

ÖZGÜN ARAŞTIRMA / ORIGINAL ARTICLE



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# The Role of Gender Inequality, Financial Development, and Inflation in Achieving Sustainable Development Goals

## Sürdürülebilir Kalkınma Hedeflerine Ulaşmada Cinsiyet Eşitsizliği, Finansal Kalkınma ve Enflasyonun Rolü

Rahman AYDIN 

### Abstract

**Aim:** This study examines the effects of gender inequality (GI), financial development (FD) and inflation (INF) on “Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all” as defined under Sustainable Development Goals (SDGs) Goal 8 (SDG8) in Turkey between 1990 and 2021.

**Method:** The effects of FD, INF, and GI on EG were analysed using Fourier Augmented ARDL (FA-ARDL) and Fourier Toda–Yamamoto (FTY) causality tests, utilising data from the period 1990–2021.

**Findings:** In the long run, FD has a positive effect on EG, while GI and INF have negative effects. Additionally, it was determined that the FD, GI, and INF series are Granger cause of EG.

**Conclusion:** The FD, INF, and GI variables stand out as important determinants in achieving SDG8.

### Keywords

Sustainable Development, Economic Growth, Inflation, Financial Development, Gender Inequality, Time Series Analysis

### JEL Codes

Q01, F43, E31, B26, J16, C32

Assist. Prof., Erzurum Technical University, Faculty of Economics and Administrative Sciences, Department of Economics, Erzurum, Türkiye.  
✉ [rahman.aydin@erzurum.edu.tr](mailto:rahman.aydin@erzurum.edu.tr)

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### Öz

**Amaç:** Bu çalışma, Türkiye’de 1990-2021 yılları arasında cinsiyet eşitsizliği (GI), finansal gelişme (FD) ve enflasyonun (INF), Sürdürülebilir Kalkınma Amaçları (SDGs) Hedef 8 (SDG8) kapsamında tanımlanan “Sürdürülebilir, kapsayıcı ve kalıcı ekonomik büyümeyi, tam ve verimli istihdamı ve herkes için insana yakışır işi teşvik etmek” üzerindeki etkilerini incelemektedir.

**Yöntem:** FD, INF ve GI'nin EG üzerindeki etkileri, 1990–2021 dönemine ait veriler kullanılarak Fourier Genişletilmiş ARDL (FA-ARDL) ve Fourier Toda–Yamamoto (FTY) nedensellik testleri ile analiz edilmiştir.

**Bulgular:** Uzun dönemde EG üzerine FD'nin pozitif, GI ve INF'nin ise negatif etkileri olduğu tespit edilmiştir. Ayrıca FD, GI ve INF serilerinin EG'nin Granger nedeni olduğu belirlenmiştir.

**Sonuç:** FD, INF ve GI değişkenleri, SDG8'e ulaşmada önemli belirleyiciler olarak öne çıkmaktadır.

### **Anahtar Kelimeler**

Sürdürülebilir Kalkınma, Ekonomik Büyüme, Enflasyon, Finansal Gelişme, Cinsiyet Eşitsizliği, Zaman Serisi Analizi

### **JEL Kodları**

Q01, F43, E31, B26, J16, C32

## **Introduction**

The concept of sustainable development (SD) was first discussed at the United Nations Conference on the Human Environment held in Stockholm in 1972, and the Brundtland Report played a significant role in its current relevance (Alkan, 2015). Today, there are 17 development goals that the UN is working to achieve in order to reach the Sustainable Development Goals<sup>1</sup>. The UN provides significant support to achieve these goals worldwide by 2030. These goals generally aim to end poverty, protect the environment, take action against the climate crisis, and promote the fair distribution of prosperity. In this context, the main motivation of this study is to investigate whether GI is a significant determinant in achieving SDG8, in addition to INFL and FD, which are key macroeconomic indicators affecting EG. In this context, the study is planned as presented below. In the second section, the effects of FD, INF, and GI on EG are examined. The theoretical framework of the third study is presented. The fourth chapter presents a literature review on the topic. In the fifth and sixth chapters, the empirical application and the findings obtained are presented. The seventh and eighth chapters present the results, discussion, and policy implications.

## **Financial Development, Inflation, and Gender Inequality: The Link to Economic Growth**

### **Economic Growth and Financial Development**

Bagehot (1873) and Schumpeter (1911), who examined the relationship between FD and EG, highlighted the critical role of the banking system and the financial sector in terms of EG (Purewal and Haini, 2022). Goldsmith (1969) and Shaw (1973), who followed this approach, stated that the development of financial intermediaries would increase savings rates, encourage foreign capital inflows, and thus positively impact EG (Bloch and Tang, 2003; Durusu-Ciftci, 2017).

This theoretical framework elucidates the relationship between FD and EG through four essential hypotheses. The following is a summary of these hypotheses (Adusei, 2019; Appiah-Otoo and Song, 2022; Ikubor et al., 2022; Tian et al., 2024): (i) The supply-leading hypothesis posits that improvements in financial markets and financial services will accelerate EG by increasing savings and investment. (ii) The demand-following hypothesis argues that EG triggers FD. (iii) The interdependence hypothesis posits a bidirectional causality between FD and EG, specifically asserting that foreign direct investment can facilitate EG via technology transfer and innovations in products and processes. (iv) The neutrality hypothesis states that there is no significant relationship between FD and EG.

Recent literature focuses on the factors influencing the adoption of environmentally friendly practices in the SDG8 context, expanding traditional FD-EG approaches. In this context, FD is considered one of the important determinants of environmental sustainability. Indeed, it is stated that FD, along with financial market efficiency and financial accessibility, can have greenhouse gas

<sup>1</sup><https://turkiye.un.org/tr/sdgs>

emission-reducing effects (Parashar and Jaiswal, 2025). The importance of green finance policies in the transition to sustainable energy is notably highlighted (Ibrahim et al., 2022; Jiakui et al., 2023; Shen et al., 2024; Xiao and Tabish, 2025).

### Economic Growth and Inflation

Inflation is one of the key indicators of macroeconomic stability. It also plays a decisive role in terms of sustainable growth and increased prosperity. Therefore, the effects of INF on EG are a significant area of discussion in theoretical and empirical studies (Pradhan et al., 2015; Kütükçü and Günay, 2025).

The literature contains findings that support both positive and negative relationships between INF and EG. The approach that emphasises a positive relationship, especially with the experiences of high inflation and high growth seen simultaneously in developed countries after World War II, strengthened the view that there is a positive relationship between inflation and growth, which was the effective approach of the time, the Phillips Curve. According to some economists in the Keynesian and Monetarist traditions, inflation can support growth through various channels. So much so that due to the diminishing effect of inflation on wealth, it can lead individuals to save more to maintain their previous wealth balance. This can lead to increased savings and lower interest rates. This result can stimulate investment and EG. Additionally, inflation can strengthen capital accumulation and production capacity by causing investment preferences to shift from financial assets to the real sector. In this context, inflation can be seen as an element that accelerates economic processes (Grimes, 1991; Chowdhury, 2002; Berber and Artan, 2004).

On the other hand, there are views that argue inflation has a negative impact on EG. According to these views, high inflation can lead to inefficient investments by economic actors, especially investors, due to the uncertainties it creates for monetary and fiscal policy. Additionally, as a result of rising prices, the structure of sectors is deteriorating and the efficiency of future investments is decreasing. Therefore, if the country's investments are realised, they can shift to unproductive areas. On the other hand, inflation can have a negative impact on the national currency. These factors can lead to negative effects on exports and consequently on EG (Chowdhury, 2002).

### Economic Growth and Gender Inequality

The concept of GI describes the differences between the biological, genetic, and physiological characteristics that exist between women and men (Şimşek, 2011; Bal, 2014). This concept refers to discrimination between women and men in all areas of social life (Bardakçı and Oğlak, 2022). Equal opportunity in national economies is important for the equitable distribution of wealth. Because the issue of equal opportunity, social exclusion, discrimination, and all other inequalities affects the distribution of well-being in society (Berger-Schmitt, 2022). Therefore, the equitable distribution of wealth in national economies is crucial for sustainability. Specifically, the equitable distribution of wealth between men and women contributes to economic development (Çolak, 2021). So much so that women in society who are subjected to inequality are deprived of education and employment, which negatively impacts their participation in the workforce. This situation leads to both entrepreneurship and the workforce falling short of their potential (Braunstein, 2011).

On the other hand, women remaining outside the labour market also negatively impacts human capital. Human capital, which enables the use of individuals' knowledge and skills in economic activities, is crucial for the development process. Therefore, the relationship between human capital and economic growth is closely related to sustainable development policies (Çakmak and Gümüş, 2005). In this context, the exclusion of women from the labour market, or in other words, the existence of gender inequality in the labour market, harms economic activities (Braunstein, 2011). Therefore, improvements in gender inequality are of critical importance both for ensuring social justice and for achieving the SDGs.

## 3. Theoretical Background

This study investigates the relationship between sustainable development, gender inequality, inflation, and financial development within the context of sustainable development theory. In its

most common definition, sustainable development refers to "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987). This approach necessitates addressing global issues such as gender inequality, poverty, and climate change. Looking at the theoretical foundations of sustainable development, they are constantly evolving over the years according to the conditions of the day. The theory of sustainable development gained momentum after the 1970s due to the influence of environmental movements. It gained prominence on the global policy agenda, particularly with the report of the Brundtland Commission in 1987. It has transformed into a global policy within the framework of the SDGs, with the 1992 World Summit and the 2030 Agenda adopted in 2015 (WCED, 1987; UN, 2015; Işık et al., 2025).

With its social, economic, and environmental dimensions, the United Nations (UN) established the 2030 SDGs in 2015 as a global plan for human and environmental well-being (Leal Filho et al., 2023). Among these goals, the empowerment of women (SDG5) is highlighted and is gaining priority as a cross-cutting issue with other goals. In this context, integrating gender into all SDG targets, such as poverty, nutrition, education, employment, and energy policies, is essential for achieving sustainable and equitable development (Odera and Mulusa, 2020; Jeevanasai et al., 2023). Specifically, women's and girls' participation in education (SDG4), the improvement of maternal health conditions (SDG3), and poverty eradication (SDG1) contribute to gender inequality and accelerate EG, particularly in underdeveloped regions (Nilsson et al., 2016). In this context, the focus is on how women can be empowered, addressing educational inequalities in the SDGs, and achieving gender equality (Malik et al., 2025). Because reducing gender inequality can increase productivity and efficiency by unlocking an educated workforce and creating opportunities for women to access more employment (Ryu and Nam, 2024). Similarly, it can be argued that access to new technology, facilitating financial access, and developing policies that provide equal rights for female workers will positively impact EG (Balasubramanian et al., 2024; Mubiinzi and Mutumba, 2025).

## Literature

Policies that address gender-based inequalities and promote equal conditions for all create opportunities for women to develop their potential and contribute to the economy (Bertay et al., 2025). Therefore, researchers frequently study the link between EG and GI in the literature. In this context, when current studies are examined, they explain that positive developments in GI will, on the one hand, increase women's participation in the labour force and productivity and, on the other hand, have a positive impact on growth. For example, Nguyen (2021) researched the topic in 119 countries. It is stated that the empowerment of women will contribute positively to the economy. Agu and Aguegboh (2021) emphasise the necessity of women's access to higher education, participation in the labour force, and involvement in the political arena to empower women and achieve economic development in selected African countries.

In addition, Girón and Kazemikhasragh (2022) found a negative between GI and EG in 34 developing and least developed countries in Asia and Africa. Alwago (2023) identified the direct impact of GI and occupational discrimination on growth in Sub-Saharan African countries, influenced by macroeconomic policies and globalisation. Akinwande et al. (2025) found that GI and FD cause EG in the long and short term in Nigeria. Similarly, Kanat et al. (2024) found that FD and education reduce GI in Pakistan. Wani and Khanday (2024) confirm the positive impact of financial participation on GI and EG in 48 developing countries. In addition, studies on the different effects of GI on country groups are also noteworthy. For example, Castillo et al. (2025) found that GI negatively affects GDP in high-income countries and positively affects GDP in low-income countries.

FD plays an important role in EG. However, macroeconomic and other economic factors render the impact of FD on EG uncertain (Ductor and Grechyna, 2015). On the other hand, many studies indicate that financial institutions and markets affect EG through various channels. For example, Valickova et al. (2015) note that the link between financial markets and growth varies across regions and that foreign direct investment is faster than other financial intermediaries. Caporale et al. (2015) found that in 10 new European Union member countries, the contribution of relatively underdeveloped

stock and credit markets to EG is limited, whereas the efficiency of the banking sector accelerates growth. Peng et al. (2025) confirm that financial access supports EG by encouraging bank deposits in 281 Chinese cities.

Among the existing studies, there are those that suggest that developments in the financial sector will stimulate EG. Durusu-Ciftci et al. (2017), found that in 40 nations with credit and stock markets, FD will hasten EG. Raghutla and Chittedi (2021) found that FD in BRICS countries has a significant positive effect on EG through research and development expenditures and industrial production. Conversely, Cheng et al. (2021) found that FD negatively impacts EG in 72 countries. Elfaki and Ahmed (2024) draw attention to the negative consequences of FD on EG in Sudan.

The relationship between INF and EG is complex and variable. Some empirical studies confirm a negative relationship between INF and EG (Khan and Hanif 2020; Sequeira 2021; Ahmad 2022; Malec et al., 2024). For example, Mandeya and Ho (2021) found that INF negatively affected EG in South Africa in both the short and long term. Azam and Khan (2022) found a negative relationship between INF and growth in 16 developing and 11 developed economies. Alghamdi et al. (2024) found that INF had a negative impact on development in Egypt, while in Saudi Arabia, the INF ratio had a negative impact on health but a positive impact on agriculture, education, and industry.

Some empirical studies confirm a positive relationship between INF and EG (Dinh 2020; Uddin and Rahman 2023). For example, Fung and Nga (2022) found that INF has a positive long-term effect in ASEAN countries, meaning that an increase in the rate improves EG. Uddin and Ullah (2024) confirm that INF has a positive effect on per capita GDP in Pakistan. Additionally, Thioune et al. (2024) focused on the relationship between institutional quality (democratic regimes) and INF and growth. Accordingly, they concluded that INF below the 9.27% threshold supports growth, while INF above it harms growth.

## Data, Model and Method

This study examines the effects of FD, GII, and INF on GDP in Türkiye between 1990 and 2021. The series and sources obtained within this scope are presented in Table 1.

**Table 1.** Research Variables and Explanation

Variables	Variable Definition	Source
Gross domestic product	GDP	World Bank
Gender inequality index	GII	UNDP
Financial development	FD	IMF
Inflation	INF	World Bank

Table 1 presents the series used in the study. GDP is calculated in constant 2015 US dollars. INF is based on consumer prices (annual %). GII is obtained from the UNDP database; it takes values between 0 and 1, and as it approaches zero, gender inequality is understood to decrease. FD consists of nine different financial indicators. In this context, the model of the study is presented below, taking into account the work of Akinwande et al. (2025):

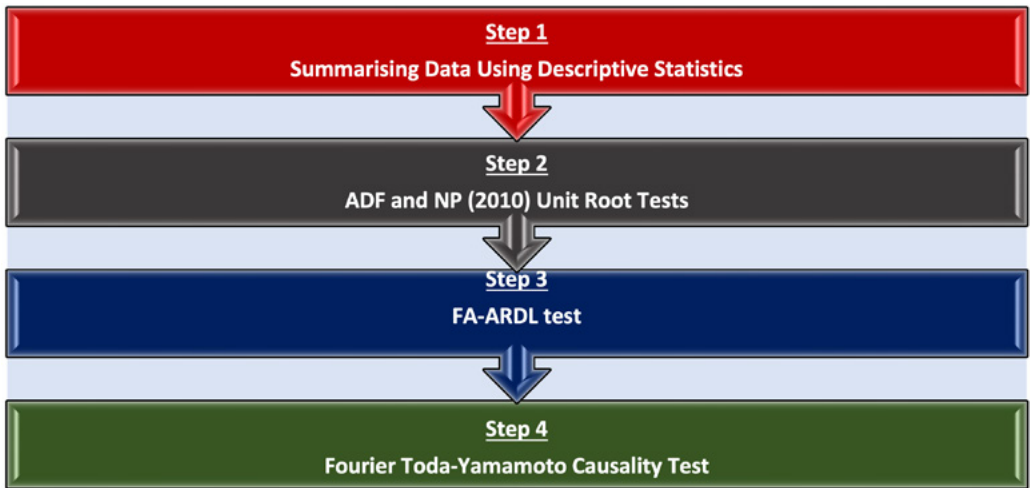
$$GDP_t = \beta_0 + \beta_1 GII_t + \beta_2 FD_t + \beta_3 INF_t + \epsilon_t \quad (1)$$

The constant term  $\beta$  in Equation 1 represents the slope coefficients of  $\beta_{1,2,3}$ , the error term  $\epsilon_t$  and the index  $t$  represents time. The null hypothesis ( $H_0$ ) of the study is that at least one of the independent variables does not explain the dependent variable. Therefore, the constraint of the study is  $H_0 = \beta_1 = \dots = \beta_3 = 0$  and  $H_a \neq \beta_1 \neq \dots \neq \beta_3 \neq 0$ .

## Econometric Approach

The study investigates the effects of GII, FD, and INF on EG. To estimate the model established within this scope, ADF and NP (2010) unit root tests (URTs) were first used. The ADF and NP (2010) URTs determined that the series were stationary at different levels. Additionally, the NP (2010) unit root test (URT) revealed that the series exhibit structural breaks. Therefore, to estimate the model used in this study, the augmented ARDL (AARDL) method incorporating Fourier functions was

employed, as the series are both stationary at  $I(0)$  and  $I(1)$  and contain structural breaks. Also, since the series are stable at different levels and have structural breaks, the Toda-Yamamoto (TY) Granger causality test, which uses Fourier functions, was chosen to find out how the series influence each other.



**Figure 1.** Econometric approach

### Unit Root Test

In econometric applications, statistical analyses are primarily performed on series. This is because the series' unit root (UR) processes determine the study methods. In addition, obtaining reliable results from the UR process of the series is important for the estimation of the model. Therefore, when investigating the UR process of the series, it is necessary to consider whether they are normally distributed and whether they contain structural breaks. In this context, the study first investigated whether the series used in it were normally distributed. Table 2's results confirm the normal distribution of the series.

ADF and NP (2010) URTs were used to investigate the UR process of the series. The ADF URT does not take structural breaks into account. Therefore, the NP (2010) test for double breaks in the UR was used to investigate the structural break process of the series as well.

Two headings in econometric literature examine structural break tests. The first of these headings is single break tests, which include the Perron (1998), Zivot and Andrews (1992), and Popp (2008) tests. The second category includes the Lumsdaine and Papell (LP) (1992) and Lee and Strazicich (LS) (2003) tests. One of the single breakpoint tests, the Popp (2008) test, was developed by Narayan and Pop in 2010, which led to the introduction of the double breakpoint NP (2010) test into the literature. In the NP (2010) test, breakpoint dates are determined at two points. Breakpoint dates are determined using dummy variables. On the other hand, Monte Carlo simulation also plays an important role in determining break dates in the NP (2010) test. With Monte Carlo simulation, the break dates of the series are reliably estimated (Narayan and Popp, 2013).

### 5.3. FA-ARDL Method

Various methods are used to investigate cointegration relationships in econometric analyses. One such method is the ARDL model developed by Pesaran et al. (2001). The ARDL model provides flexibility for the independent variables to be  $I(0)$  and  $I(1)$  under the condition that the dependent variable is  $I(1)$ . The ARDL model can be expressed as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^n \beta_1 \Delta Y_{t-1} + \sum_{i=1}^m \beta_2 \Delta X_{t-1} + \dots + \sum_{i=1}^p \beta_i \Delta X_{i,t-1} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + \dots + \delta_i X_{i,t-1} + \mu_t \quad (5)$$

The constant term  $\alpha_0$  in Equation 5 represents the short-term coefficient  $\beta_{1,2,\dots,i}$ , the long-term coefficient  $\delta_{1,2,\dots,i}$ , the error term  $\mu_t$ , and finally  $n$ ,  $m$ , and  $p$  represent the lag number.

Sam et al. (2019) proposed the F-test to investigate cointegration in the ARDL model. The most important feature of the new cointegration test, known as AARDL, is that it provides flexibility at the I(1) and I(0) levels of the dependent variable. Thus, in this method, all variables can be I(0) and I(1), but they must not be I(2).

Despite the flexibility provided by the A-ARDL model, its findings regarding structural breaks have not been sufficiently discussed. In models with structural breaks, making predictions under the assumption that there are no structural breaks is controversial in terms of the reliability of the results (Kruse, 2011). In this context, adding terms related to the Fourier function transforms the A-ARDL model into a robust estimator against structural breaks. Therefore, there is no need to conduct research on the break dates present in the model (Tu, 2024). In this context, the Fourier A-ARDL (FA-ARDL) model can be expressed as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^n \beta_1 \Delta Y_{t-1} + \sum_{i=1}^m \beta_2 \Delta X_{t-1} + \dots + \sum_{i=1}^p \beta_i \Delta X_{i,t-1} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + \dots + \delta_i X_{i,t-1} + \mu_t (5) + \beta_1 \sin\left(\frac{2\pi kt}{T}\right) + \beta_2 \cos\left(\frac{2\pi kt}{T}\right) + \mu_t (6)$$

When examining Equation 6 above,  $\beta_1$  and  $\beta_2$  represent the coefficients of the terms belonging to the Fourier function,  $t$  represents the trend,  $T$  represents the sample size, and  $k$  represents the Fourier frequency. Finally, the term  $\pi$  has a value of 3.14.

### Fourier Toda-Yamamoto Causality Test

One of the methods used in econometric applications is causality analysis. In causality analysis, series must be stationary at the same level. However, the causality test proposed by Toda and Yamamoto (TY) (1995) brings a new understanding to the condition that series must be stationary at the same level and provides flexibility for series to be stationary at different levels. The TY test is based on the VAR ( $p + d_{max}$ ) model. Here, the term 'p' represents the lag length, and 'dmax' represents the order of cointegration of the series. Thus, in the TY model based on VAR ( $p + d_{max}$ ), the alternative hypothesis ( $H_a$ ) is tested against the  $H_0$ , stating that there is no causality relationship between the series. (Toda-Yamamoto, 1995). The TY test equation can be expressed as follows:

$$y_t = a(t) + \beta_1 y_{t-1} + \dots + \beta_{p+d} y_{t-(p+d)} + \varepsilon_t (7)$$

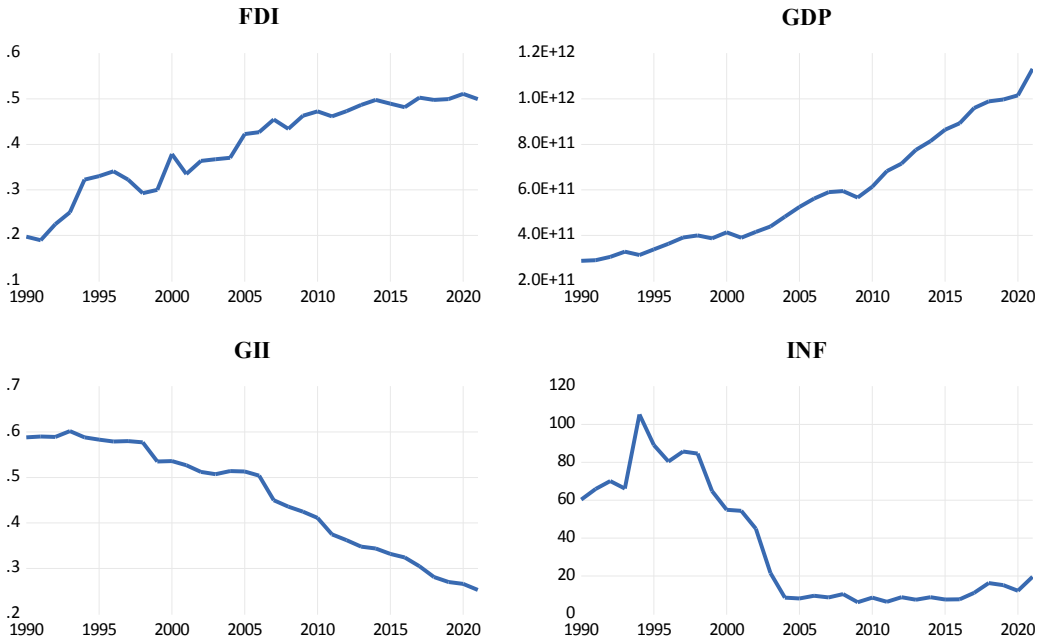
Although the TY test investigates causality relationships between series that are stationary at different levels, the results obtained in the estimation of structural break models may be controversial. For this reason, Nazlıoğlu et al. (2016) added Fourier terms to the TY causality test in their studies. In this context, the  $H_0$  stating that there is no causality between the series is tested against the  $H_a$  in the FTY test. The equation of the FTY test can be expressed as follows:

$$y_t = a(t) + \beta_1 y_{t-1} + \dots + \beta_{p+d} y_{t-(p+d)} + \phi_1 \sin\left(\frac{2\pi kt}{T}\right) + \phi_2 \cos\left(\frac{2\pi kt}{T}\right) + \varepsilon_t (8)$$

## Findings

### Statistical Evaluation of Series

The graphs of the variables included in the study are examined first, followed by their statistical values. Examining the variable graphs reveals an increasing trend for the FD and GDP variables over time. However, the GII variable has a decreasing trend. Despite showing an increasing trend after 1990, the INF variable experienced a decrease until 2005 and then followed a stable process after that. However, it is understood that the INF series has the potential to show an increasing trend after 2015.



**Graph 1.** Trends in variables between 1990 and 2021

According to the descriptive statistics of the series, GDP has the highest average. Similarly, it is understood that the variable with the highest standard deviation (SD) is INF. The skewness (skw) and kurtosis (krt) values of the series indicate that the FD and GII variables are skewed to the left, while the GDP and INF variables are skewed to the right. Additionally, it is understood that all variables are kurtosis relative to the norm. Finally, according to the Jarque-Bera (JB) test, the series has a normal distribution.

**Table 2.** Descriptive Stats

	FD	GDP	GII	INF
Mean	0.39	5.89	0.46	35.32
Median	0.42	5.44	0.50	15.75
Max.	0.51	1.13	0.60	105.21
Min.	0.18	2.89	0.25	6.25
SD	0.09	2.54	0.12	32.16
Skw	-0.59	0.61	-0.35	0.67
Krt	2.21	2.08	1.66	1.91
JB	2.72	3.11	3.05	4.02

### Unit Root Test Results

In econometric applications, it is necessary to investigate the UR processes of series to estimate models using the most appropriate method. The UR processes of the variables used in this study are investigated using two different tests. The reason for using two different tests is that events such as financial, political, and pandemic crises occurred in Türkiye during the relevant periods, which could cause structural breaks in the economy. Therefore, this study employed the double-break NP (2010) URT in addition to the ADF URT.

According to the ADF test, all series except INF are stationary in the first difference in the fixed model. The INF series is stationary at the level in the fixed model. According to the results obtained from the fixed and trending models of the ADF test, all series are stationary in the first difference. According to the findings obtained from the NP (2010) test, the GII and INF variables are stationary at

the level in the fixed model. The GDP and FD variables, on the other hand, are stationary in the first difference in the fixed model. The NP (2010) test's fixed and trend models conclude that all series are stationary in the fixed model.

**Table 3.** ADF and NP (2010) unit root test results

Variable	ADF		NP			
	ADF <sub>c</sub>	ADF <sub>c+t</sub>	NP <sub>c</sub>	breaks <sub>c</sub>	NP <sub>c+t</sub>	breaks <sub>c+t</sub>
GDP	0.513	-2.581	-3.535	-	-14.454***	12-20
ΔGDP	-5.508***	-5.479***	-8.356***	18-20	-	-
GII	1.145	-2.676	-7.182***	13-20	-5.590**	12-15
ΔGII	-5.005***	-5.286***	-	-	-	-
FD	-1.864	-2.548	-3.827	-	-5.906**	13-16
ΔFD	-6.667***	-7.095***	-7.239***	13-20	-	-
INF	-5.009***	-2.422	-7.561***	18-20	-4.986*	15-18
ΔINF	-	-3.839**	-	-	-	-

Note: ADF<sub>c</sub> and ADF<sub>c+t</sub> / NP<sub>c</sub> and NP<sub>c+t</sub> denote fixed and fixed-trend models, respectively. breaks<sub>c</sub> and breaks<sub>c+t</sub> represent the double break dates in the fixed and fixed-trend model, respectively. Δ, symbol represents the first difference operation. For significance levels of 1%, 5%, and 10%, \*\*\*, \*\*, and \* are used, respectively.

### FA-ARDL Method

The FA-ARDL method was used to estimate Equation 1. This is because it was determined that the series in Equation 1 were stationary at different levels and had structural breaks. Therefore, for Equation 1, the cointegration test was first conducted, followed by an investigation of the long-term relationship. According to the cointegration test results, a cointegration relationship was determined. Subsequently, the long-term relationship between the series was investigated. According to the findings obtained in the long term, it was determined that the series were statistically significant at the 1% level. Accordingly, it was concluded that a one-unit increase in the GII and INF series reduces the GDP series by -1.542% and -0.002%, respectively, while a one-unit increase in the FD series increases the GDP series by 1.988% (Table 5).

Other findings obtained from the FA-ARDL model are presented in Panels B and C. According to Panel B, the coefficients of the Fourier function terms used in the FA-ARDL test are statistically significant. In addition, the error correction term is statistically significant as expected and has a negative coefficient. It is clear from Panel C's results that the FA-ARDL model does not contain any model specification errors. Furthermore, it is seen that there are no issues such as heteroskedasticity, autocorrelation, and non-normal distribution. Furthermore, the model incorporates the results of the CUSUM test, even with the inclusion of Fourier terms. The CUSUM test result indicates the stability of the model.

**Table 4.** FA-ARDL cointegration test result

Test	Test Statistics	Critical Values		
		%1	%5	%10
F <sub>overall</sub>	31.997***	7.06	5.01	4.15
t <sub>DV</sub>	-7.441***	5.61	4.35	3.77
F <sub>IDV</sub>	38.884***	7.72	5.14	4.11

Note: \*\*\* denotes statistical significance at 1%. Table critical values are obtained from Narayan (2005), Pesaran et al. (2001) and Sam et al. (2019).

**Table 5.** FA-ARDL Results

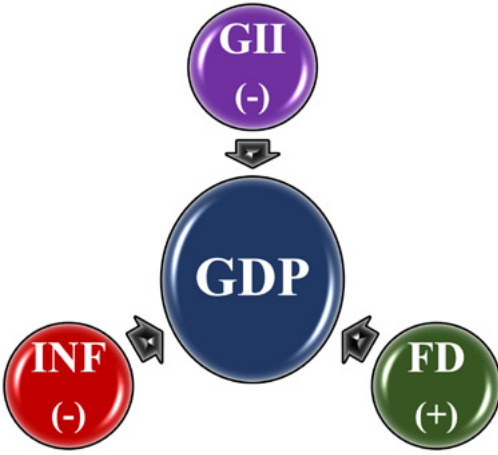
Dependent Variable: GDP		
Variable	Coef.	P-value
<b>Section A: Findings in the Long-run</b>		
GII	-1.542	0.002***
FD	1.988	0.001***
INF	-0.002	0.001***
<b>Section B: Fourier and error correction terms</b>		
$\sin(\beta_1)$	0.225	0.000***
$\cos(\beta_2)$	0.207	0.000***
ect	-2.275	0.000***
<b>Section C: Diagnostic test results</b>		
Ramsey Reset Test	0.127	0.906
BG LM Test	1.442	0.553
BPG Test	1.073	0.536
Jarque-Bera	0.389	0.823
Cusum Test	Stabil	
Cusum of Squares Test	Stabil	

Note: The \*\*\* symbol is used for significance at the 1% level. ect term represents the error correction term. The lags of the FA-ARDL model are 5, 4, 4, 4 respectively. The frequency value  $k=1$  is calculated by considering the smallest Akaike information criterion (Akaike value is -7.102 for  $k=1$ , -6.917 for  $k=2$ , -5.323 for  $k=3$ , -6.199 for  $k=4$ , and -4.612 for  $k=5$ ).

Table 5 shows that there is a negative relationship between GII and GDP. This means that as GII goes up, GDP goes down. The decrease in GI can support growth through labour supply and productivity channels by increasing women's participation in the labour market and their effectiveness within it. The increase in female employment can also have a positive impact on aggregate demand and production by raising household incomes and consequently expanding private consumption expenditures. When these mechanisms are considered together, it is understood that the reduction of GI contributes positively to the country's economy.

The study also reveals a positive correlation between FD and EG. Financially developed markets deepen financial intermediation, reduce information and transaction costs, and direct capital towards more efficient investments. This situation supports EG through both capital accumulation and resource allocation efficiency.

Finally, the results indicate that INF negatively impacts EG. High inflation weakens price signals, increasing uncertainty, which can delay investment decisions and complicate long-term planning. Additionally, rising interest rates along with INF can increase financing costs, putting pressure on investments. Therefore, it is assessed that the increase in ING is pulling down growth by weakening the investment and productivity channels. The results of the FA-ARDL method used in the study are presented in Figure 2.



**Figure 2.** Long-run Results of FA-ARDL Model

### Fourier Toda-Yamamoto Causality Test

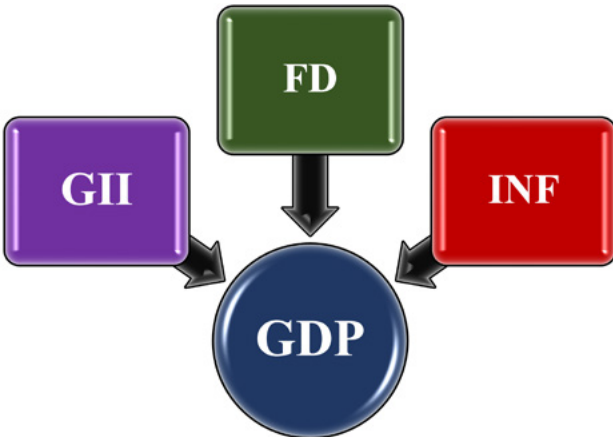
The most appropriate lag length for the FYT test is determined by the sum of the lag length ( $p$ ) and the cointegration degree ( $d_{max}$ ). The most appropriate lag length for the FYT test has been determined as 5 ( $p = 4, d_{max} = 1$ ). In this case, the results from the FYT test show that the GII, FD, and INF variables influence the GDP variable significantly at the 1% level. Thus, the  $H_0$  stating that there is no Granger causality relationship between the variables is rejected, and the  $H_a$  is accepted.

**Table 6.** Fourier Toda-Yamamoto causality test result

Direction of causality	Wald Stat.	df	p-value
GII GDP	102.952	5	0.000***
FD GDP	44.004	5	0.000***
INF GDP	99.531	5	0.000***

Note: \*\*\*, indicate significance at the 1% levels, respectively. Akaike value is -10.352 for  $k=1$ , -9.085 for  $k=2$ , -8.505 for  $k=3$ , -7.963 for  $k=4$ , and -8.026 for  $k=5$ .

According to the FTY test results, it has been determined that the GII, FD, and INF variables are caused by GDP. The results of the FTY causality test are presented in Figure 3.



**Figure 3.** FTY Granger Causality Test Results

## Discussions

This study reveals a strong relationship between FD, INF, GII, and SDG8. Although the findings are similar to those of previous studies in the literature, they offer more comprehensive results. In particular, the use of FA-ARDL and FTY tests to examine the effects of GII on SDG8 distinguishes this study from many others in the literature.

In the study, EG is used to represent SDG8. The positive impact of the EG is important for achieving SDG8 in a shorter time and at a lower cost. In the literature, there are studies that argue that FD promotes EG (Durusu-Ciftci et al., 2017; Raghutla and Chittedi, 2021). In this context, FD may have a mediating effect on EG and can make significant contributions to the achievement of SDG8.

The relationship between INF and EG is controversial in the existing literature. This conclusion is because while some studies in the literature indicate that INF negatively affects EG (Khan and Hanif 2020; Sequeira 2021; Ahmad 2022; Malec et al., 2024), others state that INF has positive effects on EG (Dinh 2020; Uddin and Rahman 2023). In countries experiencing high inflation, uncertainties in financial markets negatively impact economic units, particularly investors (Chowdhury, 2002). Therefore, the inflationary process can lead to negative effects on the country's economy. It can particularly negatively impact the well-being of individuals. In this context, it is considered that the high level of inflation has been a significant obstacle to achieving SDG8.

There are studies in the literature on GI achieving SDG8. In this context, the exclusion of the female workforce, which is an important component of human capital, from the labour market can have negative effects on the economy. So much so that it is known in the literature that negative developments in GI are among the reasons for the exclusion of women from the labour market (Braunstein, 2011). Therefore, improvements in GI can provide a significant advantage in achieving SDG8.

## Conclusions with Policy Implications

In this study conducted for Turkey between 1990 and 2021, the effects of FD, GII, and INF on the EG variable, which represents SDG8, are investigated. In this context, the study aims to assist readers and policymakers in achieving SDG8. Therefore, it is believed that identifying the determinants of SDG8 in this study will provide significant time and cost advantages in the policies developed to achieve SDG8.

The URT of the data used in the study was examined using the ADF and NP (2010) tests. In addition, the cointegration and long-term relationship between the data were investigated using the FA-AARDL method, while the causality relationship between the series was investigated using the FTY causality test.

Empirical findings indicate that the data is stationary at different levels and contains structural breaks. Therefore, the FA-ARDL method was chosen to achieve strong and consistent results. The findings from this method indicate that improvements in FD, GII, and INF have a positive impact on EG. Similarly, the FTY test determined that FD, GII, and INF are Granger causes of EG.

The findings from the study indicate that the variables FD, GII, and INF could be important policy tools for achieving SDG8. In this context, it is important to ensure stability and a climate of trust in financial markets in Turkey. On the other hand, high INF can be a significant obstacle to achieving SDG8. Therefore, monetary and fiscal policies, which are important tools in combating inflation, are crucial for achieving SDG8. Finally, the positive developments in GII in Turkey have been identified as a significant factor in achieving SDG8. Specifically, it is important to develop policies to increase women's participation in the Turkish labour market. In this context, it can be considered that the policies to be developed in light of the results obtained from the GII, INF, and FD variables will provide significant time and cost advantages in achieving SDG8.

The study has significant limitations. Structural breaks were identified during the years covered by the study. The Fourier method was used to compensate for the effects of structural breaks. However, in subsequent studies, dummy variables can be used for periods when structural breaks occurred. Thus, the effects of structural break periods on EG and consequently SDG8 can be discussed in depth.

On the other hand, the EG variable was selected in the study to represent Sustainable Development Goal 8. Considering the relevant literature, the determinants of the EG variable can be redefined. Thus, by discussing the most suitable determinants for achieving SDG8, a contribution can be made to the literature.

### Declaration:

1. The author declare no financial support.
2. The author declare no conflict of interest.
3. The author declares that no ethical committee approval is required.

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## Özet

*Sürdürülebilir kalkınma kavramı, ilk kez 1972 yılında Birleşmiş Milletler (BM) tarafından Stockholm'de düzenlenen "United Nations Conference on the Human Environment" konulu konferansta gündeme gelmiştir. Kavram üzerine tartışmalar bu tarihten itibaren devam etmiş; ancak özellikle Brundtland Raporu, sürdürülebilir kalkınmanın günümüzdeki anlamını kazanmasında belirleyici bir rol oynamıştır. Bu raporda sürdürülebilirlik, insan ile doğa arasında denge gözeten, gelecek nesillerin kaynaklarını tehlikeye atmadan kalkınmanın nasıl gerçekleştirileceğine dair çerçeveyi sunmuştur. Sonraki dönemlerde, sürdürülebilir kalkınmanın sağlanmasında ekonomik büyüme, çevrenin korunması ve sosyal eşitlik gibi temel ilkeler öne çıkmıştır. Günümüzde ise Birleşmiş Milletler (BM) tarafından sürdürülebilir kalkınmayı desteklemek amacıyla belirlenen 17 SDG bulunmaktadır. Bu amaçlar; yoksulluğun sona erdirilmesi, çevrenin korunması, iklim krizine karşı önlem alınması ve barış ile birlikte refahın adil paylaşımı gibi öncelikleri kapsamaktadır.*

*Kalkınmanın sosyal, ekonomik ve çevresel boyutu BM tarafından 2015'de insan ve çevre refahı için küresel bir plan olan 2030 SDGs kapsamında belirlenmiştir. Bu hedefler arasında kadınların güçlendirilmesi (SDG5) diğer pek çok hedefle kesişen temel bir konu başlığı olarak öne çıkmaktadır. Bu bağlamda, yoksulluk, beslenme, eğitim, istihdam ve enerji politikaları gibi cinsiyet eşitsizliğinin tüm kalkınma hedeflerine entegre edilmesi, sürdürülebilir ve adil kalkınmanın sağlanması açısından büyük önem taşımaktadır. Özellikle az gelişmiş bölgelerde kadınların ve kızların eğitime katılımı (SDG4),*

anne sađlık kořullarının iyileřtirilmesi (SDG3), yoksulluđın ortadan kaldırılması (SDG1) hem cinsiyet eřitsizliđini azaltmakta hem de ekonomik bymeyi desteklemektedir. Cinsiyet eřitsizliđinin azalması, eđitimi li ř gcn artırarak kadınların daha fazla istihdam edilmesine olanak tanımaktadır. Bylece lke ekonomisinde retkenlik ve verimlilik artışı sađlanmaktadır. Benzer řekilde, kadınların yeni teknolojiye eriřimi, finansal hizmetlere ulařımının kolaylařtırılması ve eřit haklara sahip olmalarını destekleyen politikalar, onların ekonomik faaliyetlerde daha retken hale gelmesini sađlayarak ekonomik bymeye olumlu katkı sunmaktadır.

Bu alıřma, Trkiye’de 1990-2021 yılları arasında cinsiyet eřitsizliđi, finansal geliřme ve enflasyonun SDG Hedef 8 kapsamında tanımlanan “istikrarlı, kapsayıcı ve srdrlebilir ekonomik byme, tam ve retken istihdam ile herkes iin insana yakıřır iř” zerindeki etkilerini incelemektedir. Bu kapsamda alıřmada ADF ve NP (2010) birim kk testlerinden faydalanılmıřtır. alıřmanın devamında veriler arasındaki eřbtnleřme ve uzun dnemli iliřki FA-ARDL yntemi kullanılarak incelenirken, seriler arasındaki nedensellik iliřkisi FYT nedensellik testi kullanılarak arařtırılmıřtır.

alıřmadan elde edilen bulgular, verilerin farklı seviyelerde durađan olduđunu ve yapısal kırılmalar ierdiđini gstermektedir. Bu nedenle, gcl ve tutarlı sonular elde etmek iin FA-ARDL yntemi seilmiřtir. Bu yntemden elde edilen bulgular, FD, GII ve INF’deki iyileřmelerin EG zerinde olumlu bir etkiye sahip olduđunu gstermektedir. Benzer řekilde, FTY testi FD, GII ve INF’nin EG’nin Granger nedenleri olduđunu belirlemiřtir.

alıřmadan elde edilen bulgular iřiđında, FD, GII ve INF deđiřkenlerinin SDG8’e ulařmada nemli politika araları olabileceđini gstermektedir. Bu bađlamda, Trkiye’deki finansal piyasalarda istikrarın ve gven ortamının sađlanması nemlidir. te yandan, yksek enflasyon oranı SDG8’e ulařmada olumsuz etkileri olabilir. Bu nedenle, enflasyonla mcadelede nemli aralar olan para ve maliye politikaları, SDG8’e ulařmak iin kritik rol oynayabilir. Son olarak, Trkiye’deki GII’deki olumlu geliřmelerin SDG8’e ulařmada nemli bir faktr olduđu belirlenmiřtir. zellikle, iřgc piyasasında kadınların katılımını artırmak iin politikalar geliřtirmek nemlidir. Bu bađlamda alıřmada GII, INF ve FD deđiřkenlerinden elde edilen sonular dođrultusunda geliřtirilecek politikaların, SDG8’e ulařmada zaman ve maliyet avantajları sađlayacađı dřnlebilir.

alıřmanın nemli kısıtları bulunmaktadır. alıřmanın kapsadıđı yıllar iinde yapısal kırılmalar tespit edilmiřtir. Yapısal kırılmaların etkilerini telafi etmek iin Fourier yntemi kullanılmıřtır. Ancak, sonraki alıřmalarda, yapısal kırılmaların meydana geldiđi dnemler iin kukla deđiřkenler kullanılabilir. Bylece, yapısal kırılmanın bulunduđu dnemlerin, EG ve dolayısıyla SDG8 zerindeki etkileri tartıřılabilir. te yandan, EG deđiřkeni alıřmada SDG8’i temsil etmek zere seilmiřtir. İlgili literatr dikkate alınarak EG deđiřkeninin belirleyicileri zerine arařtırma yapılabilir. Bylece, SDG8’e ulařmak iin en uygun belirleyiciler tartıřılarak literatre katkı sađlanabilir.