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THE SILENT RESISTANCE OF GENDER: THE HYSTERESIS EFFECT IN WOMEN'S UNEMPLOYMENT IN TURKIYE

Sıddıka AKDENİZ^{1*}

¹Assistant Professor, Sırnak University, Sırnak, Türkiye

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Corresponding Author: Sıddıka AKDENİZ
(akdenizsba@gmail.com.tr)

ABSTRACT

This study examines the stationarity properties of the female unemployment rate in Türkiye within the framework of the unemployment hysteresis hypothesis. While the hysteresis literature has largely focused on aggregate unemployment dynamics, gender-based analyses remain limited, particularly for high-frequency data. Drawing on feminist macroeconomic approaches that conceptualize labor markets as institutionally gendered structures, the study evaluates whether economic shocks generate persistent effects in female unemployment. Monthly seasonally adjusted female unemployment rate data covering the period 2005:01-2025:09 are employed. The hysteresis hypothesis is tested using a multi-stage econometric strategy including Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), KPSS and Fourier-based unit root tests. The findings indicate that the female unemployment series is non-stationary at level and becomes stationary after first differencing, implying an I(1) process. Fourier terms are not statistically significant, suggesting that persistence is primarily linear rather than driven by smooth structural shifts. These results provide empirical evidence supporting the hysteresis hypothesis for female unemployment in Türkiye. The findings suggest that labor market shocks produce long-term effects and that gender-based structural inequalities may reinforce persistence mechanisms. The study contributes conceptually by integrating gendered labor market theory with hysteresis analysis and methodologically by employing high-frequency data and multiple unit root specifications. Policy implications underline the necessity of gender-sensitive labor market interventions aimed at preventing long-term scarring effects in female employment.

KEYWORDS: Female unemployment, hysteresis hypothesis, gendered labor markets, unit root tests, Fourier ADF, *Türkiye*, labor market persistence.

1. INTRODUCTION

The inability of unemployment rates to return to their previous equilibrium levels following economic shocks in labor markets has brought the debate on unemployment hysteresis to the center of the economics literature. The study by Blanchard and Summers (1986) created a significant rupture regarding the dynamic nature of unemployment by demonstrating that this phenomenon cannot be explained solely by temporary cyclical deviations. In this approach, unemployment is not a short-term response to macroeconomic shocks; rather, it is a process that can settle into a new equilibrium path through the traces left by shocks in the labor market. Therefore, hysteresis positions unemployment not as a “deviation,” but as a mechanism that generates persistence.

Although the hysteresis literature was initially shaped through wage rigidities and cyclical fluctuations, it has over time incorporated the institutional structure of the labor market into the analysis as well. The insider–outsider approach has demonstrated that through the bargaining power of the employed labor force and dismissal costs, shocks can create asymmetric and persistent effects on the unemployed (Lindbeck, 2002). Within this framework, persistence in unemployment is a result not only of macro demand shocks but also of institutional structures and market regulations. Empirical studies on OECD countries also support this structural dimension (Bakas, 2014).

However, despite this enrichment in the literature, there is a dimension that is frequently overlooked in discussions of unemployment hysteresis: gender. Labor markets are institutionally gendered structures. Macroeconomic policy regimes are not gender-neutral; rather, fiscal and monetary priorities shape labor market outcomes through socially structured constraints that systematically disadvantage women (Elson & Çağatay, 2000). Wage mechanisms, care regimes, sectoral segmentation, and employer behavior distance the labor market from being a neutral sphere (Elson, 1999). For this reason, the effects of economic shocks on employment cannot be expected to be symmetric between women and men. Women’s labor force participation decisions, their probabilities of exiting unemployment, and their speed of return to employment generate different dynamics due to factors such as the distribution of care burdens, sectoral concentration, and informal employment.

Recent empirical studies more clearly reveal this divergence. Cuestas et al. (2022) demonstrate that in European countries the responses of female and male

unemployment series to shocks differ and that the degree of persistence can diverge by gender. Panel unit root analyses conducted for OECD countries also indicate that in certain country groups the hysteresis effect in female unemployment is more pronounced (Bekmez & Özpolat, 2016; Bakas, 2014). Studies incorporating demographic breakdowns emphasize that hysteresis is not a uniform structure; rather, it exhibits a heterogeneous pattern across age, education, and gender dimensions (Ataklı Yavuz, 2024; Singh et al., 2025).

The concept of “she-cession,” which became widespread in the literature with the COVID-19 pandemic, has demonstrated how deeply this asymmetry can intensify in the face of macro shocks (Alon et al., 2020). Multi-country empirical studies reveal that the pandemic has generated more severe and persistent effects on female employment (Bluedorn et al., 2021; Bluedorn et al., 2023). These findings suggest that large-scale shocks can interact with gendered labor market structures and thereby reinforce persistence in unemployment.

In the context of *Türkiye*, the female labor market embodies structural vulnerabilities due to factors such as low labor force participation rates, concentration in the service sector, the relative prevalence of informal employment, and limited care infrastructure. These vulnerabilities increase the likelihood that economic shocks will generate more persistent effects on female unemployment. Particularly during periods of crisis, the increase in care burdens and the tendency to withdraw from the labor force, when combined with prolonged unemployment durations, can deepen human capital loss. In this context, hysteresis can be interpreted not only as a statistical indicator of persistence for female labor in *Türkiye*, but also as a “silent resistance” produced by the gendered structure of the labor market.

This study aims to empirically test the existence of the hysteresis effect in female unemployment in *Türkiye* and to reveal how this persistence is shaped within the context of gender. Using seasonally adjusted monthly female unemployment rate series covering the period 2005–2025, unemployment hysteresis is tested through time series methods. The use of monthly data allows seasonal dynamics to be captured more sensitively and increases the finite sample power of unit root tests (Choi & Chung, 1995).

This study aims to provide contributions at three levels: (i) to achieve a conceptual framework expansion by addressing unemployment hysteresis together with gendered labor market institutions, (ii)

to offer a methodological contribution through high-frequency data and alternative time series methods, and (iii) to establish an evidence-based discussion ground for policy areas aimed at making female employment more resilient to economic shocks based on the obtained findings.

2. UNEMPLOYMENT HYSTERESIS IN THE CONTEXT OF GENDER: CONCEPTUAL AND EMPIRICAL FRAMEWORK

Labor markets are not neutral in terms of gender. The systematic divergence between women and men in employment, unemployment, and labor force participation dynamics indicates that this field embodies an institutionally gendered structure. The feminist economics literature has long drawn attention to this point (Elson, 1999). Nevertheless, mainstream analyses still tend to reduce women's labor primarily to wage and productivity indicators. Yet, a rational analysis of the labor market will remain incomplete without taking into account the unequal distribution of care labor within the household and the impact of gender roles on production processes (Folbre, 2001). Feminist macroeconomic analyses further demonstrate that economic crises are transmitted through gendered care regimes and labor market segmentation, thereby generating asymmetric and often long-lasting employment effects on women (Seguino, 2013). These structural inequalities render women's processes of entry into and exit from the labor market more fragile compared to men. Findings indicating that female employment responds more sensitively to economic fluctuations constitute the empirical reflection of this fragility (Kabeer, 2012). Indeed, it has been shown that the sectors in which women are concentrated are more sensitive to cyclical fluctuations and that female unemployment increases more rapidly during periods of crisis (Razavi et al., 2012). More striking is the recovery process. In the post-crisis period, women's re-entry into the labor force generally occurs more slowly; this situation lays the groundwork for unemployment to move beyond a temporary fluctuation and acquire persistence (Seguino, 2010). Institutional analyses of post-recession labor markets indicate that such slower recovery patterns are embedded in gendered employment regimes, reinforcing the risk of long-term unemployment persistence for women (Rubery & Rafferty, 2013).

The unemployment hysteresis approach seeks to explain long-term dynamics by distinguishing the persistence observed in the labor market from temporary cyclical fluctuations. Blanchard and

Summers (1986) proposed that economic shocks can permanently displace the unemployment rate from its long-term equilibrium level and render unemployment path-dependent, thereby offering an alternative framework to the natural rate of unemployment approach. In this perspective, unemployment is not merely a short-term deviation; rather, it is a process that can take shape around a new equilibrium under the influence of shocks.

The hysteresis hypothesis is empirically tested through the stationarity properties of unemployment series. In series containing a unit root, the effects of shocks do not disappear over time, and the tendency toward persistence strengthens. However, stationarity tests do not directly indicate for which groups persistence intensifies. Ball (2009) demonstrates that demand-side shocks generate long-term employment losses particularly for vulnerable groups, thereby showing that hysteresis is not merely a statistical phenomenon but one that produces real economic consequences.

Within the scope of this study, when the unemployment hysteresis approach is considered from the perspective of gender, which we define as the silent resistance of the labor force, hysteresis mechanisms are expected to operate more strongly in terms of female labor. Women's prolonged detachment from the labor market leads to human capital loss from a macroeconomic perspective. Comparative evidence further shows that prolonged unemployment generates institutional scarring effects, reducing re-employment probabilities and reinforcing long-term disadvantage within specific welfare and labor market regimes (Gangl, 2004). At the same time, discriminatory policies encountered by women in their re-entry into the labor market within the context of gender emerge as the primary mechanisms reinforcing persistence in female unemployment (Ball, DeLong and Summers, 2014). This situation demonstrates the partial validity of the assumption that the stationarity properties of female unemployment series may diverge from total unemployment and/or male unemployment series. Although the history of the unemployment hysteresis approach does not extend very far back, recent empirical studies reveal that unemployment hysteresis exhibits a heterogeneous structure across demographic groups. Analyses conducted through gender-based disaggregation show that female unemployment displays higher persistence compared to male unemployment and that the hysteresis hypothesis is more strongly confirmed for this group (Azazi, 2022). Similar results have been obtained in studies conducted for *Türkiye*; it has been

empirically demonstrated that female unemployment responds more sensitively and more persistently to economic shocks (Şahin Kutlu, 2023). A recent study examining the gender-based unemployment hysteresis approach specifically for *Türkiye* shows that the stationarity properties of the female unemployment series diverge markedly from those of male unemployment and that this divergence possesses a structural character (Acar and Soydal, 2024). These findings, which also constitute the main objective of this study, demonstrate that addressing female unemployment as an independent unit of analysis is necessary not only descriptively but also methodologically.

This study examines the stationarity properties of the female unemployment series within the framework of the unemployment hysteresis hypothesis, drawing on the theoretical and empirical literature. The analysis, conducted in line with the assumption that gender-based structural inequalities may reinforce persistence in female unemployment, is tested through the dataset and econometric methods detailed below.

Although it does not claim to cover the entire literature, a table summarizing selected studies is presented below in order to reveal the development of the subject and methodological tendencies.

Table 1: Overview of Empirical Studies on Unemployment Hysteresis.

Author(s)	Country/ Sample	Data Type	Period	Method	Gender Dimension	Main Findings
Blanchard & Summers (1986)	European countries	Annual	1960-1985	Theoretical + Time Series	None	Unemployment responds persistently to shocks; the hysteresis hypothesis is strong.
Neumann & Topel (1991)	USA	Annual	1950-1988	ARIMA	None	Persistence in unemployment exhibits periodical differences.
Røed (1997)	OECD countries	Annual	1960-1992	Panel Unit Root	None	Hysteresis is heterogeneous across countries.
Gustavsson & Österholm (2006)	Sweden	Annual	1970-2004	Nonlinear Unit Root	None	When structural changes are taken into account, hysteresis weakens.
Ball (2009)	OECD/ USA	Annual	1980-2007	Structural Macro Analysis	Indirect	Demand shocks increase unemployment persistently in the long run.

Chang et al. (2011)	OECD countries	Annual	1970-2008	Panel SURADF	None	Hysteresis is valid in many countries.
Cuestas & Gil-Alana (2018)	Europe	Annual	1970-2015	Fractional Integration	Indirect	Long memory and persistence in unemployment are strong.
Yılanç (2011)	<i>Türkiye</i>	Annual	1923-2007	Nonlinear Unit Root	None	The unemployment rate in <i>Türkiye</i> has a nonlinear structure; hysteresis is valid.
Yılanç & Özcan (2013)	<i>Türkiye</i>	Annual	1980-2011	Fourier ADF	None	Hysteresis is strongly confirmed under structural breaks.
Güriş, Tiftikçigil & Yılanç (2017)	<i>Türkiye</i>	Annual	1988-2015	Fourier KPSS	None	Linear tests are insufficient; nonlinear hysteresis is valid.
Özkan & Altınsoy (2015)	<i>Türkiye</i>	Annual	1988-2014	ADF, PP, ZA	None	Hysteresis is valid even under structural breaks.
Kılıç, Karabulut & Uğurlu (2018)	<i>Türkiye</i>	Annual	1980-2016	ZA, LM	None	Persistence in unemployment in <i>Türkiye</i> is strong.
Akkuş & Topuz (2019)	<i>Türkiye</i>	Annual	1988-2017	ADF, KPSS	None	The natural rate hypothesis is rejected.
Çiçen (2020)	<i>Türkiye</i>	Monthly	2005-2019	Fourier KPSS	Female-Male	Female unemployment is more persistent compared to male unemployment.

Azazi (2022)	<i>Turkiye</i>	Monthly	2005–2020	Fourier ADF	Female	Hysteresis in female unemployment is strong.
Şahin Kutlu (2023)	<i>Turkiye</i>	Monthly	2005–2022	Fourier ADF	Female	The nonlinear structure is limited; linear hysteresis is dominant.
Acar & Soydal (2024)	<i>Turkiye</i>	Annual	2000–2022	ADF, PP, KPSS	Female–Male	Gender-based hysteresis is pronounced.
Çat & Kırca (2024)	<i>Turkiye</i>	Monthly	2005–2023	Wavelet + FADF	Age & Gender	Persistence is higher in youth and female unemployment.

The studies summarized in the table reveal that unemployment hysteresis has an extensive literature both internationally and in the context of *Turkiye*. However, significant differences are observed in data frequency and methodological preferences. In the international literature, early studies predominantly examined hysteresis through linear time series and panel data approaches; more recent studies have turned toward nonlinear dynamics and long memory properties. This methodological diversity indicates that the responses of unemployment rates to economic shocks exhibit a heterogeneous structure depending on country and period conditions.

In the Turkish literature, nonlinear unit root tests and Fourier-based approaches appear to be particularly prominent. Yılanıcı (2011) and Yılanıcı and Özcan (2013) emphasized the persistence property of the unemployment rate in *Turkiye* through nonlinear models that take structural breaks into account. Similarly, Güriş, Tiftikçigil and Yılanıcı (2017), using the Fourier KPSS test, drew attention to the limitations of linear tests and demonstrated that nonlinear methods can produce more consistent results. However, in the Turkish literature, studies addressing unemployment hysteresis through a gender-based disaggregation are limited. In particular, analyses that focus on female unemployment using monthly data are quite scarce. Existing studies indicate that female unemployment may exhibit higher persistence compared to male unemployment; however, these findings have not been comparatively and systematically tested under different sets of methods. This situation points at a significant gap in the literature both

methodologically and in terms of the gender dimension.

This study provides a methodological and empirical extension to the limited number of studies in the Turkish literature that examine female unemployment within the framework of hysteresis. Using monthly data, the female unemployment series is evaluated under a holistic approach that incorporates linear, structural break, and nonlinear unit root tests together. This methodological diversity makes it possible to comparatively reveal how persistence dynamics are shaped under different model assumptions.

In this respect, the study adds gender-based empirical evidence to the unemployment hysteresis literature in *Turkiye* and renders visible the effect of methodological choices on the results.

3. DATASET AND METHOD

The dataset and econometric methods used in this section are designed not only for the purpose of a technical stationarity test but also in a manner that renders visible the gender-based differences of labor markets. The theoretical and empirical debates suggesting that unemployment hysteresis may be more pronounced in terms of female labor directly affect the selection of the variable used in the analysis and the methodological approach. For this reason, before proceeding to the presentation of the econometric tests, it is clearly set forth how the study conceptualizes the gender perspective and why female unemployment is addressed within a separate analytical framework.

The theoretical and empirical literature presented

in the previous section demonstrates that addressing unemployment hysteresis under a gender-based disaggregation is meaningful both theoretically and empirically (Elson, 1999). In particular, findings indicating that the responses of female unemployment to economic shocks diverge from those of male unemployment and that this divergence becomes pronounced in the dimension of persistence render it necessary to examine female unemployment as an independent unit of analysis (Acar and Soydal, 2024).

The methodological approach of this study is based on the assumption that labor markets are not homogeneous in terms of gender. In the feminist economics and gender literature, it is emphasized that women's entry into and exit from the labor market are more fragile compared to men; and that they possess structural disadvantages in terms of care responsibilities, concentration in certain sectors, informality, and employment continuity (Elson, 1999; Seguino, 2010). In this context, it is suggested that the effects of economic shocks on female unemployment may be more persistent and that recovery processes may not operate symmetrically.

In the unemployment hysteresis literature, the persistence of shocks is empirically tested through the stationarity properties of unemployment series. The non-stationarity of a series in levels implies that past shocks permanently affect the unemployment rate and supports the hysteresis hypothesis (Blanchard and Summers, 1986; Ball, 2009). In this study, this framework is addressed specifically for female unemployment; the analysis is conducted under the assumption that gender-based structural inequalities may reinforce hysteresis mechanisms.

Accordingly, in this section of the study, the dataset used is introduced and the econometric methods followed in testing the unemployment hysteresis hypothesis are explained in detail. The methodological approach adopted in the study is based on a holistic framework that jointly considers the linear and nonlinear dynamics of unemployment series (Yılanıcı & Özcan, 2013). This approach increases the methodological sensitivity of the obtained findings by allowing different tests to be applied to the same dataset (Güriş, Tiftikçigil & Yılanıcı, 2017).

3.1. Dataset

Empirical studies conducted for *Türkiye* show that examining unemployment hysteresis using monthly and seasonally adjusted data is a common practice (Çiçen, 2020; Özkan and Altınsoy, 2015). However, it is also emphasized in the literature that

seasonal unit root tests in monthly series may produce different results and that seasonal adjustment alone may not be sufficient (Yıldırım, 2013). For this reason, this limitation is taken into account when evaluating the obtained findings.

The dataset used in the analysis consists of seasonally adjusted monthly 15+ female unemployment rate series for the period 2005:01–2025:09 obtained from the Turkish Statistical Institute (TURKSTAT) Household Labor Force Survey. Data prior to 2005 were not included in the study due to maturity incompatibility. The fact that TURKSTAT began calculating post-2005 data on a monthly basis, thereby increasing the number of observations compared to annual data, and as emphasized by Choi and Chung (1995) and Gustavsson and Österholm (2006), the increase in the power of unit root tests depending on sample frequency were decisive factors in the preference for this period. The examined period covers the time interval in which monthly data continuity is ensured. Since seasonal fluctuations are pronounced in monthly labor force series, the data were included in the analysis after being seasonally adjusted. The female unemployment rate is defined as the ratio of unemployed women within the female labor force to the total female labor force and is expressed as a percentage (%) (TURKSTAT, 2024).

The use of monthly frequency data in the analysis allows short-term fluctuations in the labor market and the effects of economic shocks on unemployment to be captured more sensitively (Çiçen, 2020). In the literature, it is emphasized that high-frequency data provide stronger results, particularly in the application of nonlinear and structural break unit root tests (Yılanıcı & Özcan, 2013).

The analysis period addressed in the study was determined by taking data continuity and methodological requirements into consideration. The fluctuations observed in the female unemployment rate throughout the examined period are closely related to macroeconomic shocks of both domestic and external origin experienced in the Turkish economy (Şahin Kutlu, 2023). This situation constitutes an appropriate empirical ground for testing the unemployment hysteresis hypothesis.

A seasonally adjusted dataset was used. Because the seasonal adjustment process is applied in order to prevent regularly recurring periodic effects in the labor market from misleading the analysis results (Çiçen, 2020). In unemployment hysteresis studies using monthly data, this approach is observed to be widely preferred (Şahin Kutlu, 2023).

In the next subsection, the econometric tests used

to examine the stationarity properties of the female unemployment series and the theoretical foundations of these tests are presented in detail.

3.2. Methodology: Unit Root Tests and the Hysteresis Hypothesis

The fundamental approach in empirically testing the unemployment hysteresis hypothesis is based on examining the stationarity properties of the unemployment rate series. Accordingly, this study employs both classical and modern unit root tests that evaluate the presence of a unit root in economic series through various econometric examinations. The presence of a unit root in a time series indicates that shocks to the series have permanent effects and that the unemployment rate does not return to its natural level in the long run. Therefore, the presence of a unit root in unemployment series is considered a finding supporting the hysteresis hypothesis, whereas stationarity is regarded as supporting the natural rate hypothesis (Blanchard & Summers, 1986).

Table 2. Unit Root Tests.

Test	Deterministic Component	Structural Break Assumption	Linearity Assumption	Null Hypothesis (H_0)	Main Feature
ADF (Augmented Dickey-Fuller)	Constant and/or linear trend	None	Linear	Unit root exists	Classical time series approach; controls autocorrelation with lagged difference terms
PP (Phillips-Perron)	Constant and/or linear trend	None	Linear	Unit root exists	Controls autocorrelation and heteroskedasticity with non-parametric correction
KPSS	Stationarity under constant and/or trend	None	Linear	Stationarity exists	Reverse hypothesis of ADF/PP; complementary test
Fourier ADF	Constant + trigonometric (Fourier) terms	Multiple/smooth breaks	Nonlinear deterministic structure	Unit root exists	Approximately represents non-sharp structural changes
Fourier KPSS	Constant + Fourier terms	Multiple/smooth breaks	Nonlinear deterministic structure	Stationarity exists	Tests stationarity und

The test set is diversified in order to jointly

evaluate the possible linear, structural break, and smooth transition dynamics of the unemployment series. Thus, the hysteresis hypothesis is tested under different deterministic structure assumptions. In this study, the stationarity properties of the female unemployment series are tested using linear and nonlinear unit root tests developed under different assumptions.

In order to examine the stationarity properties of the female unemployment rate series, linear unit root tests are applied at the first stage. In this context, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are used together with the KPSS test. While the null hypothesis in the ADF and PP tests is that the series contains a unit root, the null hypothesis in the KPSS test is based on the assumption that the series is stationary. The joint use of these tests, which have opposing null hypotheses, increases the robustness of stationarity results (Kwiatkowski et al., 1992; Torun, 2015). Despite their advantages, classical unit root tests may produce misleading results regarding stationarity because they do not take into account structural breaks occurring in time series. Perron (1989) demonstrated that if structural breaks occurring in the series are ignored, a series that is actually stationary may incorrectly appear to contain a unit root. Therefore, in series sensitive to economic shocks such as unemployment, incorporating structural breaks into the model is of importance.

3.2.1. Augmented Dickey-Fuller (ADF) Test

Originally, this methodological framework was developed by David A. Dickey and Wayne A. Fuller in 1981.

The ADF test is a classical method developed to test whether a time series contains a unit root. Dickey and Fuller (1981) proposed adding lagged difference terms to the model in order to increase the validity of the test in the presence of autocorrelation in the error terms.

The regression equation of the ADF test is expressed as follows:

$$(1) \quad \Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \delta_2 \Delta y_{t-2} + \dots + \delta_p \Delta y_{t-p} + \varepsilon_t$$

Here;

y_t : denotes the female unemployment rate,

Δ : the difference operator,

t : the deterministic trend,

p : the lag length,

ε_t : the error term.

The hypotheses tested in the ADF test are as follows:

$H_0: \gamma = 0$ (The series contains a unit root)

$H_1: \gamma < 0$ (The series is stationary)

The test statistic is evaluated by comparing the t-statistic of the γ coefficient with the Dickey-Fuller critical values (Dickey & Fuller, 1981).

The presence of a unit root in the female unemployment rate series indicates that economic shocks permanently affect women's position in the labor market in the long run (Blanchard and Summers, 1986).

3.2.2. Phillips-Perron (PP) Test

The Phillips-Perron (PP) test extends the Dickey-Fuller approach by addressing autocorrelation and heteroskedasticity problems in the error terms through non-parametric corrections. Phillips and Perron (1988) demonstrated that the classical DF test is sensitive to assumptions regarding the error term and developed the PP test in order to overcome this limitation. The PP test developed by Phillips and Perron (1988) has a regression structure similar to the ADF test; however, it addresses autocorrelation and heteroskedasticity problems in the error terms through non-parametric corrections. In this respect, the PP test is used as a complementary tool to the ADF test.

The basic regression model of the PP test is as follows:

$$(2) \\ y_t = \alpha + \beta t + \rho y_{t-1} + u_t$$

The hypotheses tested in the PP test are the same as in the ADF test:

$H_0: \rho = 1$ (The series contains a unit root)

$H_1: \rho < 1$ (The series is stationary)

The test statistics used in the PP test include corrections for the long-run variance and follow the Dickey-Fuller distributions (Phillips & Perron, 1988).

3.2.3. KPSS Test

The KPSS test is a complementary unit root test that adopts stationarity as the null hypothesis. Kwiatkowski, Phillips, Schmidt and Shin (1992) argued that testing only for a unit root is insufficient and that stationarity should also be tested directly. The KPSS test, developed by Kwiatkowski et al. (1992), is based on the null hypothesis of stationarity. The test examines whether the series is stationary around a deterministic component and provides a perspective opposite to that obtained from linear unit root tests. This feature allows the persistence dynamics in the female unemployment series to be evaluated more reliably.

$$(3) \\ y_t = \mu_t + r_t + \varepsilon_t$$

Here;

μ_t : denotes the deterministic component,

r_t : the random walk process,

ε_t : the stationary error term.

The hypotheses tested in the KPSS test are as follows:

$H_0: \sigma_r^2 = 0$ (The series is stationary)

$H_1: \sigma_r^2 > 0$ (The series contains a unit root)

The KPSS test, particularly when used together with the ADF and PP tests, allows for stronger and more consistent inferences regarding the stationarity properties of the series (Kwiatkowski et al., 1992).

3.2.4. Fourier-Based Unit Root Tests

Structural breaks occurring in time series may not always be sudden and sharp. Such smooth breaks, frequently observed in economic series, may not be adequately captured by classical structural break tests. In order to overcome this problem, approaches proposing the modeling of the deterministic component with Fourier functions have been developed.

The Fourier-based unit root tests developed by Enders and Lee (2012) flexibly model the deterministic component of the series with the help of sine and cosine terms and incorporate breaks into the analysis without pre-specifying break dates.

The regression equation of the Fourier ADF test is as follows:

$$(4) \\ y_t = \alpha + \beta t + \gamma_1 \sin(2\pi kt/T) + \gamma_2 \cos(2\pi kt/T) + \varepsilon_t$$

Using this deterministic structure, the unit root test is applied through the following regression:

$$(5) \\ \Delta y_t = \alpha + \beta t + \gamma_1 \sin(2\pi kt/T) + \gamma_2 \cos(2\pi kt/T) + \rho y_{t-1} + \sum \delta_i \Delta y_{t-i} + \varepsilon_t$$

Here;

k : denotes the Fourier frequency,

T : the number of observations,

the sin and cos terms represent smooth breaks in the series.

The hypotheses tested in Fourier-based tests are the same as in classical unit root tests:

$H_0: \rho = 0$ (The series contains a unit root)

$H_1: \rho < 0$ (The series is stationary)

Enders and Lee (2012) demonstrated that adding Fourier terms to the model significantly reduces errors arising from incorrect break specification and increases test power, particularly in macroeconomic series.

Empirical studies examining unemployment hysteresis in *Türkiye* reveal that Fourier-based tests provide more flexible and reliable results compared to linear and classical structural break tests (Güriş, Tiftikçigil & Yılançı, 2017). In this study, the joint use of ADF, PP, KPSS, and Fourier-based unit root tests

allows the stationarity properties of the female unemployment series to be tested under different assumptions. The presence of a unit root is interpreted as a finding supporting the unemployment hysteresis hypothesis; stationarity, on the other hand, is interpreted as supporting the natural rate of unemployment hypothesis. The multiple test approach increases the methodological consistency and reliability of the empirical findings obtained. Thus, through the multi-stage methodological approach adopted in this study, the stationarity properties of female unemployment in Türkiye are addressed together with their linear and nonlinear dimensions; the risk that the obtained findings are specific to a particular test method is reduced. The results obtained under the assumption that gender-based structural inequalities may reinforce persistence in female unemployment contribute to the unemployment hysteresis literature from the perspective of the female labor market.

4. EMPIRICAL FINDINGS

In this section, the empirical findings regarding the female unemployment series are evaluated. The stationarity properties of the series were examined using monthly data covering the period 2005:M01–2025:M09, and the unemployment hysteresis hypothesis was tested. The analysis process proceeded in a stepwise manner. In the first stage, the classical linear Augmented Dickey–Fuller (ADF) unit root test was applied; subsequently, the Fourier ADF approach was employed in order to take into account possible smooth structural changes in the series.

This sequence aims first to evaluate linear dynamics and then to test whether there are gradual transformations in the deterministic structure. The obtained results are presented in the tables below; explanations regarding the assumptions and hypothesis structures of the tests are provided in the notes below the tables.

Table 3: ADF, PP and KPSS Unit Root Test Results at Level.

Test	Model	Test Statistic	5% Critical Value	p-value	Decision
ADF	Constant	-1.8859	-2.8743	0.3386	Unit root cannot be rejected
ADF	Constant+Trend	-2.0665	-3.4300	0.5612	Unit root cannot be rejected
PP	Constant	-1.9601	-2.9484	-	Unit root cannot be rejected
PP	Constant+Trend	-4.7025	-2.9511	-	Unit root rejected
KPSS	Constant	0.1778	0.4630	-	Stationarity cannot be rejected
KPSS	Constant+Trend	0.1592	0.1460	-	Stationarity rejected

Note: The lag length in the ADF test was determined by the Schwarz Information Criterion. In the PP and KPSS tests, the bandwidth was calculated using the Newey–West method. The ADF test statistics are based on MacKinnon (1996) one-sided p-values.

When the findings obtained from the level values are evaluated together, it is understood that the female unemployment series does not exhibit a stationary structure. The ADF test results do not support the alternative hypothesis of no unit root; in other words, the null hypothesis of a unit root cannot be rejected. In contrast, the KPSS test rejects the stationarity hypothesis, particularly under the model with trend.

Considering that these two tests are based on different null hypotheses, it is observed that the results are complementary in nature. The inability of the ADF test to exclude the presence of a unit root and the rejection of stationarity under trend by the KPSS test indicate that the series possesses a persistence property at level. This finding suggests that shocks to the unemployment rate do not fully dissipate over time and that past values continue to

affect the current level.

However, since classical linear tests do not take structural breaks into account, it becomes necessary to re-evaluate the obtained results under the presence of breaks.

Table 4: Unit Root Test Results at First Difference.

Test	Model	Test Statistic	5% Critical Value	p-value	Decision
ADF	Constant	-14.9951	-2.8743	0.0000	Unit root rejected (Stationary)
ADF	Constant+Trend	-15.0171	-3.4300	0.0000	Unit root rejected (Stationary)

Note: The first difference results indicate, according to the ADF test, that the series becomes strongly stationary.

The fact that the female unemployment series becomes stationary at first difference indicates that the series follows an I(1) process. In other words, the effects of shocks observed in the level values do not disappear automatically over time; however, after differencing, the series attains a stationary structure.

This result indicates that shocks arising in the labor market may generate persistent effects on female unemployment. The presence of a unit root shows that the unemployment rate exhibits a dynamic dependent on its past values and that the process of returning to equilibrium does not occur automatically. Within this framework, the obtained findings reveal a structure consistent with the unemployment hysteresis hypothesis.

However, persistence should be evaluated not only as a statistical property but also as a dynamic associated with the institutional and gender-based structures of the labor market.

Table 5. Fourier ADF Test and Wald Results.

Series	Frequency (k)	Lag	FADF	Wald p-value
UNEMPLOYMENT (Level)	1	12	2.47	0.0865
Δ UNEMPLOYMENT	4	7	0.62	0.5365

Note: The Fourier frequency and lag length were determined by the Akaike Information Criterion. The Wald test examines the joint significance of the sine and cosine terms (Enders and Lee, 2012).

The Wald test results indicate that the Fourier terms added to the model do not reach a statistically strong level of significance. This finding suggests that

smooth and continuous structural changes in the deterministic component of the series do not play a dominant role. In other words, it is understood that the dynamics observed in the female unemployment series may have been shaped under a more linear structure rather than gradual regime shifts represented by the Fourier approach.

In this case, the results obtained from classical linear unit root tests become decisive in the evaluation of stationarity. When the indication of a unit root by linear tests and the stationarity of the series at first difference are considered together, it is observed that the female unemployment rate possesses a persistence property at level.

The obtained results demonstrate that shocks arising in the labor market in *Turkiye* are not limited to temporary fluctuations in female unemployment; rather, they can generate permanent effects on the level. This situation presents a framework consistent with theoretical discussions suggesting that gender-based structural inequalities may reinforce persistence mechanisms.

Linear ADF tests indicate that the female unemployment series is not stationary at level and becomes stationary at first difference. Under the Fourier approach, however, nonlinear/smooth break components are not found to be significant. When these two findings are considered together, it is concluded that the female unemployment series in *Turkiye* exhibits persistence at level and that the effects of shocks can be transmitted into the long term.

From the perspective of the article's gender focus, these findings indicate that female unemployment may display a temporally "non-reverting" dynamic; however, the mechanisms of this persistence and the gender channels will be addressed in the next section (Discussion) together with the literature.

5. DISCUSSION AND CONCLUSION

In this study, the stationarity properties of the female unemployment series in *Turkiye* were examined within the framework of linear and nonlinear unit root tests, and the validity of the unemployment hysteresis hypothesis for female unemployment was empirically tested. Within the framework of the findings obtained as a result of the analysis, the ADF tests indicate that the female unemployment series is not stationary at level and becomes stationary at first difference. In contrast, under the Fourier approach, nonlinear/smooth break components were not found to be significant. When these two findings are considered together, it is concluded that the female unemployment series in

Türkiye exhibits persistence at level and that the effects of shocks can be transmitted into the long term. It has been shown that the female unemployment series is not stationary at level and becomes stationary at first difference. This result indicates that the series follows an I(1) process and that shocks arising in the labor market can generate permanent effects.

These findings demonstrate that shocks arising in the labor market in *Türkiye* are not limited to temporary fluctuations in female unemployment; rather, they can generate permanent effects on the level. This situation presents a framework consistent with the discussions in the theoretical literature suggesting that gender-based structural inequalities may reinforce persistence mechanisms. From a gender perspective, the persistence observed in female unemployment exhibits a pattern consistent with structural inequalities in the labor market. The concentration of women in certain sectors, the high rates of informal employment, care labor responsibilities, and the more fragile structure of entry-exit cycles in the labor market may provide a basis for economic shocks to have more persistent

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