against ESTAR Based on a Class of Modified Statistics", *Stat Papers*, 52, 71-85.

Lee, J. & M. Tieslau (2019), "Panel LM Unit Root Tests with Level and Trend Shifts", *Economic Modelling*, 80, 1-10.

Lee, J. & M.C. Strazicich (2003), "Minimum Lagrange Multiplier Unit Root Test with Two Structural Breaks", *The Review of Economics and Statistics*, 85(4), 1082-1089.

Leybourne, S. et al. (1998), "Unit Roots and Smooth Transitions", *Journal of Time Series Analysis*, 19(1), 83-97.

Mike, F. & A.E. Alper (2020), "Gelişmiş ve Gelişmekte Olan Ülkeler İçin İşsizlik Histerisinin İncelenmesi: Fourier ADF Test Bulguları", *Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 10(1), 1-14.

Nazlıoğlu, Ş. et al. (2023), "Smooth Structural Changes and Common Factors in Nonstationary Panel Data: An Analysis of Healthcare Expenditures", *Econometric Reviews*, 42(1), 78-97.

Önal, M. (2021), "Cinsiyete Göre Türkiye'de İşsizlik Histerisi", *Biga İktisadi ve İdari Bilimler Fakültesi Dergisi*, 2(1), 29-41.

Papell, D.H. et al. (2000), "The Structure of Unemployment", *The Review of Economics and Statistics*, 82(2), 309-315.

Park, J.Y. & J. Sung (1994), "Testing for Unit Roots in Models with Structural Change", *Econometric Theory*, 10(5), 917-936.

Pata, U.K. (2020), "OECD Ülkelerinde İşsizlik Histerisinin Ampirik Bir Analizi: Fourier Panel Durağanlık Testi", *Sosyal Güvenlik Dergisi*, 10(1), 125-144.

Perron, P. (1989), "The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis", *Econometrica*, 57(6), 1361-1401.

Pesaran, M.H. et al. (2013), "Panel Unit Root Tests in the Presence of a Multifactor Error Structure", *Journal of Econometrics*, 175(2), 94-115.

Phelps, E.S. (1967), "Phillips Curves, Expectations of Inflation and Optimal Unemployment over Time", *Economica*, 34(135), 254-281.

Saraç, Ö. et al. (2023), "Türkiye Cumhuriyeti Vatandaşlarının Bağımsız Türk Dünyası Devletlerini Turizm Destinasyonu Olarak Algılama Düzeyleri", *Sosyoekonomi*, 31(58), 365-385.

Sigeze, Ç. et al. (2019), "AB Ülkelerinde ve Türkiye'de İşsizlik Histerisinin Fourier-KPSS Birim Kök Testi ile İncelenmesi", *İzmir İktisat Dergisi*, 34(1), 15-24.

Solarin, S.A. & C. Stewart (2021), "Is the Reports-Based Measure of Uncertainty Stationary? Evidence from a New Panel Residual Augmented Least Squares Unit Root Test", *The Singapore Economic Review*, 1-35, https://doi.org/10.1142/S0217590821500727.

Sollis, R. (2009), "A Simple Unit Root Test Against Asymmetric STAR Nonlinearity with an Application to Real Exchange Rates in Nordic Countries", *Economic Modelling*, 26(1), 118-125.

Songur, M. (2020), "OECD Ülkelerinde İşsizlik Histerisi: Fourier Panel KPSS Testinden Yeni Kanıtlar", *Dicle Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 25, 51-63.

Tam, P.S. (2006), "Breaking Trend Panel Unit Root Tests", *Computing in Economics and Finance*, Society for Computational Economics, No. 341.

Tokatlıoğlu, İ. et al. (2014), "AB Ülkeleri ve Türkiye İşgücü Piyasasında Histeri Etkisi: RATCHET Modeli Analizi", *Sosyoekonomi*, 22(22), 297-320.

Torun, M. et al. (2023), "Testing the Validity of Unemployment Hysteresis in Turkic Republics by Panel Unit Root Test Analysis", *Economic Insights - Trends and Challenges*, 12(2), 61-72.

Türkmen, S. & S. Özbek (2022), "Is Unemployment Hysteresis Valid in BRICS-T Countries? Evidence from Panel Fourier LM Approach", *Social Sciences Studies Journal (SSSJournal)*, 7(78), 542-549.

Uğur, B. & D. Atılgan (2021), "BRICS-T Ülkeleri İçin İşsizlik Histerisi Mi, Yoksa Doğal Oran Hipotezi Mi Geçerlidir?", *Çukurova Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 25(2), 311-325.

Üçler, Y.T. (2022), "Türkiye'de İşsizlik Histerisi Üzerine Bir Araştırma (2005-2022)", *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 25(1), 216-225.

World Bank (2024), *World Development Indicators*, <https://databank.worldbank.org/source/world-development-indicators#>, 23.08.2024.

Yıldız, G.A. (2021), "N-11 Ülkelerinde İşsizlik Histerisi Geçerli Mi?", in: *İktisadi ve İdari Bilimler Alanında Uluslararası Araştırmalar II* (215-229), Eğitim Yayınevi.

Yılmaz, M. (2023), "An Econometric Study on the Validity of the Unemployment Hysteresis Hypothesis in EU-15 and EU-28", *OPUS Journal of Society Research*, *20*(Human Behavior and Social Institutions), 842-851.

Appendix: 1
Descriptive Statistics of Variables

	General Unemployment Rate					
	Azerbaijan	**Uzbekistan**	**Türkiye**	**Turkmenistan**	**Kyrgyzstan**	**Kazakhstan**
Mean	6.546848	6.77	9.847303	6.058818	2.609727	7.013424
Median	5.86	5.345	10.227	4.452	2.558	5.77
Maximum	11.78	13.3	14.026	12.7	4.63	13.46
Minimum	0.9	1.9	6.495	1.4	1	0.9
Std. Dev.	2.449942	2.972327	1.924988	3.279061	1.01348	3.467596
Skewness	0.225387	0.88626	0.155788	0.659664	0.207189	0.364464
Kurtosis	3.092611	2.743624	2.702213	2.197417	1.992009	2.522
Jarque-Bera	0.29119	4.410392	0.255416	3.279056	1.633163	1.044755
Probability	0.864508	0.110229	0.88011	0.194072	0.44194	0.593109
Sum	216.046	223.41	324.961	199.941	86.121	231.443
Sum Sq. Dev.	192.071	282.7113	118.5785	344.0718	32.86855	384.775
Observations	33	33	33	33	33	33
	Female Unemployment Rate					
	Azerbaijan	**Uzbekistan**	**Türkiye**	**Turkmenistan**	**Kyrgyzstan**	**Kazakhstan**
Mean	7.124606	8.722697	10.80082	3.584818	2.76103	8.085485
Median	6.516	6.653	11.114	2.725	2.7	6.617
Maximum	12.7	18.703	16.507	7.387	4.982	15.524
Minimum	0.971	2.392	5.965	0.817	1.055	1.04
Std. Dev.	2.518611	4.551741	2.874796	1.870266	1.080458	4.055583
Skewness	0.131295	0.863372	-0.0231	0.633632	0.229897	0.345764
Kurtosis	3.509296	2.511715	1.953027	2.256116	2.02876	2.410424
Jarque-Bera	0.451462	4.427592	1.510145	2.969069	1.587735	1.13549
Probability	0.797933	0.109285	0.469977	0.226608	0.452093	0.566802
Sum	235.112	287.849	356.427	118.299	91.114	266.821
Sum Sq. Dev.	202.9889	662.987	264.4625	111.9327	37.35645	526.3281
Observations	33	33	33	33	33	33
	Male Unemployment Rate					
	Azerbaijan	**Uzbekistan**	**Türkiye**	**Turkmenistan**	**Kyrgyzstan**	**Kazakhstan**
Mean	5.968848	5.524606	9.414667	8.761061	2.491091	5.961303
Median	5.121	5.096	9.182	6.363	2.44	4.973
Maximum	10.865	9.977	13.916	18.472	4.369	11.444
Minimum	0.831	1.594	6.478	2.042	0.954	0.767
Std. Dev.	2.470837	2.0755	1.699988	4.800571	0.967686	2.905053
Skewness	0.270882	0.575478	0.446167	0.666302	0.199152	0.394682
Kurtosis	2.452283	2.757331	3.211096	2.176568	1.965038	2.661169
Jarque-Bera	0.816066	1.902432	1.156128	3.374073	1.690963	1.014616
Probability	0.664957	0.386271	0.560983	0.185067	0.42935	0.602114
Sum	196.972	182.312	310.684	289.115	82.206	196.723
Sum Sq. Dev.	195.3611	137.8464	92.47872	737.4553	29.96533	270.0587
Observations	33	33	33	33	33	33
	Youth Unemployment Rate					
	Azerbaijan	**Uzbekistan**	**Türkiye**	**Turkmenistan**	**Kyrgyzstan**	**Kazakhstan**
Mean	14.2753	14.55915	18.42406	12.16633	4.911697	9.750879
Median	13.67	12.1	18.295	9.179	4.597	5.214
Maximum	22.121	27.897	24.977	24.913	8.916	24.03
Minimum	1.674	3.956	12.929	2.74	1.837	1.608
Std. Dev.	4.438807	6.009437	3.121566	6.177001	2.079456	7.64923
Skewness	-0.62479	0.830351	0.373393	0.615328	0.379418	0.733244
Kurtosis	4.482513	2.841659	2.804956	2.315518	2.031058	2.017294
Jarque-Bera	5.168999	3.826626	0.819132	2.726663	2.082687	4.284907
Probability	0.075434	0.147591	0.663938	0.255807	0.35298	0.117367
Sum	471.085	480.452	607.994	401.489	162.086	321.779
Sum Sq. Dev.	630.4962	1155.627	311.8136	1220.971	138.3724	1872.343
Observations	33	33	33	33	33	33

	Young Female Unemployment Rate					
	Azerbaijan	**Uzbekistan**	**Türkiye**	**Turkmenistan**	**Kyrgyzstan**	**Kazakhstan**
Mean	15.88167	21.11239	19.63379	7.320697	5.992242	10.62991
Median	15.334	17.951	20.515	5.723	5.672	5.711
Maximum	25.724	43.036	30.088	14.375	10.321	25.565
Minimum	1.933	5.515	11.272	1.575	2.292	1.712
Std. Dev.	5.228768	10.13775	5.316373	3.48208	2.414281	8.087497
Skewness	-0.33137	0.772942	0.126748	0.490463	0.213822	0.688962
Kurtosis	3.912662	2.516441	2.142078	2.364702	1.80526	1.959026
Jarque-Bera	1.749225	3.607435	1.100398	1.878004	2.21414	4.100666
Probability	0.417023	0.164686	0.576835	0.391018	0.330526	0.128692
Sum	524.095	696.709	647.915	241.583	197.744	350.787
Sum Sq. Dev.	874.8804	3288.767	904.4424	387.9962	186.52	2093.043
Observations	33	33	33	33	33	33
	Young Male Unemployment Rate					
	Azerbaijan	**Uzbekistan**	**Türkiye**	**Turkmenistan**	**Kyrgyzstan**	**Kazakhstan**
Mean	12.79064	10.71418	17.79558	19.39076	4.205424	8.970636
Median	12.738	10.089	17.324	14.692	3.845	4.773
Maximum	19.147	18.921	24.938	40.861	8.133	22.626
Minimum	1.451	3.038	13.418	4.489	1.524	1.516
Std. Dev.	3.950034	3.803614	2.582843	10.30861	1.938278	7.248909
Skewness	-0.86967	0.468824	0.670086	0.677857	0.613461	0.770616
Kurtosis	4.324992	2.858258	3.307805	2.287833	2.357636	2.075447
Jarque-Bera	6.57378	1.236505	2.59986	3.224571	2.637208	4.441516
Probability	0.03737	0.538885	0.272551	0.199431	0.267508	0.108527
Sum	422.091	353.568	587.254	639.895	138.779	296.031
Sum Sq. Dev.	499.2886	462.9593	213.4744	3400.561	120.2215	1681.494
Observations	33	33	33	33	33	33