Analysis of Female Labor Force Participation, Education, and Income Inequality in Türkiye Employing Regional Data

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Türkiye'de Kadın İşgücüne Katılımı, Eğitim ve Gelir Eşitsizliğinin Bölgesel Verilerle Analizi

Öz

Bu çalışma, 2014-2023 yılları arasında Türkiye'nin İBBS2 düzeyindeki 26 bölgesinden panel veri kullanarak kadın işgücüne katılımın gelir eşitsizliği üzerindeki etkisini analiz etmektedir. P80/P20 oranı gelir eşitsizliğini ölçmektedir. Model, temel açıklayıcı değişken olan kadın işgücüne katılımının yanı sıra eğitimli kadınların payı, şehirleşme, işsizlik, enflasyon ve kişi başına düşen reel gelir kontrol değişkenleri de içermektedir. Eğitimin bu ilişkiyi nasıl etkilediğini incelemek için katılım ve eğitim arasındaki etkileşim terimi de modele eklenmiştir. İçselliği ele almak için GMM yöntemi uygulanmaktadır. Bulgular, kadınların iş gücüne katılımının başlangıçta gelir eşitsizliğini artırdığını, ancak eğitimli kadınların oranı yükseldikçe bu etkinin tersine döndüğünü göstermektedir. Bu durum, kadın iş gücüne katılımının eşitsizlik üzerindeki etkisinin eğitim düzeyine bağlı olduğunu ortaya koymakta ve önemli politika önerilerine zemin hazırlamaktadır.

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Abstract

This study analyzes the effect of female labor force participation on income inequality using panel data from 26 Turkish regions (NUTS 2 level) between 2014 and 2023. The S80/S20 ratio measures income inequality. The model includes female labor force participation as the primary explanatory variable, with controls for the share of educated women, urbanization, unemployment, inflation, and real income per capita. An interaction term between female participation and educated women is added to explore how education influences this relationship. To address endogeneity, the GMM method is applied. Findings show that female participation initially increases inequality, but this effect reverses when the share of educated women is higher, highlighting that its impact depends on education levels, with important policy implications.

Anahtar Kelimeler: Kadın işgücüne katılım, gelir eşitsizliği, IV-GMM, aile ekonomisi, Türkiye.

Makale Türü: Araştırma Makalesi

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1. Introduction

The Republic of Türkiye declared 2025 the "Year of the Family," emphasizing the importance of the family in social and economic life. The official announcement acknowledged the family as the "foundational building block of society" and emphasized that its protection is a "universal human right" (TİHEK, 2025). The 1982 Constitution also stated that the family is the foundation of society and is based on a structure of equality between spouses; the state was tasked with protecting family peace and well-being (T.C. Anayasası, 1982). Within the scope of the "Action Plan for the Protection and

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Strengthening of the Family (2024-2028)," prepared in line with the family protection objectives of the Twelfth Development Plan, family policy focused on eliminating social and economic inequalities, increasing employment, and regulating income distribution (Twelfth Development Plan, 2023; AKGVBEP, 2024). In this context, the concept of family is considered not only as a sociological or cultural phenomenon but also as a critical economic unit for both individual well-being and sustainable social development.

The concept of family economics views the family, or household, as an economic unit, encompassing the income-generating, consumption, saving, and investment activities of individuals within the family. The distribution and use of family income directly impact both the well-being of family members and the overall balance of the national economy. Indeed, studies show that determinants such as women's employment status influence the use of household income. For example, a married woman entering a paid job significantly expands the family budget, leading to changes in spending and saving patterns (Aydıner Boylu & Terzioğlu, 2007). From an income distribution perspective, the share that families receive from their total income and how this income is used are closely linked to the principles of justice and equality at the societal level. Income inequality in Türkiye has been on the rise in recent years, with upper-income groups receiving an increasingly larger share of income, while the share of lower-income groups is declining. Therefore, it is argued that intra-family variables, such as the internal distribution of family income and women's employment, have significant impacts on income equity across the country (Başar, 2024; Gözüm, 2024).

Women's labor force participation plays a central role in understanding the relationship between the family economy and income distribution. The literature emphasizes that women's participation in employment may help lessen poverty and improve the overall well-being of society by increasing household income. For example, Başar (2024) states that increasing women's labor force participation increases household incomes, leading to a more balanced distribution of economic welfare and may generally lower income inequality. Similarly, Gözüm (2024) emphasizes that women's economic empowerment can increase family income levels, reduce poverty, and positively impact social welfare. Women's employment not only supplements the family budget but also changes spending priorities, investment, and saving patterns within the family. Related studies have shown that the increased income generated by married women in the workforce makes it easier for families to meet their basic requirements, like clothing, education, housing, and healthcare (Aydıner Boylu & Terzioğlu, 2007). At the same time, women's economic independence allows them to have a say in family decision-making processes, thus reshaping the balance of power (Başar, 2024). These dynamics are reflected both in family well-being at the micro level and in employment and income distribution at the macro level.

In Türkiye, the female labor force participation rate lags significantly behind the OECD average (World Bank, 2025). Official development plans and policies also highlight this situation, prioritizing increasing women's employment to achieve the goals of "strengthening women's socioeconomic position, ensuring gender equality in social life, sustainable economic growth, and social development." For example, the strategy document prepared by the Ministry of Family and Social Services highlights the goals of increasing women's employment and ensuring equal pay for equal work (Ministry of Family and Social Services, 2022). Furthermore, studies on income distribution focusing on family economics and women's employment are rare, and the findings will provide new perspectives. Hence, investigating the potential impact of women's employment on reducing income inequality is crucial.

At this point, the importance and contribution of our research become evident. Examining the impact of women's employment on the family economy and income distribution using regional panel data will open new horizons for the literature and provide guidance for policymakers. Analyses using panel data covering 26 regions at the NUTS-2 level in Türkiye during the 2014–2023 period will reveal

regional disparities and enable mapping of family economic dynamics. The results will provide concrete evidence showing how women's employment incentives improve family incomes and contribute to income equity. These findings can inform the design of family-focused programs by institutions such as the Ministry of Family and Social Policies. For example, policies such as increasing access to childcare services, providing flexible work arrangements, or expanding educational opportunities can increase family incomes by encouraging greater women's participation in the workforce. Ultimately, the study aims to offer strategic recommendations to increase the effectiveness of economic and social policies by illuminating the relationship between women's employment and family well-being.

The study will continue as follows. Following the introduction, a review of relevant literature will be provided. In Sections 3 and 4, we introduce the dataset and the econometric methodology we use. Section 5 details the empirical findings. We discuss the findings and offer policy recommendations in Section 6.

2. Literature Review

Income inequality has been a central topic of discussion in the economics literature for many years, and the causes of this phenomenon have been addressed in numerous studies within the framework of economic, structural, and social dynamics. The impacts of many factors, such as economic growth, labor market structure, education level, technological change, urbanization, and gender roles on income distribution have been examined in detail in the literature (Abdullah et al., 2015; Castellano et al., 2017; Kharlamova et al., 2018; Dossou, 2023; Magda et al., 2024). This study analyzes the effects of the female labor force participation rate on income inequality explicitly, while also assessing the role of variables such as women's education, urbanization, unemployment, inflation, and per capita income. Thus, the unique position of women's employment within the multidimensional dynamics affecting income inequality is explored.

International studies generally show that female labor force participation has a reducing effect on income inequality (Harkness, 2010). Conversely, increased employment for women can also lead to increased income inequality under some circumstances (Sudo, 2017). In a comparison of 17 developed countries conducted by Harkness (2010), women's earnings played a significant role in reducing household income inequality. Similarly, using Swiss data, Kuhn and Ravazzini (2017) found that increasing women's labor force participation reduces household income inequality over time. Furthermore, studies in the literature indicate that inequality can be negatively affected even if women's labor force participation increases in certain specific circumstances. For instance, Khera (2016) argues that rigidities in the labor market hinder adequate formal job creation, which in turn raises unemployment and informal employment rates, ultimately exacerbating gender disparities in formal job access and earnings.

Income inequality has generally been found to decrease as women's level of education increases. Studies such as Park (1996) and Gregorio & Lee (2002) have found that a higher average level of education has a reducing effect on income inequality. Equality in education also reduces inequality; Gregorio & Lee (2002) concluded that, in addition to higher education levels, increased education expenditures and their equal distribution also play a role in improving inequality. Uyanık and Yeşilkaya (2021) observed that the employment of women with a high school education contributes to a rise in the Gini coefficient, indicating increased income inequality, whereas greater employment among women with university degrees leads to a decline in the Gini coefficient, thereby reducing inequality. Similarly, Munir and Kanwal (2015) identified a positive link between educational and income inequality, emphasizing that the effect of gender inequality on income distribution may vary depending on the level of education attained.

The impact of urbanization on income inequality has yielded mixed results in the literature. In the short term, urbanization can generally increase inequality and decrease it in the long run. For example, an empirical study in Vietnam found that urbanization reduces income inequality in the long run, but its short-term impact is very limited (Ha et al., 2019). Ali et al. (2022) also demonstrated that urbanization has different effects on inequality across different income groups. Sulemana (2019) found that urbanization increases income inequality for 48 sub-Saharan African countries. Wu and Rao (2017) also identified an inverted-U relationship between income inequality and urbanization in their study of Chinese cities. Generally, it is argued that increasing urbanization rates can increase inequality during periods of uncontrolled urbanization, but over time, they can improve income distribution through equalizing mechanisms such as infrastructure and educational opportunities.

Increases in unemployment are thought to worsen the relative situation of low-income groups. Therefore, a generally positive relationship can be assumed between unemployment rates and income inequality (Mocan, 1999). González and Menendez (2000) found in their study of Argentina that unemployment accounts for a significant portion of earnings inequality. Şenol and Onaran (2023) also showed that unemployment increases income inequality in BRICS-T countries. Gokhool et al. (2024), in their study of 42 sub-Saharan African countries, grouped by income diversity, showed that increased employment reduces inequality in some groups of countries.

Inflation, a factor that affects households' real incomes, affects income inequality in two ways. First, households with different income levels may face different inflation rates because their consumption baskets may differ. Second, inflation affects the real rate of return households receive on their savings. Because household savings rates vary across income levels, inflation affects income distribution (Ünal & Doğan, 2021). For example, Siami-Namini and Hudson (2019) demonstrated the existence of a long-term bidirectional causal relationship between inflation and income inequality across both developed and developing economies. Thalassinos et al. (2012) also showed that inflation increases inequality for 13 European countries. The results of microdata analysis conducted in Türkiye also indicate that high inflation has a significant impact on income distribution (Ünal & Doğan, 2021). Finally, Sintos (2023) showed in his meta-analysis that inflation has an inequality-increasing effect with a small to medium effect.

The nexus between economic growth and income inequality has been extensively examined in the economic literature, particularly through the lens of the Kuznets Curve. According to Kuznets (1955), income inequality tends to rise during the initial phases of economic development but subsequently diminishes once a specific income threshold is surpassed. This hypothesis implies an inverted-U-shaped relationship. However, empirical studies have observed varying estimates of this effect. For example, Rubin and Segal (2015) and Chang et al. (2018) detected a positive association between growth and income inequality. Bouincha and Karim (2018) estimated the different influences of growth dynamics on inequality levels in a study examining 189 countries. While no significant relationship was found in the estimates for all countries, developing countries, and medium-sized developed countries, they found an adverse impact of growth on inequality for developed countries. In contrast, focusing on transition economies, Fawaz and Rahnama (2022) identified a positive association between income disparity and economic expansion in high-income economies, while they estimated a negative linkage in low-income economies.

In general, the literature contains extensive studies on how variables such as women's employment, education, and urbanization affect income inequality. However, most of these studies focus on developed countries or international cross-sections. In Türkiye, however, few studies examine income inequality with multiple macro variables. In particular, empirical studies examining the interaction effect of two variables, such as the proportion of educated women and labor force participation, are virtually nonexistent in the literature. In our study, we aim to address this deficiency

by including the product of women's education rate and labor force participation in the model. This allows us to provide a detailed explanation of the impact of increasing the proportion of educated women on women's employment and the dynamics of income inequality. Furthermore, the findings obtained through a current panel data analysis specific to Türkiye are expected to contribute to the literature.

3. Data Description

The data utilized for the purposes of this research includes annual observations for 26 regions (NUTS-2 classification) between 2014 and 2023. Thus, a balanced panel data structure containing a total of 260 observations is obtained. The dependent variable is the S80/S20 ratio, an indicator of income inequality. The independent variables are the female labor force participation rate, the share of educated women, the urbanization rate, the unemployment rate, the inflation rate, and real income per capita. Table 1 displays the descriptions of the relevant variables and the data source.

Table 1. Definition and Sources of the Variables

Variable	Definition	Unit	Source
Inequality	S80/S20 ratio by Household disposable income: The ratio of the share of the top 20% income earners in society to the share of the lowest 20% income earners in society.		TURKSTAT, (2025a)
Participation	Female labor force participation rate: Labor force participation rate of women aged 15 and over.	%	TURKSTAT, (2025b)
Education	Female population by education status (15 years of age and over): Proportion of females who graduated from high school or vocational school at the high school level.	%	TURKSTAT, (2025c)
Urbanization	Urbanization rate: The ratio of the population of provincial and district centers to the total population.	%	TURKSTAT, (2025c)
Unemployment	Unemployment rate.	%	TURKSTAT, (2025b)
Inflation	Consumer price index.	%	TURKSTAT, (2025d)
Real income per capita	Per capita GDP deflated by CPI.	Tl	TURKSTAT, (2025e)

Descriptive statistics pertaining to these variables are reported in Table 2.

Table 2. Summary Statistics of Key Variables over the Years

Variable	Observation	Mean	Sd	Min	Max
2014					
Inequality	26	6.415	0.811	5.026	7.725
Participation	26	30.088	7.285	12.300	39.700
Education	26	16.820	3.884	9.760	24.700
Urbanization	26	85.985	13.985	50.290	100.000
Unemployment	26	9.277	4.605	3.400	24.000
Inflation	26	242.020	0.000	242.020	242.020
Gdp	26	9077.031	3506.796	4290.141	18288.570
2019					
Inequality	26	6.191	0.728	4.714	7.455
Participation	26	33.335	6.002	21.400	43.500
Education	26	20.625	2.827	15.160	26.250

Urbanization	26	87.443	12.882	53.550	100.000
Unemployment	26	13.419	5.705	7.600	30.900
Inflation	26	418.236	0.000	418.236	418.236
Gdp	26	10279.200	3928.950	4850.134	20718.210
2023					
Inequality	26	7.309	1.088	5.068	9.428
Participation	26	34.662	6.081	22.700	43.100
Education	26	22.970	2.452	17.800	27.830
Urbanization	26	87.730	12.499	56.860	100.000
Unemployment	26	9.350	2.758	4.900	17.200
Inflation	26	1488.914	0.000	1488.914	1488.914
Gdp	26	17100.250	6566.348	8267.636	34302.380

The table results show that there are significant differences in income inequality and related socioeconomic indicators among Türkiye's NUTS 2 regions, and that these differences fluctuate over time.

As of 2014, the S80/S20 ratio averaged 6.415, with the lowest value at 5.026 belonging to the region with the most equal income distribution and the highest at 7.725 belonging to the most unequal region. The female labor force participation rate averaged 30.09%; in some regions, this rate remained as low as 12.3%, with a peak of 39.7%. The average rate of women with high school or higher education is low at 16.82%, falling below 10% in some regions. A wide range is also evident in real per capita income: a minimum of 4,290 TL and a maximum of 18,288 TL.

In 2019, the S80/S20 ratio decreased to an average of 6.191, indicating a general improvement in income distribution. However, regional differences persist (min: 4.714; max: 7.455). The female labor force participation rate increased compared to 2014, with an average of 33.34%. The female education rate also rose to 20.63%, with a low of 15.16%. Conversely, a significant increase was observed in the unemployment rate; average unemployment rose from 9.28% to 13.42%. While real per capita income increased compared to 2014 (approximately 10,279 TL on average), the rate of increase was quite heterogeneous across regions.

By 2023, the S80/S20 ratio reached its highest level during the period, with an average of 7.309. The lowest inequality was measured at 5.068, and the highest at 9.428. This suggests a deterioration in income distribution in the period after 2019. Female labor force participation continued its upward trend with an average of 34.66%; The female education rate rose to 22.97%. The unemployment rate, at an average of 9.35%, declined from its peak in 2019, but reached 17.2% in some regions. A significant increase in real per capita income is observed, with the average rising to 17,100 TL, while the maximum is 34,302 TL, nearly four times the minimum.

These findings suggest a slight decrease in income inequality during the 2014–2019 period, but a reversal during the 2019–2023 period. Female labor force participation and the proportion of women with high school or higher education increased steadily during the period under study. Despite this, the increase in the Gini coefficient suggests that improvements in these two indicators did not reduce inequality in the short term.

While real per capita income data exhibit a general upward trend throughout the period, the significant difference between the minimum and maximum values indicates that both regional and interannual heterogeneity persist across the panel. The unemployment rate increased between 2014 and 2019 and decreased between 2019 and 2023. However, the fact that unemployment rates remain high in some regions suggests that this indicator may deviate from the general trend. Overall, these changes

in the examined indicators suggest that different dynamics may be at play, both regionally and temporally.

4. Empirical Framework

In this study, we aim to analyze the relationship between income inequality and economic and social variables. While the variable we primarily want to measure is the female labor force participation rate, we also include several control variables in our model. Moreover, economic growth significantly influences income distribution. Kuznets' (1955) seminal study proposes an inverted U-shaped relationship between economic growth and income inequality. Specifically, inequality tends to rise during the initial phases of development but declines after reaching a certain level, as growth promotes industrialization, democratic institutions, and social welfare improvements. Following the Kuznets' work, we included squared per capita GDP to capture the nonlinear relation.

In this concept, we estimate the model in equation (1).

$$inequality_{it} = \beta_0 + \beta_1 participation_{it} + \beta_2 education_{it} + \beta_3 urbanization_{it} \tag{1}$$
$$+ \beta_4 unemployment_{it} + \beta_5 inflation_{it} + \beta_6 gdp_{it} + \beta_7 gdp_{it}^2 + u_i + \varepsilon_{it}$$

where inequality represents income inequality, participation represents the female labor force participation rate, education represents the share of women over the age of 15 who graduated from high school or equivalent, unemployment represents the unemployment rate, inflation represents the inflation rate measured by CPI, and GDP represents real per capita income. Furthermore, i represents region, t represents time, u_i represents region-specific effects, and ε_{it} represents the error term. Furthermore, an interaction term is added to the model to reflect the possibility that female labor force participation may affect inequality differently across different proportions of educated women.

$$inequality_{it} = \beta_0 + \beta_1 participation_{it} + \beta_2 education_{it} + \beta_3 participation_{it} * education_{it} \tag{2}$$
$$+ \beta_4 urbanization_{it} + \beta_5 unemployment_{it} + \beta_6 inflation_{it} + \beta_7 gdp_{it} + \beta_8 gdp_{it}^2$$
$$+ u_i + \varepsilon_{it}.$$

In equation (2), the participation*education term controls the influence of participation on inequality as the share of educated women changes.

4.1. Estimation Strategy

Considering equation (1), reverse causality can be assumed to arise between the dependent variable and the explanatory variables. Increasing female labor force participation can lead to diversification of household incomes and an increase in total labor supply, thereby reducing income inequality. At the same time, a more egalitarian income distribution can encourage women's participation in economic life. In this context, a bidirectional causality relationship can be considered between the female labor force participation rate and income inequality. In this case, an estimation method that takes reverse causality into account needs to be developed.

A possible reverse causality problem between the dependent and control variables violates the exogeneity postulation, a traditional Ordinary Least Squares OLS assumption. In other words, if the endogeneity problem arises in the model, traditional techniques, namely OLS, could lead to inconsistent results (Wooldridge, 2010). In this context, to estimate equations (1) and (2), we ponder an instrumental variable estimator employing two-stage Generalized Method of Moments (IV-GMM) under panel fixed effects. IV-GMM estimations were performed using Schaffer (2020)'s xtivreg2

command in Stata, which extends the instrumental variables and GMM framework outlined by Baum et al. (2007).

Female labor force participation and the education-participation interaction are assumed to be endogenous. To correct for endogeneity primarily driven by reverse causality, lagged values of female labor force participation and the education–participation interaction are used as internal instruments. Lagged levels are expected to be strongly correlated with their current values (instrument relevance) while remaining exogenous to contemporaneous shocks in the dependent variable once fixed effects are controlled for (instrument exogeneity). Due to such features, when a suitable instrumental variable cannot be found, lagged explanatory variables can be used as instruments (See: Lechman and Kaur (2015), Cabeza-García et al. (2018)). The inclusion of the first and second lags provides a sufficiently strong instrument set and helps mitigate potential weak-instrument concerns.

5. Empirical Results

We estimate two models. The first model is our baseline model defined in equation (1), which includes the dependent and control variables. The second model described in equation (2) incorporates an interaction term of participation and education variables. Table 3 reports the estimation results obtained using a panel dataset for 26 NUTS-2 regions over the 2014–2023 period. The dependent variable is the S80/S20 ratio, a measure of income inequality. In both models, region and year fixed effects are controlled, and robust standard errors are obtained.

Table 3. Regression Results Corresponding to Models 1 and 2

VARIABLES	Model 1	Model 2
Participation	0.0778*	0.2734**
	(0.0461)	(0.1379)
Education	-0.1954***	0.1193
	(0.0661)	(0.1637)
Participation*Education		-0.0143*
		(0.0082)
Urbanization	0.1617**	0.1013*
	(0.0665)	(0.0555)
Unemployment	0.0361[a]	0.0475*
	(0.0237)	(0.0278)
Inflation	0.0014**	0.0017***
	(0.0004)	(0.0005)
GDP	4.0224	-53.9940
	(140.7874)	(143.3724)
GDP^2	-510.9266	1299.703
	(2357.63)	(2710.824)
Observations	234	208
Hansen J statistic (p-value)	0.000 (NA)	1.240 (0.5381)
Region FE	Yes	Yes
Time FE	Yes	Yes
Number of individuals	26	26

Notes: Model 1 and 2 refer to the equations (1) and (2), respectively. GDP is scaled by 1,000,000 (expressed in millions) to improve numerical stability and ease interpretation. Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$, a $p<0.13$

In Model (1), the female labor force participation rate is positively associated with the S80/S20 ratio and statistically significant at the 10% level, indicating that, ceteris paribus, an increase in participation corresponds to an increase in income inequality. The proportion of educated women has a negative and statistically significant coefficient at the 1% level, suggesting that a higher share of educated women in the population reduces inequality. Urbanization and inflation are also positively and significantly related to inequality, while the unemployment rate shows a weak positive significance. The estimated coefficients of real per capita income and its squared term are positive and negative, respectively, aligning in sign with the Kuznets hypothesis; however, neither is statistically significant, implying no robust evidence for a Kuznets-type relationship in the dataset.

When the interaction term between female labor force participation and the proportion of educated women is introduced in Model (2), the direct effect of participation becomes positive and significant at the 5% level, while the coefficient for the proportion of educated women turns positive but remains statistically insignificant. The interaction term itself is negative and significant at the 10% level, indicating that the inequality-increasing effect of female labor force participation diminishes as the proportion of educated women rises. This suggests that the net effect of higher participation on inequality depends on educational composition: at lower education levels, increased participation tends to raise inequality, whereas at higher education levels, the effect weakens and can potentially reverse beyond a certain threshold.

Urbanization and inflation maintain their positive and significant relationship with inequality in both models, while unemployment becomes significant at the 10% level in Model (2). Real per capita income variables remain statistically insignificant in all specifications.

The Hansen J test statistic for Model (2) yields a p-value of 0.5381, failing to reject the validity of the instruments. In Model (1), the use of a one-period lagged variable as the sole instrument results in an exactly identified equation, rendering the overidentification test statistic equal to zero.

Overall, the comparison between the two models underscores the importance of including the interaction term. In Model (1), participation and education appear to have effects in opposite directions—participation increases, and education decreases inequality. In Model (2), the interaction term reveals that these effects are not independent; instead, the educational composition of the female labor force critically conditions the relationship between participation and inequality. This finding highlights that analyses omitting the interaction risk oversimplify the dynamics and misrepresent the underlying mechanisms.

6. Discussion and Conclusion

This study investigates the impact of the female labor force participation rate and its interaction with the proportion of educated women on income inequality, using panel data for Türkiye's NUTS-2 regions over the period 2014–2023. The S80/S20 ratio measures income inequality. The baseline model incorporates female labor force participation, the proportion of educated women, urbanization, unemployment, inflation, real income per capita, and its squared term. The extended model adds an interaction term between female labor force participation and the proportion of educated women to assess how education conditions this relationship. Estimations are performed using the IV-GMM method with lagged variables as instruments to address endogeneity arising from potential reverse causality between participation and inequality.

Empirical results from the baseline model show that female labor force participation has a positive and statistically significant effect on the S80/S20 ratio, implying that, ceteris paribus, an increase in participation is associated with higher inequality. Conversely, the proportion of educated women

exhibits a negative and significant coefficient, indicating that a larger share of educated women in the population is associated with reduced inequality.

The inclusion of the interaction term in Model 2 substantially alters the interpretation. While the direct effect of participation remains positive and statistically significant, the interaction coefficient is negative and significant. This finding implies that the impact of female labor force participation on inequality is conditional on the proportion of educated women. Specifically, at lower levels of education, increased participation tends to raise inequality, whereas at higher levels of education, this effect diminishes and may even reverse beyond a certain threshold.

Interpreting these results within the framework of family economics highlights that female labor force participation influences household welfare and income distribution in multifaceted ways. At lower education levels, women often enter low-wage and insecure employment, which, while supplementing household income, may have limited potential to improve overall welfare and can exacerbate inequality. In contrast, the participation of more educated women—who are more likely to access higher-value-added and better-paid jobs—can significantly increase household income and contribute to a more equitable distribution of resources. This mechanism also has implications for intra-household dynamics. Employment of more educated women not only boosts family income but also enhances their bargaining power in household decision-making, potentially leading to fairer resource allocation and long-term benefits such as improved child education and health outcomes.

The results align with the broader literature, which emphasizes the role of contextual factors in shaping the participation–inequality nexus. For example, Aldan (2021) points to findings that female labor force participation increases wage inequality. However, education emerges as a key determinant of both the direction and magnitude of this relationship in our analysis. For instance, Uyanık and Yeşilkaya (2021) argue that the employment of women with different educational levels has different impacts on inequality. The negative interaction coefficient supports the conditionality mechanism observed in international studies, where the quality of employment, sectoral distribution, and formality of work critically influence outcomes. In Türkiye, high rates of informal employment and the concentration of many women in low-wage sectors can amplify the inequality-increasing effect of participation among less educated women. Indeed, studies on wage inequality frequently emphasize that increasing women's education reduces gender wage gaps (see, for example, Nakavachara, 2010; Garcia-Prieto & Gómez-Costilla, 2017). These findings suggest that higher education levels facilitate women's access to better-paying jobs, indirectly consistent with the results of our study.

The signs and effects of the control variables are generally consistent with the existing literature. For example, Sulemana (2019) shows that urbanization increases income inequality, a finding consistent with the positive urbanization effect in our study. Similarly, the increasing effect of unemployment on inequality has been reported by Şenol and Onaran (2023) and Gokhool et al. (2024). The positive relationship between inflation and income inequality is consistent with the findings of Sintos (2023).

From a policy perspective, these findings underscore that simply increasing female labor force participation may not automatically reduce inequality. Policies should integrate strategies to raise the proportion of educated women—such as expanding access to higher education, vocational training, and lifelong learning opportunities—alongside measures promoting formal employment and improving access to childcare and eldercare services. In addition, the policy implications should account for Türkiye's pronounced regional heterogeneity. NUTS-2 regions vary substantially in women's educational attainment, informality rates, and sectoral employment structures. In more developed western and central regions, where female education levels and formal job opportunities are relatively higher, expanding female labor force participation is more likely to contribute to

inequality-reducing outcomes. By contrast, in eastern and southeastern regions, where informality is widespread and educational attainment is lower, policy priorities should first focus on strengthening human capital through targeted scholarship programs for women, region-specific vocational training, and initiatives that facilitate transitions from informal to formal employment. Moreover, expanding affordable childcare and eldercare services in low-employment regions would help reduce the care burdens that disproportionately constrain women's access to better-paid, more stable jobs. Tailoring policy instruments to regional labor market conditions—such as supporting women-owned enterprises in developing regions or promoting skill-upgrading programs in urban centers—can enhance the effectiveness of labor market interventions and ensure that increases in participation translate into more equitable income distribution.

While the study provides important insights, it also presents opportunities for further research. The analysis period coincides with macroeconomic fluctuations, crises, and exceptional events such as the COVID-19 pandemic, which may have influenced labor market structures and income distribution patterns in ways that go beyond the scope of this study. In addition, the available data do not include detailed information on aspects such as informal employment or job quality, which could help to better explain the mechanisms linking female labor force participation, education, and inequality. The analysis focuses on the proportion of women with at least upper secondary education; future studies could extend this approach by differentiating between education levels, such as tertiary or postgraduate attainment, to reveal more nuanced effects. Endogeneity is addressed for female labor force participation and its interaction with education, but exploring potential reverse causality in other explanatory variables could also strengthen future findings. Finally, as the study relies on a single inequality measure (S80/S20), future research could benefit from incorporating alternative indicators to test the robustness of the results and provide a more comprehensive assessment of the participation–inequality relationship.

Araştırma ve Yayın Etiği Beyanı

Bu çalışma etik kurul izni gerektirmemektedir.

Yazarların Makaleye Olan Katkıları

Çalışma tek yazar tarafından oluşturulmuştur.

Destek Beyanı

Araştırma herhangi bir kurum veya kuruluş tarafından desteklenmemektedir.

Çıkar Beyanı

Herhangi bir çıkar çatışması bulunmamaktadır.

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Extended Summary

This study investigates the relationship between female labor force participation and income inequality in Türkiye, with a particular emphasis on how the proportion of educated women conditions this relationship. The analysis is grounded in the perspective of family economics, which views the household as an economic unit whose members make joint decisions on labor supply, consumption, savings, and investments. Within this framework, women's participation in the labor market is not only a source of additional household income but also a factor that can alter the structure of income distribution both within the family and across society. Education plays a central role in shaping these effects, as higher educational attainment generally enhances productivity and earning potential, and can strengthen women's bargaining power in household decision-making. Nevertheless, the influence of female labor force participation on income inequality is not unidirectional. Depending on the distribution of skills, the quality of available jobs, and the institutional environment, increased participation can either reduce inequality by raising household incomes in the lower parts of the distribution or exacerbate inequality if the gains are concentrated among women already in more advantaged positions.

The empirical analysis uses a balanced panel dataset covering 26 NUTS-2 regions of Türkiye for the years 2014 to 2023. The dependent variable is the S80/S20 income ratio, a measure of income inequality capturing the gap between the incomes of the top 20 percent and the bottom 20 percent of the distribution. The main explanatory variable is the female labor force participation rate, defined as the percentage of women aged 15 and above participating in the labor force. The proportion of educated women, measured as the share of women aged 15 and above with at least an upper secondary education, is included to capture differences in human capital. An interaction term between these two variables is also constructed to evaluate whether the effect of participation on inequality depends on the share of educated women. Control variables include the urbanization rate, the unemployment rate, the consumer price index as an indicator of inflation, real GDP per capita, and the square of real GDP per capita to capture potential non-linear effects.

Given the possibility of reverse causality between female labor force participation and income inequality, the analysis employs an instrumental variables approach using the two-stage Generalized Method of Moments estimator with region and time fixed effects. This method allows the model to address the endogeneity problem, which arises when changes in participation affect income distribution and, conversely, when changes in income distribution influence women's participation decisions. Female participation and the interaction term are treated as endogenous, and their lagged values, together with other exogenous variables, are used as instruments. Robust standard errors are used to correct for potential heteroskedasticity, and the Hansen J-test is applied to assess the validity of the instruments.

The estimation results provide clear insights into the nature of the participation–inequality relationship in Türkiye. In the baseline model, which excludes the interaction term, the coefficient on female labor force participation is positive and statistically significant at the 10 percent level. This indicates that, holding other factors constant, higher female participation is associated with an increase in the S80/S20 ratio, meaning greater income inequality. The proportion of educated women, on the other hand, has a negative and highly significant coefficient, suggesting that a greater share of educated women is associated with lower inequality. Urbanization and inflation also have significant positive effects on inequality, while unemployment shows a weaker positive effect. The coefficients for real GDP per capita and its square follow the expected signs under the Kuznets hypothesis, but are not statistically significant.

The second model, which introduces the interaction term between female labor force participation and the proportion of educated women, presents a different picture. In this specification, the direct

effect of female participation becomes larger in magnitude and gains statistical significance at the 5 percent level. The coefficient on the proportion of educated women becomes positive but is no longer statistically significant, while the interaction term is negative and significant at the 10 percent level. This combination of results implies that the effect of female participation on inequality depends on the level of education among women. Specifically, at lower levels of education, higher participation appears to increase inequality, whereas at higher levels of education, this effect is weakened and may even reverse. In other words, the potential inequality-increasing impact of participation is mitigated when more of the participating women are educated.

These findings have important implications for understanding how changes in women's labor market activity translate into broader distributional outcomes. The results suggest that participation in itself is not a guarantee of reduced inequality; rather, the characteristics of the participants matter greatly. In the Turkish context, where a significant portion of female employment is concentrated in low-wage, insecure jobs, increases in participation driven by less-educated women may fail to reduce inequality and may even exacerbate it. Conversely, when a higher share of educated women accompanies increased participation, the additional labor income tends to be associated with better jobs and higher earnings, which can contribute to narrowing income disparities.

From the perspective of family economics, these results highlight that the role of women's employment in the household economy is heterogeneous. For households where women enter the labor force without higher educational qualifications, the additional income may be modest, and the overall impact on household welfare may be limited, especially if the jobs are precarious and lack benefits. For households where women with higher education enter the labor market, the income gains are likely to be larger and more stable, with greater potential to improve both the household's standard of living and the allocation of resources within the family. Higher-earning women may also have greater influence over household decision-making, leading to better outcomes for children's education and health, thereby producing longer-term reductions in inequality.

The inclusion of the interaction term in the model proves crucial for capturing these dynamics. Without accounting for education, the estimated relationship between female participation and inequality could be misleading, potentially suggesting that increased participation inherently worsens inequality. By incorporating the interaction, the analysis reveals that this is only the case under certain conditions and that the relationship can shift direction depending on the educational composition of the female labor force. This underlines the importance of considering both participation and human capital jointly when analyzing the drivers of income inequality.

The study's findings also align with broader international evidence showing that the impact of female labor force participation on inequality is mediated by factors such as education, sectoral employment patterns, and the quality of jobs available to women. In countries with high rates of informal employment and gender segregation in low-wage sectors, participation gains alone often do not yield equitable outcomes. In contrast, in contexts where women's employment is concentrated in high-skill, high-wage sectors, increased participation is more likely to reduce inequality. Türkiye's mixed labor market structure, with both high-skilled urban employment and widespread low-wage informal work, provides a context in which these conditional effects are particularly visible.

While the study offers robust evidence on the conditional role of education in shaping the participation–inequality relationship, there remains scope for further research. The analysis covers the years 2014 to 2023, a period marked by macroeconomic volatility, including economic slowdowns, currency fluctuations, and the COVID-19 pandemic. These factors may have influenced labor market dynamics and income distribution patterns in ways not fully captured by the present model. In addition, the dataset does not provide detailed information on aspects such as job quality, contract types, or the sectoral composition of female employment, which could help to better explain the

mechanisms at work. The analysis focuses on the proportion of women with at least upper secondary education; extending this approach to distinguish between different education levels, such as tertiary or postgraduate attainment, could yield more granular insights. Endogeneity is addressed for female participation and its interaction with education, but exploring potential reverse causality in other explanatory variables could also strengthen the robustness of future findings. Finally, as the study relies on a single inequality measure (S80/S20 ratio), future research could incorporate alternative indicators to provide a broader perspective on the participation–inequality nexus.

Overall, the extended analysis shows that policies aimed at increasing female labor force participation need to be designed in conjunction with strategies to improve women's educational attainment and access to higher-quality employment. Simply raising participation rates without addressing the educational composition of new labor market entrants may not yield the desired effect on income distribution and could even worsen inequality. The findings thus reinforce the view that education and labor market policies must be coordinated to ensure that increased female participation contributes positively to reducing inequality in Türkiye.