THE ANALYSIS OF YOUTH UNEMPLOYMENT IN TÜRKİYE UNDER THE IMPACT OF COVID-19 WITHIN THE FRAMEWORK OF UNEMPLOYMENT HYSTERESIS AND THE NATURAL RATE OF UNEMPLOYMENT

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Abstract

The research looks into the lasting impacts of youth unemployment rates in Türkiye after Covid-19 to comprehend the condition of the labor market. The goal is to assess whether the effect is enduring or short-lived, examining the credibility of the hysteresis theory or the natural rate theory in regards to Türkiye's youth unemployment rates. Changes in the structure of Türkiye's labor market were noticed prior to, during, and following the pandemic. Different statistical tests were employed to examine these changes, revealing that economic disturbances, particularly during times of crisis, have a persistent impact on the rates of unemployment among young people in Türkiye. The research indicates that the impacts have resulted in long-lasting consequences, posing difficulties for unemployment rates to revert to levels seen before the crisis. Specifically, the structural changes seen in 2016 and 2022 indicate that the pandemic has had a long-term effect on youth unemployment rates, stopping them from returning to pre-pandemic levels. This research provides important understanding to the literature on hysteresis of youth unemployment in Türkiye, backing the idea that enduring structural problems continue to exist following shocks, impacting both overall and youth unemployment levels.

Keywords *: Unemployment Hysteresis, Natural Rate of Unemployment, Youth Unemployment, Covid-19.*

Jel Classifications *: E24, E32, J64.*

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TÜRKİYE'DE GENÇ İŞSİZLİĞİNİN COVID-19 ETKİSİ ALTINDAKİ İŞSİZLİK HİSTEREZİSİ VE DOĞAL İŞSİZLİK ORANI ÇERÇEVESİNDE ANALİZİ

Öz

Araştırma, işgücü piyasasının durumunu anlamak için Covid-19 sonrası Türkiye'deki genç işsizlik oranlarının kalıcı etkilerini incelemektedir. Çalışmanın amacı işsizlik oranlarında meydana gelen etkilerin kalıcı mı yoksa kısa ömürlü mü olduğunu değerlendirmek ve histeri teorisinin veya doğal oran teorisinin Türkiye'nin genç işsizlik oranları açısından güvenilirliğini incelemektir. Pandemi öncesinde, sırasında ve sonrasında Türkiye işgücü piyasasının yapısında birtakım değişiklikler meydana gelmiştir. Bu değişiklikleri incelemek için farklı istatistiksel testler kullanılmış ve özellikle kriz dönemlerinde yaşanan ekonomik rahatsızlıkların Türkiye'deki gençler arasındaki işsizlik oranları üzerinde kalıcı bir etkiye sahip olduğu tespit edilmiştir. Çalışma sonuçları, bu etkilerin uzun süreli sonuçlara yol açtığını ve işsizlik oranlarının kriz öncesindeki seviyelere dönmesini zorlaştırdığını göstermektedir. Özellikle, 2016 ve 2022 yıllarında görülen yapısal değişiklikler, salgının ve krizlerin genç işsizlik oranları üzerinde uzun vadeli bir etkisi olduğunu ve salgın öncesi seviyelere dönmesini engellediğini göstermektedir. Bu araştırma, Türkiye'de genç işsizliğinin histerezisine ilişkin literatüre önemli bir anlayış getirmekte ve kalıcı yapısal sorunların şokların ardından var olmaya devam ederek hem genel hem de genç işsizlik seviyelerini etkilediği fikrini desteklemektedir.

Anahtar Kelimeler   : *İşsizlik Histerezisi, Doğal İşsizlik Oranı, Genç İşsizliği, Covid-19.*

Jel Sınıflandırmas   : *E24, E32, J64.*

INTRODUCTION

Unemployment is a chorinic economic problem that presents adverse performance indicators in the labour market specialy during periods of economics recession. Global crises such as those witnessed during the 2008 financial crises and the Covid 19 pandemic, have worsened labour market imbalances resulting in substantially higher rates of unemployment across the globe. The Covid 19 pandemic acted as a majör disruption in labour markests and has underscored requirements for more profound understandings of the Dynamics of unemployment and its long-run effects.

The economic therization of unemployment persistence uses concepts such as the natural rate of unemployment and hysteresis. The former states that by Fridman (1968) and Phelps (1968), the natural rate hypothesisall temporary shocks to the economy would only cause short deviations from the natural rate of unemployment. The latter however the hysteresis hypothesis has been defended especially by Blanchard and Summers (1986) whic showed that such deviations could in fact get permanent due to changes in structure deeper in the labour markets. These frameworks are important for analyzing the impact of economic crises on unemployment.

The issue of youth unemployment is of great importance in countries with a large youth population. Young people are more exposed to the effects of economic fluctuations and therefore may face long-term socioeconomic effects. Although many studies have been conducted on unemployment in Türkiye, there is a limited number of studies that include the Covid 19 process in their data. Therefore, the aim of this study is to determine the impact of the Covid 19 pandemic on youth unemployment in Türkiye, especially whether the increases in youth unemployment are permanent or temporary. Fort his purpose, econometric analysis was carried out using unit root methods such as ADF, Zivot-Andrews, Narayan Popp and Fouirer ADF.

I. THEORETICAL BACKGROUND

The global financial crisis of 2007, which occurred prior to the Covid-19 pandemic, had been regarded as the worst financial crisis since the Great Depression of 1936 (Hall, 2010) (Song, Shu, & Zhu, 2022). Triggered by the collapse of the housing market in the United States and the subsequent closure of major U.S. investment banks, this crisis is remembered for two significant outcomes: the onset of a global recession and the world debt crisis. Similarly, the consequences of the Covid-19 pandemic have led countries into severe economic distress, causing imbalances in labor markets. Therefore, the Covid-19 pandemic can also be considered a major crisis (Shinde, 2022; Verick, Schmidt-Klau, & Lee, 2021). Much like its predecessor crises, the most prominent impact of the Covid-19 pandemic on labor markets is reflected in rising unemployment rates. This phenomenon of rising unemployment following major economic crises underscores the importance of exporing the underlying mechanisms that contribute to its persistence over time. In fact, Blanchard and Summers, who are among the pioneers of the unemployment hysteresis theory, argued in their 1986 study that unemployment rates in Western Europe had been steadily increasing since the early 1970s, doubling during the period between the 1970s and 1980s, They further emphasized that due to the persistence of elevated unemployment rates, traditional macroeconomic theories struggled to explain this phenomenon necessitating alternative approaches such as "unemployment hysteresis".(Blanchard & Summers, 1986).

Unemployment is a concept that refers to the mismatch between labor supply and demand. In this context, it is frequently studied and debated in economic literature due to its persistence in labor markets, how it evolves, and the critical role these changes play in analyzing labor market dynamics. This makes unemployment a prominent concept. In this regard, the concept of unemployment hysteresis is one of the key economic theories considered by countries when shaping their labor market policies. Proposed by Blanchard and Summers (1986), this theory argues that temporary shocks can lead to permanent increases in unemployment rates, suggesting that such shocks can result in long-term structural changes in the labor market.

The question of whether changes in unemployment rates in countries are temporary or permanent is explained through three fundamental theories: the natural rate of unemployment, the hysteresis hypothesis, and the structuralist approach (Gordon, 1997; Kalbasi & Ashtary, 2011; Friedman, 1968; Phelps, 1968; da Silva, 2011; Campbell & Mankiw, 1987; Nelson & Plosser, 1982; Blanchard & Summers, 1986; Camarero, Carrion-i-Silvestre, & Tamarit, 2006).

The natural rate of unemployment hypothesis first appeared in the literature as a concept introduced by Friedman (1968) and Phelps (1968) when they incorporated adaptive expectations into the Phillips Curve model (Palley, 2012). In Friedman's own words, he described the "natural rate of unemployment" as follows:

> "The 'natural rate of unemployment', in other words, is the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is embedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the costs of mobility and so on." (Friedman, 1968)

This hypothesis posits that, in cases where there is a supply-side imbalance between labor supply and demand, the actual unemployment rate may exceed the natural rate of unemployment. However, over time, the unemployment rate will eventually return to the natural rate, albeit alongside inflation (Gordon, 1997; Kalbasi & Ashtary, 2011). The concept of NAIRU (Non-Accelerating Inflation Rate of Unemployment), derived from the Phillips Curve, also refers to the natural rate of unemployment and is known as the unemployment rate that does not increase inflation (Friedman, 1968; Phelps, 1968; da Silva, 2011).

Based on Friedman's (1968) natural rate of unemployment hypothesis, unemployment can be defined as an imbalance caused by the real imperfections of an economy moving toward a general equilibrium position. According to this view, equilibrium can only be disrupted in the short term by monetary policy when there is an exploitable trade-off between inflation and unemployment, as economic agents are unable to accurately predict prices. Consequently, proponents of the natural rate hypothesis argue that, due to the dynamics of labor markets, unemployment will never be entirely eliminated in any country. The primary reason for this is that even if a legal minimum wage is enforced, individuals willing to work for less than this wage may remain unemployed. In essence, the natural rate of unemployment is the result of imbalances between labor supply and demand in the labor market (Friedman, 1968; Phelps, 1968; da Silva, 2011).

With the transformation and development processes experienced by countries, changes in the NAIRU have begun to attract attention. Consequently, a broad body of literature has focused on explaining these changes. Researchers such as Nickell et al. (2005) have concentrated on the changes in labor market imperfections, as discussed by Friedman. On the other hand, other researchers, such as Blanchard and Wolfers (2000) and Blanchard (2005), have focused on the interactions between economic "shocks" such as globalization, institutional factors, and productivity slowdowns (Ball, 2009).

In summary, NAIRU, or the natural rate of unemployment, is one of the fundamental hypotheses in macroeconomic literature. The natural unemployment rate in a country is determined by the balance within the labor market. Fluctuations caused by imbalances in labor supply and demand can lead to deviations of actual unemployment rates from the natural rate. In such cases, NAIRU assumes that these deviations will eventually cause inflation to rise, driving unemployment rates back to their natural levels over time (Song & Wu, 1998). In other words, proponents of the natural rate hypothesis assume that the Phillips Curve theory will hold for countries' labor markets. However, the persistent unemployment problem, exacerbated by major global crises, has led to criticisms of the natural unemployment rate theory.

For instance, after the Great Depression of 1936, the oil crisis in 1937 significantly increased unemployment rates. The slowdown in production raised costs, which in turn led to higher inflation rates in many countries. This situation sparked doubts about the validity of both the Phillips Curve and the natural unemployment rate (Song & Wu, 1998; Pata, 2020; Coşgun, 2021; Summers, 1986). Summers (1986), noted that unemployment rates in the U.S. had been rising steadily since 1960s, driven by non-competitive wage disparities. Similarly, researchers who argue against the optimistic view presented by the natural unemployment rate suggest that it is difficult for unemployment rates to return to their average levels following economic shocks. Researchers such as Nelson and Plosser (1982), Campbell and Mankiw (1986), Brunello (1990), Mitchell (1993), Song and Wu (1998), Christopoulos and León-Ledesma (2007) tried to explain this new phenomenon. The most well-known of these is the research by Blanchard and Summers, which first introduced the hysteresis hypothesis.

Blanchard and Summers (1986) highlighted that shocks in the labor market could lead to permanent unemployment increases. Unionized insiders, prioritizing their interests during wage negotiations, may marginalize non-unionized outsiders, perpetuating unemployment (Christopoulos & León-Ledesma, 2007). Additionally, factors such as skill erosion and institutional inefficiencies exacerbate the hysteresis effect. Pissarides (1992) demonstrated that long-term unemployment reduces job vacancies, while Sessions (1994) argued that stigma effects and dismissal costs also contribute to hysteresis. From an econometric perspective, the presence of a unit root in the unemployment rate series and its failure to return to the mean is seen as a reflection of the hysteresis effect (Brunello, 1990; Camarero & Tamarit, 2004; Mitchell, 1993; Yılancı, 2009; Pata, 2020).

The third approach that attempts to explain the effects of shocks on unemployment is the structuralist approach, developed by the structuralist school, which emphasizes the internalization of the natural rate of unemployment. The argument put forth by the structuralists is that the natural rate of unemployment can be endogenous. They also suggest that just as economic variables can cause shifts in countries' Beveridge Curves (Layard, Nickell, & Jackman, 2005), labor markets can be affected by

events occurring in the economy. In his work, Phelps (1994) argues that the unemployment rate can deviate from its natural rate due to factors such as structural breaks and economic fluctuations, but these deviations will gradually diminish over the long term. Therefore, the structuralist view suggests that a stationary process with stochastic variance—i.e., an I(0) process—would be consistent with the presence of structural breaks along the steady-state path (Camarero, Carrion-i-Silvestre, & Tamarit, 2006).

The unemployment hysteresis hypothesis asserts that when a time series contains a unit root, shocks can have permanent effects, causing unemployment rates to rise during crises and become entrenched. In contrast, the natural rate of unemployment hypothesis argues that the series is stationary, even with structural breaks, and that economic shocks have only temporary effects. Therefore, the stochastic characteristics of the unemployment rate provide a crucial analytical tool within the framework of structuralist approaches, enabling policymakers to better understand the impact of economic fluctuations on unemployment (Pata, 2020).

A review of the literature reveals extensive research on how unemployment rates change and whether these changes stem from hysteresis effects or the natural rate of unemployment. General unemployment rates are crucial for shaping national policies. However, in countries with a high proportion of young people, such as Türkiye, youth unemployment rates are particularly important alongside overall unemployment rates (Murat & Şahin, 2011). Understanding whether youth unemployment arises from hysteresis or the natural rate effect is essential for designing effective labor market policies for the future.

Testing whether unemployment hysteresis or the natural rate of unemployment is influencing a country's unemployment figures is crucial for assessing labor markets. This is where the purpose of the present study becomes clear. Specifically, the study aims to assess the impact of the post-Covid-19 economic stagnation on labor markets, examining whether its effects on youth unemployment are permanent or temporary. While such tests have frequently been conducted on overall unemployment rates in the literature, there is a noticeable lack of studies focusing on the impact on youth unemployment—an important segment that will shape the future labor market. Therefore, this study not only seeks to fill this gap in the literature but also aims to provide a foundation for future research on this subject.

II.   STUDIES ON UNEMPLOYMENT HYSTERESIS IN TÜRKİYE

When examining the research on unemployment hysteresis in Türkiye, discussions have focused on whether general unemployment rates have a lasting impact or if they eventually return to the natural rate. However, there is a noticeable lack of studies in the Turkish literature that specifically address youth unemployment rates. The following table presents a detailed overview of studies conducted on unemployment hysteresis in Türkiye:

Author	Title	Country Group	Methodology	Conclusion
Bülent Güloğlu, M. Serdar İspir (2011)	Natural Rate of Unemployment or Unemployment Hysteresis? A Sectoral Panel Unit Root Test Analysis for Turkey	Türkiye	Panel Unit Root Test Considering Multiple Structural Breaks	A panel data set consisting of annual unemployment rate series covering the period from 1988 to 2008 has been used. The results obtained indicate that the unemployment rates of the sectors that make up the Turkish economy can be explained by a specific version of the natural rate of unemployment hypothesis. These findings reveal that, unlike previous studies, the long-term dynamics of sectoral unemployment in Türkiye are consistent with the natural rate of unemployment

				hypothesis.
Yıldırım Beyazıt Çiçen (2020)	The Lasting Impact of the Crisis on Unemployment in Turkey: The Global Crisis Period	Türkiye	Harvey et al. (2008) linearity test, Zivot-Andrews (1992) and Bai-Perron (1998) unit root tests considering structural breaks, and Kapetanios et al. (2003) and Kruse (2011) nonlinear unit root tests	In the study, econometric methods were used to examine whether the unemployment rates in Türkiye had lasting effects during the global crisis period. The data set consists of monthly unemployment rates published by TÜİK between 2005 and 2015. According to the study's findings, the global crisis had a hysteresis effect on unemployment rates in Türkiye, indicating that unemployment rates did not return to pre-crisis levels.
Ferit Kula, Alper Aslan (2014)	Unemployment Hysteresis in Turkey: Does Education Matter?	Türkiye	Unit Root Tests Considering Structural Breaks	In the study, semi-annual data from the period 1989-2008 were used to examine the differences in unemployment rates by education level in Türkiye. Analyses conducted using the Lagrange Multiplier (LM) unit root test indicate that the unemployment rates of high school and vocational school graduates differ from the overall unemployment rates. In tests considering structural breaks, it was concluded that the unemployment rates of high school and vocational school graduates return to equilibrium after shocks, indicating the validity of the natural rate hypothesis.
Taha Bahadır Saraç (2014)	Hysteresis Effect in Unemployment: The Case of Turkey	Türkiye	Linear and Nonlinear Unit Root Test	The study examines unemployment rates and labor force participation rates in Türkiye covering the period from 2005:01 to 2013:07. According to the results of the linear unit root test, it was found that the unemployment and labor force participation rate series are stationary, indicating the validity of NAIRU. However, the nonlinear unit root test results show that only the unemployment rate series is stationary in one case. In light of these findings, it is revealed that the hysteresis effect in unemployment is valid only in one case in Türkiye, and unemployment rates can be used to reflect this effect.
Seyhan Taş, Burak Uğur (2017)	Is Unemployment Hysteresis or Natural Rate Hypothesis Valid for Turkey?	Türkiye	Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Lee-Strazicich Unit Root Tests with Structural Breaks	It has been found that unemployment hysteresis is valid fort he Turkish economy during the period of 1980-2013.

Ahmet Tayfur Akcan (2018)	Unemployment Hysteresis in Agricultural and Non-Agricultural Sectors	Türkiye	Augmented Dickey Fuller ve Phillips Perron Unit Root Tests	In the study, data from the years 2005-2017 were used and the results indicated that unemployment hysteresis is present in both sectors, with it veing more pronounced in the non-agricultural sectors.
Selim Yıldırım, Selim İnançlı (2018)	An Empirical Evaluation of the Validity of the Unemployment Hysteresis Hypothesis in Turkey	Türkiye	ADF, KSS, KPSS and Fourier ADF, Fourier KSS, Fourier KPSS tests	In this study, monthly unemployment rate data from January 2005 to July 2016 were used. The study tests the validity of the unemployment hysteresis hypothesis in the Turkish economy. According to the findings, the unemployment hysteresis hypothesis is not valid in Türkiye, and the unemployment rate returns to equilibrium in a linear manner.
İpek Tekin (2018)	Unemployment Hysteresis in Turkey: Stationarity Tests with Fourier Functions	Türkiye	Fourier Unit Root Tests and unit root tests	The study tests the effect of unemployment hysteresis in Türkiye using monthly unemployment data from the period 2005-2017. According to the findings, it is observed that unemployment rates in Türkiye do not tend to revert to the mean, indicating the presence of unemployment hysteresis.
Ahmet Tayfur Akcan (2019)	Unemployment Hysteresis Among Youth in Turkey	Türkiye	Augmented Dickey Fuller and Phillips Perron Unit Root Tests	In the study, the hysteresis effect of youth unemployment and overall unemployment rates in Türkiye was investigated using monthly data from the period between January 2005 and June 2017. The results indicate that youth unemployment rates exhibit a greater hysteresis effect compared to overall unemployment rates.
Yıldırım Beyazıt Çiçen (2020)	Global Krizde Cinsiyet ve Medeni Duruma Göre İşsizlik Histerisi: Türkiye İçin Fourier Durağanlık Analizi	Türkiye	Fourier KPSS Tests	In the study, monthly unemployment rates from 2005 to 2014 were used. The results indicate that the unemployment rates of single men and married women are not stationary and exhibit unemployment hysteresis. On the other hand, the unemployment rates of married men and single women are found to be stationary.
Nuran Coşkun (2021)	Genç Nüfusta İşsizlik Histerisinin Sınanması: Türkiye Örneği	Türkiye	Time Series	The ADF test statistics provided findings that support unemployment hysteresis. When sudden breaks are considered, the structuralist approach was found to be valid. However, when smooth breaks are taken into account, mixed findings were obtained, supporting both the structuralist approach and the hysteresis effect.
Yıldırım	2008 Global	Türkiye	Fourier KPSS Tests	In the study, monthly unemployment rates

Beyazıt Çiçen (2021)	Krizinde Cinsiyet ve Yaş Gruplarına Göre İşsizlik Histerisi			from 2005 to 2014 were used. The results indicate that men and women were affected by unemployment at different levels, and in certain age groups, an increase in unemployment rates was observed following the crisis.
Hasan Azazi, Serhat Ateş (2022)	Türkiye İçin Genel İşsizlik ve Genç İşsizlik Histerisinin Karşılaştırmalı Bir Analizi	Türkiye	Philips Perron Unit Root Tests	It was concluded that there is no unemployment hysteresis effect in Türkiye. The study used monthly unemployment data from January 2014 to February 2022. The Phillips-Perron Unit Root Test was applied to analyze seasonally adjusted overall unemployment and youth unemployment rates.
Yasemin Telli Üçler (2022)	Türkiye'de İşsizlik Histerisi Üzerine Bir Araştırma (2005-2022)	Türkiye	Augumented Dickey Fuller and Phillips Perron Unit Root Tests	In this study, the effect of hysteria on general and youth unemployment rates in Türkiye is determined. It is determined that general unemployment data contains more hysteria than youth unemployment data. In the study, data on youth and general unemployment rates for the years 2005-2022 are used.
Aslı Özen Atabey (2024)	Türkiye'de Farklı Gruplar İtibarıyla İşsizlikte Histeri Etkisinin Analizi	Türkiye	Carrion-i-Silvestre vd. (2009) unit root test with multiple structural breaks, Fourier ADF and Fourier KPSS tests	In the study, generali youth, female and male unemployment rates and labour force participation rates are examinde and it is concluded that the hysteria effect is present.
Muhammet Daştan (2024)	Türkiye'de Yaş ve Cinsiyete Göre Ayrıştırılmış İşsizlik Oranlarında Histeri Etkisinin Test Edilmesi	Türkiye	ARNN-ADF Unit Root Tests Testi, ADF and PP Testleri, Zivot-Andrews, Lee-Strazicich and Narayan-Popp Tests	In the study, it is found that the hysteria effect is valid in unemployment rates in Türkiye regardless of age and gender differences.

As can be understood from the table, various studies in Türkiye have employed different methodologies to examine unemployment hysteresis and the natural rate hypothesis. While the findings regarding the validity of these theories have been mixed, the majority of the studies suggest that the hysteresis effect is prevalent. Therefore, it would not be inaccurate to conclude that unemployment rates in Türkiye exhibit persistent effects. In other words, economic growth has not had a temporary impact on Türkiye's unemployment figures, leading to unemployment rates becoming more permanent. However this study differs from prior studies in some important respects. First, examines the effects of Covid 19 pandemic whic is underexplored by the literature on the unemployment hysteresis in the case of Türkiye. With the inclusion youth unemployment of recent data during pandemic (January 2005 to June 2024) this paper adds a contemprorart example of a scenario that corroborates previous results. Secondly, while many studies mainly focus on econometric dimension of hysteresis this study explores also the policy implication providing with actionable knowledge how to deal with persistent unemployment in Türkiye. In doing so, it not only fills a gap in understanding the Covid 19 driven dynamics of unemployment but alson contributes to the literature by bridging theoretical frameworks with pratical solutions.

III.   ECONOMETRIC METHODOLOGY

Youth unemployment refers to individuals between the ages of 15-24 who are willing and able to work but are unable to find employment in the labor market. The youth unemployment rate is calculated by dividing the number of unemployed individuals in this age group by the total labor force within the same demographic (Murat & Şahin, 2011). Understanding the persistent effects of youth unemployment is crucial for shaping labor market policies. Particularly in the aftermath of the Covid-19 pandemic, it is essential to determine whether the rising youth unemployment rates are a result of temporary shocks or if they have become permanent. This knowledge is vital for informing the labor market policies that the country will implement in the future (Røed, 1996). Therefore, understanding whether the natural rate hypothesis or the hysteresis hypothesis is more applicable will serve as a valuable guide for policymakers.

Theoretically, if a country's unemployment time series contains a unit root at the level, it supports the "hysteresis" hypothesis, whereas if the series is stationary at the level, the "natural rate (NAIRU)" hypothesis is considered valid. The findings from such analyses can also provide insights into the development level of a country's labor market. Generally, in more developed labor markets, unemployment series tend to revert to the natural rate. In contrast, as the level of labor market development decreases, the hysteresis hypothesis becomes more applicable (Røed, 1996). To assess the impact of unemployment rates in Türkiye following the developments in the labor market after the Covid-19 pandemic, time series analysis will be employed.

The phenomenon of unemployment hysteresis in Türkiye is analyzed within the framework of the Covid 19 pandemic through the application of an extensive array of unit root tests. The first analysis was conducted using the Augumented Dickey-Fuller (ADF) test which is know as one of the most prominent test for assessing stationarity in time series data. To account for potential structural change induced by significant economic fluctuation, such as the current pandemic the Zivot-Andrews (ZA) unit root test which allows for a single structural break in the series was added.

The Narayan-Popp test was also applied to account for dual structural breaks further reinforcing the findings. Possible non-linearities and time related variations in the trend of youth unemployment are accounted for by the Enders and Lee Fourier ADF test through the flexible incorporation of Fourier terms. Structural breaks are modeled to examine the hysteresis effect more effectively within the natural rate of unemployment framework. This set of econometric tests ensures that the robustness and thoroughness of the stationarity properties of the youth unemployment data are thoroughly explored, allowing not only for the investigation but also for the assessment of the hysteresis effect itself.

III.I. Data Set

The dataset to be used in this study consists of monthly data from January 2005 to June 2024, derived from the core labor force indicators provided by the Turkish Statistical Institute (TÜİK). The youth unemployment data for individuals aged 15-24 has been seasonally adjusted by TÜİK. This period is particularly suitable for analysis as it includes various economic crises and structural changes, providing a comprehensive timeframe for assessing the impact of these events on youth unemployment and the labor market dynamics in Türkiye.

Table 1. Descriptive Statistics about The Youth Unemployment Data (15-24 Seasonally Adjust)

Mean	11.646	Kurtosis	1.881376
Median	11.669	Jarque-bera	13.33261
Maximum	12.122	Probability	0.001273
Minimum	11.310	Sum	2725.304
Std. Dev.	0.209064	Sum Sq. Dev.	10.183950
Skewness	0.170387	Observations	234

The descriptive statistics are shown in table 1. As it seen the average youth unemployment rate in the period of 11.646% and the standart deviation is of 209.0644 which confirms that there is variation over time. Skewness of suggests that that the distribution shows a slight skewness and Kurtosis indicates that the distribution is flatter than normal. The Jarque-Bera also reinforces the idea that the data is not normal. Such data provides profound information about youth unemployment such as presistence fluctions and other structural features. Unit root tests are statistical tests used to dermine whether a time series variable is non-stationary and has a unit root. For this reason it can ve aplied fort he data used in this study (Koop, 1992).

III.II. Method

Unit root tests used to examine the presence of unemployment hysteresis are crucial for determining the stationarity levels of time series data. In the literature, various tests have been developed, each considering different structural breaks, adjustments, and assumptions. In this study, to test the unemployment hysteresis and natural rate hypotheses, several unit root tests will be applied. These include the widely-used Dickey-Fuller (1979) unit root test, which does not account for structural breaks; the Zivot and Andrews (1992) and Narayan and Popp (2010) unit root tests, which account for sudden structural breaks; and the Enders and Lee (2012) Fourier ADF unit root test, which considers smooth structural breaks.

a. ADF Unit Root Test (Dickey ve Fuller, 1979)

The Augmented Dickey-Fuller (ADF) test is an enhanced version of the Dickey-Fuller (DF) unit root test, which was introduced by Dickey and Fuller in their 1979 study. The ADF test is one of the most widely used methods in the literature for examining whether time series data is stationary. The fundamental assumption in the ADF unit root test is to determine whether a time series contains a unit root. Similar to the DF test, the ADF test utilizes three different models: without a constant and trend, with a constant but no trend, and with both a constant and a trend. These models are represented by the following system of equations:

$$\Delta \gamma_{t-1} = \delta \gamma_{t-1} + \sum_{i=1}^{k} \alpha_i \, \Delta \gamma_{t-i} + \varepsilon_t \tag{1}$$

$$\Delta\gamma_{t-1} = \mu + \delta\gamma_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\gamma_{t-i} + \varepsilon_t \tag{2}$$

$$\Delta\gamma_{t-1} = \mu + \beta_t + \delta\gamma_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\gamma_{t-i} + \varepsilon_t \tag{3}$$

The fundamental hypothesis of the Augmented Dickey-Fuller (ADF) test is as follows:

$H_0: \delta = 0$

$H_1: \delta < 0$

Null Hypotehesis: The time series contains a unit root, meaning it is non-stationary. This implies that shocks to the series have a permanent effect. Alternative hypothesis is the time series does not contain a unit root, meaning it is stationary. This implies that shocks to the series have a temporary effect and the series reverts to its mean or trend. The ADF test is generally suitable for time series that do not contain structural breaks. (Dickey & Fuller, 1979).

b. Zivot ve Andrews (1992) Structural Beraks Unit Root Test

Zivot and Andrews (1992) criticized traditional unit root tests for not accounting for structural breaks and developed a unit root test that incorporates such breaks. Unit root tests conducted without considering structural breaks can yield misleading results. Structural breaks are crucial in regression models, particularly when analyzing the relationships between economic variables. Factors such as changes in economic policies, crises, natural disasters, and technological advancements can lead to structural shifts. Ignoring these breaks reduces the power of unit root tests and makes them inconsistent. Therefore, it is essential to account for structural breaks. The Zivot-Andrews (ZA) test allows for the endogenous identification of structural breaks, thus avoiding the misleading effects that these breaks might have on unit root test results (Zivot & Andrews, 1992).

In time series analyses where structural breaks are considered, if there is a deterministic trend in the series, a tendency to revert to the mean can be observed. However, if the series follows a deterministic or stochastic trend, unlike other series, there is no tendency to revert to the mean; instead, shocks can have permanent effects on the series (Atamer, Uçar & Ülger, 2023). The Zivot-Andrews unit root test, which critiques Perron's assumption of exogeneity (Yılancı, 2009), demonstrates structural breaks in level, in trend, and in both level and trend using the following models:

Model A:

$$\Delta y_t = \mu + \beta_t + \delta y_{t-1} + \theta_1 DU_t(\tilde{\lambda}) + \sum_{i=1}^{k} \delta_i \Delta y_{t-i} + \varepsilon_i$$

Model B:

$$\Delta y_t = \mu + \beta_t + \delta y_{t-1} + \theta_2 DT_t(\tilde{\lambda}) + \sum_{i=1}^{k} \delta_i \Delta y_{t-i} + \varepsilon_i$$

Model C:

$$\Delta y_t = \mu + \beta_t + \delta y_{t-1} + \theta_1 DU_t(\tilde{\lambda}) + \theta_2 DT_t(\tilde{\lambda}) + \sum_{i=1}^{k} \delta_i \Delta y_{t-i} + \varepsilon_i$$

$$DU(\hat{\lambda}) = \begin{cases} 1 & t > T_B \\ 0 & t \le T_B \end{cases} \quad DT(\hat{\lambda}) = \begin{cases} t - T\lambda & t > T - T\lambda \\ 0 & t \le T_B \end{cases}$$

In the equation system, "t" presents time, "T_B" presents break date, "λ=T_B/T" the point in the series where the break occurs. Model A, allows for a structural break only in the intercept, Model B, allows for a structural break only in the trend, Model C, allows for a structural break in both the intercept and trend.

c. Narayan ve Popp (2010) Unit Root Test with Two Structural Breaks

In traditional unit root tests, structural breaks are often ignored. Criticizing this limitation, Zivot and Andrews (1992) developed a unit root test that incorporates structural breaks into the model. While the Zivot-Andrews test allows for a single structural break, the Narayan and Popp (2010) unit root test improves performance by allowing for two structural breaks simultaneously. This approach provides a more accurate analysis of the effects of shocks or changes in national economies (Narayan & Popp, 2010). In addition to the NP test, other unit root tests that allow for two structural breaks include Lumsdaine and Papell (LP) (1997) and Lee and Strazicich (LS) (2003), both commonly used in studies with long time series.

The unit root test developed by Narayan and Popp (NP) has several advantages over the LP and LS tests. According to Yurtkuran (2021), some of these advantages include:

- The break dates are determined by placing the highest importance on the dummy coefficients used in structural breaks.

- The magnitude of structural breaks does not vary, allowing structural breaks to be measured more precisely.

- Unobserved deterministic and stochastic components in the series are taken into account.

The models used in the NP unit root test are represented as follows.

Model 1:

$$\Delta y_t = a_1 + b_1 y_{t-1} + \beta_1 D(T_B)_{1,t} + \beta_2 D(T_B)_{2,t} + \sigma_1 DU_{1,t-1} + \sigma_2 DU_{2,t-1} + \sum_{j=1}^{k} c_j \Delta y_{t-j}$$
$$+ \varepsilon_{1t}$$

Model 1 two breaks with fixed,

Model 2:

$$\Delta y_t = a_1 + a_2 t + b_1 y_{t-1} + \beta_1 D(T_B)_{1,t} + \beta_2 D(T_B)_{2,t} + \sigma_1 DU_{1,t-1} + \sigma_2 DU_{2,t-1}$$
$$+ \varphi_1 DT_{1,t-1} + \varphi_2 DT_{2,t-1} + \sum_{j=1}^{k} c_j \Delta y_{t-j} + \varepsilon_{2t}$$

Model 2 represents the two breaks in the fixed and trended cases. Null Hypotehesis: The time series contains a unit root, meaning it is non-stationary. Alternative hypothesis is the time series does not contain a unit root, meaning it is stationary.

d. Enders ve Lee (2012) Fourier ADF Unit Root Test

In 2012, Enders and Lee developed the FADF unit root test, which uses Fourier functions to model structural breaks in time series. Essentially, the FADF unit root test can be considered an extended version of the ADF test. The FADF test assumes that structural breaks in the series can be captured through sine and cosine terms. This approach allows for a flexible modeling of non-linear structures within the series (Enders & Lee, 2012). In other words, Fourier functions are included as deterministic components in the regression model, which is estimated similarly to the ADF test (Coşgun, 2021). The models in the study are constructed as follows:

Deterministic term for Model 1:

$$d_t^{model\ 1} = [1, \sin\left(\frac{2\pi kt}{T}\right) + \cos\left(\frac{2\pi kt}{T}\right)]$$

Deterministic term for Model 2:

$$d_t^{model\ 2} = [1, t, \sin\left(\frac{2\pi kt}{T}\right) + \cos\left(\frac{2\pi kt}{T}\right)]$$

Defineded.

Deterministic term without trend as follows equation:

$$d_t' = \alpha_0 + \sum_{k=1}^{n} a_k \sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \beta_k \cos\left(\frac{2\pi kt}{T}\right) \quad n \leq \frac{T}{2}$$

In determining the appropriate frequency value (k), models between 1 and 5 are initially estimated. The suitable k value is selected based on the model with the smallest sum of squared errors (Coşgun, 2021). The significance of the Fourier functions is tested using an F-test. Under the null hypothesis (H0), the trigonometric terms are insignificant, indicating that the model is linear, and these terms should not be included. In contrast, under the alternative hypothesis (H1), the trigonometric terms are significant, suggesting that the model is non-linear and that Fourier functions should be included (Yurtkuran, 2021). Applications of the Fourier ADF test can yield stronger results in detecting unemployment hysteresis compared to traditional tests (Enders & Lee, 2012).

IV. FINDINGS

In this study, unemployment hysteresis and the natural rate hypothesis were tested using youth unemployment rates following the Covid-19 pandemic. For this purpose, the analysis was conducted using traditional unit root tests, such as Dickey and Fuller (1979), the Zivot and Andrews (1992) and Narayan and Popp (2010) unit root tests, which account for sudden breaks, and the Enders and Lee (2012) Fourier ADF unit root test, which accounts for smooth breaks.

Table 2. ADF Unit Root Tests Results

Variable		Constant	Trend and Fixed Model	Without Trend and Fixed Model
Youth Unemployment Rate	ADF t statistic	- 2.281246	-3.067442	- 0.029621
	Prob. (p)	0.1790	0.1167	0.6719
H0: Has unit root. H1: Sationary.				
Seri %99, %95, %90 the confidence interval was evaluated and the case where H0 was rejected is indicated with * sign.				

In Table 1, the results of the traditional and most commonly used ADF unit root test, which does not account for structural breaks, are presented. The results for the model with a constant, the model with a trend and constant, and the model without a constant or trend are shown. The data in the table reflects the outcomes within a 95% confidence interval. According to these results, since the null hypothesis (presence of a unit root) could not be rejected for Türkiye's youth unemployment rate series, it was concluded that the series contains a unit root. ADF unit root test result shows that the young unemployment rate series is a non-stationary series while the effects of certain events such as

the Covid19. However the presence of a unit root indicates that the effects of shocks in the series including ones caused by pandemic, are permanent in nature and do not tent to revert. This is of course in line with something called unemployment hysteresis of which based on the test results, is true for Türkiye's youth. Thereby allthough this table does not clearly show any impact of pandemic persistent effects as evidenced in the series do indicate that some important impact of such exceptional cases, namely during the period of the Covid 19, last a long time Türkiye's youth labour market. This is corroborated even further by the fact that the macroeconomic disruptions attendant on a pandemic have been noted to line up with the ovserverd non-stationarity of the youth unemployment rate series.

Tablo 3. Zivot ve Andrews and Narayan ve Popp Unit Root Tests Results

Variable	Test	Zivot Andrews	Narayan Popp (Constant)	Narayan Popp (Constant and Trend Model)
		One Break	Two Breaks	
Genç İşsizlik Oranı	Test statistic	-4.231822	-4.105	-4.105
	Break Date	2013M01	2016, 2022	2016, 2022
	Critical Value	-4.93	-4.676 (%5)	%5: -5.076
	lags	2	2	2
H_0: The youth unemployment rate contaions a unit root with one structural break.				
H_1: The youth unemployment rate is stable but there is a structural break.				

In the context of the unemployment hysteresis theory, the results in Table 2 suggest that youth unemployment rates, especially in the face of economic shocks, can have lasting effects. This indicates that the shocks affecting youth unemployment rates do not result in short-term impacts but rather create long-term, permanent effects. The Zivot-Andrews test results reveal a structural break in 2013, which can be interpreted as a reflection of the consequences following the economic crisis. However, regarding the Covid-19 period, no structural break is identified in this test statistic, as the Zivot-Andrews unit root test only allows for one structural break.

The results presented in the table arguing from the point of view of the unemployment hysteresis theory suggest that the problems of youth unemployment that are caused by the shocks the economy to bear, may be longterm or permanently they can find their cause in. This in other words shows that the shocks that maket he rate of youth unemployment go high are not easy to overcome at least in the short run but their effects are of permanent nature.

The results of the Zivot-Andrews test Show a beak in 2013 which is the stuff that follows a crisis as one of the best explanations. Nevertheless, it needs to be made clear that the Zivot-Andrews unit root test can only identify one structural break. Which means that while this test does not specify the structural impact of the Covid 19, it does not imply that the pandemic had no lasting impact on youth unemployment. In other words, the limitations of the include the ability of the test to capture single break sor their relative significance, Correspondingly, the Narayan and Popp test that allows for two structural breaks the same as the Zivot-Andrews test detects them in 2016 and 2022. These discoveries accentuate the fact of the labour market in Türkiye that is unstable, while the test results remain to some extent unspecified the covid 19 pandemic effects, still thes can be compared to earlier perids such as 2013.

In light of thes observations, it can be argued that youth unemployment rates in Türkiye are highly sensitive to persistent shocks occurring during periods of deep economic difficulty. While the

economic conditions of 2013 had a pervasive and lasting impact on youth unemployment, it is critical to acknowledge that is not the sole factor at play. Further research is needed to fully understand the natüre and extent of the covid 19 pandemic's impact on the labour market and its interaction with pre-existing structural challenges.

Tablo 4. Enders ve Lee (2012) Fourier ADF Unit Root Test Results

Test	Variable	ADF Test Statistic	p value	Lags	Critical Value	Model AIC
Enders and Lee (2012)	Youth Unemploymen t Rate	-2.590854	0.284120	12	-4.000329 -3.430545 -3.138832	822.052992

According to the results of the non-linear Fourier test, the ADF test statistic was calculated to be smaller than the absolute value of the critical values at the 1%, 5%, and 10% significance levels, indicating that the series is not stationary at the 5% significance level. Thus, the hypothesis of a unit root presence could not be rejected. Based on the dataset used, the non-stationarity of Türkiye's youth unemployment rates, as seen in other tests, suggests that the economy has not quickly recovered from past shocks, economic fluctuations, and the effects of the Covid-19 pandemic. In other words, it is evident that the crises and the pandemic have diminished young people's hope of finding employment, which could lead to a long-term decline in labor force participation rates.

In this paper, the dynamics of the youth unemployment rate in Türkiye during the Covid-19 pandemic is analysed using unit root tests. The results reveal that the youth unemployment rate is non-stationary and the unemployment hysteresis theory is valid. These findings support the assumption that unemployment rates do not return to their previous levels after economic shocks. However, there are results in the existing literature that both coincide with and differ from these findings.

The results of the study Show the existence of the hysteresis effect in youth unemployment rates. It is consistent with studies such as (Çiçen, 2020; Akcan, 2019; Atabey, 2024), these studies also emphasise that unemployment rates in Türkiye have persistent effecrs after economic shocks. At the same time (Taş & Uğur, 2017; Tekin, 2018) also find that the hysteresis effect is valid in overall unemployment rates in Türkiye. As mentioned above, the results of Zivot and Andrews and Narayan Popp tests emphasise the importance of structural breaks in unemployment rates. Similarly, many studies in the literature (Daştan, 2024; Üçler, 2022) have also shown that these breaks strengthen the persistence of the hysteria effect. Therefore, this also supports the results of this study.

The findings of the study differed from the literature in two points. These differences are caused by the studies that find "Natural Proportion Theory and Mixed Results".

In the literature, especially sectoral and education based analyses studies argue that unemployment rates return to equilibrium after shocks and the natural rate theory is valid (Güloğlu & İspir, 2011; Kula & Aslan, 2014). These contradict the results of the hysteria effect in the findings of this study. This difference may be due to the scope of the data analysed and the methodologies used. Studies such as (Saraç, 2014) and (Coşgun, 2021) present mixed findings in support of both the hysteresis effect and the natural rate theory in unemployment dynamics. This situation indicates that the Covid 19 pandemic may have longer lasting effects than other economic shocks since the data used in this study cover the Covid 19 period.

In this way the study makes an important contribution to the literature by analysing in detail how youth unemployment rates are affected by economic shocks. The long term effects of a global shock such as the pandemic especially on youth unemploymenti have not been adequately addressed in the literature. Therefore, while the findings establish a link with the existing literature, they also aim to fill the knowledge gap in this area.

The econometric findings highlight the need for policymakers to adopt proactive and targeted strategies in addressing youth unemployment. Initiatives such as STEM(Science, Technology, Engineering, Mathematics)-focused teaching methods, the expansion of on-the-job training programs, and the promotion of innovation and technology-driven job sectors would help restore young people's hope of finding employment. These measures could help mitigate the persistence of youth unemployment caused by hysteresis effects.

CONCLUSION AND EVALUATION

The theoretical examination of the persistent effects observed in youth unemployment rates in Türkiye following the Covid-19 pandemic is crucial for understanding the state of the labor market. Indeed, the purpose of this study is to determine whether the impact of the Covid-19 pandemic on youth unemployment rates is permanent or temporary. In other words, the study seeks to answer the question: "Is unemployment hysteresis or the natural rate hypothesis valid for Türkiye's youth unemployment rates?" Similar to labor markets worldwide, structural breaks were observed in Türkiye's labor market before, during, and after the pandemic. To assess the impact of these breaks, the study employs both traditional unit root tests like ADF and those that account for structural breaks, such as the Zivot-Andrews, Narayan and Popp tests, as well as the more recent Fourier ADF unit root test.

The econometric findings indicate that economic shocks, particularly during periods of crisis, have had a lasting impact on Türkiye's youth unemployment rates, and the unemployment hysteresis hypothesis holds. This suggests that the shocks experienced in the labor market have created persistent effects, making it difficult for unemployment rates to return to their pre-crisis levels.

In the analyses that account for structural breaks, particularly the breaks observed in 2016 and 2022, it is evident that the shocks experienced by the labor market after the Covid-19 pandemic have had lasting effects. This suggests that the pandemic has created a permanent impact on youth unemployment rates, preventing them from returning to their natural levels. Furthermore, the fact that youth unemployment rates are higher than overall unemployment rates in countries like Türkiye highlights that unemployment among young people has much more severe consequences compared to other groups. Considering Türkiye's demographic structure, the failure of youth unemployment rates to revert to their natural levels indicates that the Covid-19 pandemic has caused significant disruption in this area as well.

This study makes an important contribution to the youth unemployment hysteresis literature, particularly given the limited number of studies on this topic in Türkiye. By demonstrating that the unemployment hysteresis theory developed by Blanchard and Summers (1986) is applicable to Türkiye's labor market, the study adds valuable insight to the literature. Additionally, the findings align with most studies conducted on overall unemployment rates in the literature, showing that long-term structural issues persist after shocks, both in general unemployment and youth unemployment rates.

This research, together with the existing literature on unemployment hysteresis on the other hand, emphasises the urgent need for further research to develop effective solutions to adress the lasting effects of youth unemployment in Türkiye. In this direction, some suggestions for future research can be listed as follows:

- Education policies that aim to meet the competence expectations of the labour market should be further explored to improve the alignment between education and the labpur market. Future studies could particularly focus on how STEM (Science, Technology, Engineering and Mathematics) education policies can effectively engage and prepare young people. Furthermore, the potential to promote employment opportunities in digital economy and technology oriented jobs could be analysed to prevent young people wtih appropriate skills and qualifications from becoming unemployed.

- Instead of focusing solely on job creation, the role of youth entrepreneurship in reducing both current and future unemployment rates should be explored. Future research could examine how youth entrepreneurship programmes and an innovation driven entrepreneurship ecosystem can provide sustainable employment alternatives fort he young workforce.

- By taking into account the young generation's intense interest in technology, future studies may investigate how practices such as prioritising digitalisation in sectors, creating flexible working environments and developing Project based working systems affect the participation of young people in the labour market as a solutions propasal to eliminate the permanent effects of unemployment hysteresis.

- Young people who stayed at home during the Covid 19 pandemic appear to have difficulties in returning to the labour market after the pandemic. Therefore, future research could examine the increased feelings of hopelessness and psychological problems among young people, as well as the rapid loss of hope in finding a job. It may also examine the effectiveness of psychosocial support programmes in increasing their motivation to look for a job and overcome the challenges of the labour market.

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Ethics Statement : The author declares that ethical rules have been followed in all preparation processes of this study. In case of a contrary situation, ÖHÜİİBF Journal has no responsibility, and all responsibility belongs to the author (s) of the study.