

IDENTIFICATION OF FACTORS AFFECTING FEMALE LABOR FORCE PARTICIPATION BY PANEL VAR ANALYSIS: EVIDENCE FROM TURKEY

KADINLARIN İŞGÜCÜNE KATILIMINI ETKİLEYEN FAKTÖRLERİN PANEL VAR ANALİZİ İLE BELİRLENMESİ: TÜRKİYE ÖRNEĞİ

Citation: Akay, Ö. and Gündüz, F.F. (2022). Identification of factors affecting female labor force participation by panel var analysis: evidence from Turkey. *Journal of Pure Social Sciences*, 3(4), 12-26.

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Abstract

A woman is one of the most important determinants of social development as she takes part in every stage of business life, gains her economic freedom, determines her own power, and being at the center of family life both as a wife and mother. In this study, in which the factors affecting female labor force participation in Turkey are determined. A panel data set was created by using the annual data of the 2nd level regions in Turkey for the period of 2014-2020 obtained from the website of the Turkish Statistical Institute (TUIK). The panel VAR analysis method was used as the econometric method. According to the panel VAR model, one lag of women's labor force participation rate and one lag of crude birth rate were statistically significant in explaining the female labor force participation rate for Model 1. For Model 2, one lag of female labor force participation rate, one lag of crude birth rate, and one lag of female population ratio were found significant to explain the female divorce rate. It is very important for states and policy makers to support women in establishing a balance between work and family life with the necessary regulations, and thus women take a more active role in working life.

Keywords: Female Labor Force Participation Rate, Panel VAR Analysis, Turkey

Öz

Kadın hem eş hem anne olarak aile hayatının merkezinde yer alırken diğer taraftan iş hayatının her kademesinde yer alıp, ekonomik özgürlüğünü kazanan, kendi gücünü kendi belirleyen yapısıyla toplumsal kalkınmanın en önemli belirleyicilerindedir. Bu çalışmada Türkiye’de kadınların işgücüne katılımını etkileyen faktörler belirlenmiştir. Türkiye İstatistik Kurumu'nun (TÜİK) web sitesinden elde edilen 2014-2020 döneminde Türkiye’de 2. düzey bölgelere ait yıllık veriler kullanılarak panel veri seti oluşturulmuş ve panel VAR analizi yöntemi ile analizler gerçekleştirilmiştir. Panel VAR modeli sonuçlarında Model 1 için kadın iş gücüne katılım oranı değişkeninin bir gecikmesi ve kaba doğum hızı değişkeninin bir gecikmesi kadın iş gücüne katılım oranı değişkenini açıklamakta anlamlı bulunmuştur. Model 2 için ise kadın iş gücüne katılım oranı değişkeninin bir gecikmesi, kaba doğum hızı değişkeninin bir gecikmesi ve kadın nüfus oranı değişkeninin bir gecikmesi kaba boşanma hızı değişkeninin açıklamakta anlamlı bulunmuştur. Devletlerin ve politika yapıcıların gerekli düzenlemelerle kadınların çalışma ve aile hayatı arasında denge kurmalarına destek olmaları ve böylelikle kadınların çalışma hayatında daha aktif rol almaları oldukça önem arz etmektedir.

Anahtar Kelimeler: Kadın İşgücüne Katılım Oranı, Panel VAR Analizi, Türkiye

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EXTENDED ABSTRACT

Background:

Women, who started their working life with the Industrial Revolution, put up great and difficult struggles in this process both to achieve the rights they demand and to maintain their economic freedom. Most women spend their lives with education, are equipped with academic and professional skills, and have the potential to take an active role in working life. Although significant progress has been made in the last 20 years, the available data show that the inequality between women and men in terms of access to the labor market, employment, and working conditions continues. It is very important to identify the innovations and transformations that can be made to increase female participation in the labor force in Turkey, to eliminate the deficiencies, and to support women in establishing a balance between their work life and family life.

Research Purpose:

Increasing women's labor force participation rates is important in terms of sustaining economic growth and ensuring social development. The difference in employment between women and men tends to decrease in developing countries and developed countries, but it increases in emerging countries. The problems experienced by women in working life hinder economic growth and social development, thus affecting societies. In this research, it is aimed to determine the factors affecting the labor force participation rate of women in Turkey.

Methodology:

In this study, the variables in the literature and the accessibility of the data were considered to investigate the effect of crude divorce rate, crude birth rate, the share of the female population in the total population, and the Gini index on the female labor force participation rate in Turkey. In this context, a panel data set was created by using annual data on the 2nd level regions in Turkey in the 2014-2020 period from the website of the Turkish Statistical Institute. Panel VAR analysis method was used as an econometric method. VAR models accept all variables in the model as endogenous, making it possible to observe the effect of the lagged values of each variable on the dependent variable. Here, logarithmic transformation was applied to the series of the variables and used the logarithmic forms of the series in the analysis. The necessary tests and predictions were made for panel VAR analysis using the Stata 13 software.

Findings:

Findings suggested that one lag of women's labor force participation rate and one lag of crude birth rate were statistically significant in explaining female labor force participation rate. In addition, one lag of female labor force participation rate, one lag of crude birth rate, and one lag of female population ratio were found significant to explain the female divorce rate. Thus, it was observed that an increase in female labor force participation rate increased divorce rates. It is challenging for women to exist in working life on the one hand, and try to establish a balance between family life and business life on the other hand. In order to have a more balanced and regular family life and to have a lower divorce rate, women should do the job they choose, and the equal distribution of responsibilities at home are issues that should be given importance.

Conclusions:

Today, women's desire to achieve success in their careers, supportive government policies, and the gradual reduction of gender inequality in working life are positive results that should be emphasized. In addition to these, women's working life and family balance should be protected with more flexible working rights such as nursery support, insurance premium support, childcare leave, breastfeeding leave, part-time work, and policies specific to women. Starting from a young age, the importance of education should be explained to women, their entrepreneurial skills should be supported, and they should be given more motivational support. Also, there should be more options for employment for women who could not receive an education but want to take an active role in the work life. Increasing the employment opportunities for women, regardless of whether they are in the city center or in the countryside, will make valuable contributions to social and human development in Turkey and in the world.

1.INTRODUCTION

Female participation in the labor force is quite significant, because it ensures development in economic and social aspects, strengthens female's individual positions financially, increases their social gains, and contributes to lifelong learning. According to TUIK data, the female labor force participation rate increased from 26% in 2000 to 34% by the end of 2021. Despite the increasing rates over the years, these numbers are still below the EU and OECD averages. Increasing female's participation in the labor force means decreasing income inequality and poverty, increasing production potential, and therefore accelerating economic growth and development. However, with the expectations of the Turkish society from women in family life and the responsibilities imposed on them, women are often forced to make a decision. Some prefer the work life, burdening the responsibilities of both business and family. Others prefer not to work and spend all their energy on family life. Many women spend their lives with education, get equipped with academic and professional skills, and gain the potential to take an active role in the work life. Over time, with the responsibilities of being a wife and a mother, these women tend to put their work life into the background, sometimes even unwillingly give up their professional life. It is of great importance to determine what can be done to increase female participation in the labor force in Turkey, to reveal the deficiencies in this regard, and to allow women to establish a balance between work life and family life.

Despite the significant progress over the past 20 years, current ILO data indicates that the inequality between women and men persists in terms of access to the labor market, employment, and working conditions. At 48.5% around the world, female labor force participation rate still lags men by 26.5%. Also, at 6% around the world, female's unemployment rate is 0.8% higher than that of men. Considering all this data, only 6 women are employed for every 10 employed men (ILO, 2018).

Table 1. Female Labor Force Participation Rates in the World and in Turkey by Years (%)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
World	48.7	48.5	48.2	48	47.9	47.8	47.7	47.7	47.6	47.7	45.9
Turkey	27.2	28.5	29.2	30.4	30.4	31.6	32.6	33.76	33.7	34.3	30.9

Source: ILO (2020)

Table 1 shows female participation in the labor force in the world and in Turkey by years. Despite the significant increases over the years in Turkey, there is a remarkable decline from 2019 to 2020 both in the world and in Turkey. Indeed, the main reason for this is the restrictions imposed with the Covid-19 pandemic, which started in China at the end of 2019 and then spread to the entire globe. Namal and Taşkesen (2022) investigated the effects of the Covid-19 epidemic on female employment. They indicated with the data that the labor force participation rate of women between the ages of 15-64 in the R81 (Zonguldak, Karabük, Bartın) region has always remained above the Turkey average between 2014 and 2020, but has not been able to recover from the effects of the epidemic in 2020 and tends to decrease. However, the statistically negative trend of the labor force participation and employment rates data in 2020 shows the negative effects of the Covid-19 epidemic for this region as well. This pandemic caused a shrinkage in all industries, increasing unemployment. Besides, because of the long-lasting interruption of education in schools, children began to spend more time at home, so many working women and women with children left their jobs of their own accord.

Throughout the history of humanity, women have always been producers, and they constitute half of the world's population. With the industrial revolution, women working in the weaving industry turned to other sectors, as many men were recruited for World War I and World War II (Aksoy, 2019: 147). Since the mid-1950s, there has been a decline in female employment in Turkey. This rate fell from nearly 70% in the second half of the 1950s to 20% in the 2000s. The

factors here are migration from rural regions to urban areas and neo-liberal agricultural policies, which have gained momentum since the end of the 1990s. With these policies, most people who used to make a living by agricultural activities began to seek jobs in non-agricultural sectors. As the service sector grew, new job opportunities were created for female employees, particularly in healthcare, social services, education, and tourism (Zeren, 2017: 88).

Based on different economic levels among countries, there are some remarkable inequalities in employment rates between men and women. In developed countries, the difference between male and female employment rates is relatively smaller. In Eastern Europe and North America, unemployment rates are lower for women than for men. However, in some regions like the Arab Countries and North Africa, where social norms continue to prevent female from working paid jobs, female unemployment rates are twice that of men. Moreover, the difference in employment between women and men tends to decrease in developing countries and developed countries, but it increases in emerging countries. This is associated with the increasing number of young females participating in formal education in emerging countries, which delays their participation in the labor market (ILO, 2018). Considering business owners around the world, it was seen that the number of men who are employers is almost four times that of women. Gender inequalities like this are also evident in management positions. Women face challenges and barriers in accessing managerial positions, which hampers economic growth and social development (ILO, 2020).

Table 2. Female Labor Force Participation Rates in Turkey by Educational Status (15+ years) (%)

Educational Status	2014	2015	2016	2017	2018	2019	2020
Illiterate	16	16.1	15.2	15.9	16.1	15.4	12.4
Literate but unable to finish a school	21.3	21.6	21.7	2.1	21	21.2	17.6
Primary school graduates	28.1	28.9	29.6	30.8	31.3	30.3	26.3
Secondary or vocational school	22.7	20.3	19.5	19.6	22.2	23.6	20.4
High school	31.9	32.7	33.7	34.3	34.7	34.1	29.9
Higher Education	71.3	71.6	71.3	72.7	71.6	71.5	65.6

Source: TUIK (2020)

According to Table 2, female labor force participation rates tend to increase as education levels increase. Accordingly, as of 2020, the labor force participation rate was 12.4% for illiterate women, 26.3% for primary school graduates, 29.9% for high school graduates, and 65.6% for higher education graduates. Even though education process delays female participation in the labor force, it still increases their participation rates. Besides, education is indispensable for women's social positions and for the social and economic growth of societies.

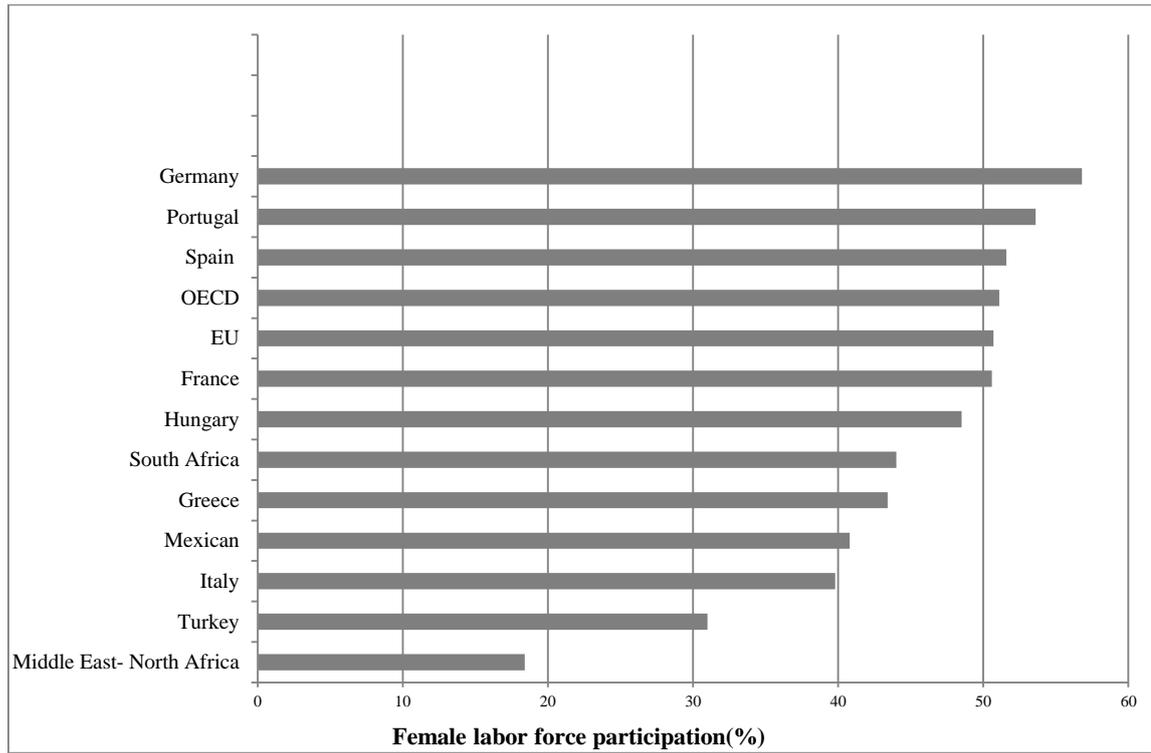


Figure 1. Female labor force participation rates by countries **Source:** OECD (2020)

Figure 1 indicates female labor force participation rates in different countries as of 2020. It is noteworthy that female labor force participation rate was over 52% in the EU and OECD member countries. Accordingly, the average participation rates were 52.4% for the EU member countries and 52.5% for the OECD member countries. Compared to some of the OECD member countries, Turkey had the lowest female labor force participation rate. Regarding some other countries with similar demographic and socio-economic structures as Turkey, female labor force participation rates were 41.1% in Italy, 44.3% in Greece, 48.4% in South Africa, and 53% in Spain. Middle Eastern and North African countries had a quite low participation rate at 18.4%. With its geographical structure, Turkey is a cultural bridge between the west and the east. This affects the socio-cultural structure of women in Turkey and plays a determinant role in female employment and participation in the labor force. Increasing female labor force participation rates is key for sustaining economic growth. Creating successful national economies and societies is only possible by explaining the significance of education and its impact on labor force participation to the young population, creating employment for women who could not receive or continue education, and reducing gender inequalities.

2. LITERATURE REVIEW

Considering previous research on female labor force participation in Turkey and around the world, numerous variables have been found to be determinants such as education, number of children, urbanization rate, divorce rate, income distribution inequality, inflation rate, marital status, unemployment, and population growth rate. Some studies have addressed most of these variables, while others have focused only on certain variables. Some of these studies are discussed below.

Pampel and Tanaka (1986) analyzed data from 70 countries on female labor force participation in the 1960s and 1970s. The authors found that female labor force participation was affected by various variables like family size, education level, economic dependency, and labor force growth rate. Mammen and Paxson (2000) investigated the impact of female labor force participation on economic growth in 90 countries between 1970 and 1980. The authors observed

that factors like education level, employment rate, and fertility were the factors that stood out. In developing countries, women's status in society, fertility rate, low education level, and taking an active role in family affairs greatly affected female labor force participation rates.

Hafeez and Ahmed (2002) examined various socio-economic and demographic factors that affected the labor force participation decisions of educated and married women in Pakistan in 1998-1999 using logit and probit analyses. The authors reported that as the education level increased, the probability of participating in income-generating activities outside the home increased. However, higher monthly household income, the number of other working family members, and living in rural areas had no positive effect on female labor force participation. Bozkaya (2013) investigated the factors affecting female labor force participation in Turkey by VAR analysis on the 1988-2012 dataset. Bozkaya found that having a low level of vocational education and transitioning from unpaid family workers in the agricultural sector to stay-at-home mothers in urban life due to migration from the village to the city were factors that affected labor force participation. The author emphasized that to increase female participation in the labor force, new opportunities should be offered to increase education levels and improvements should be made in education policies. Özer and Biçerli (2003) performed a panel data analysis using the data from 1988-2001 to determine the variables that affect female labor force participation rates in rural and urban areas in Turkey. They found significant rates of stay-at-home mothers and unpaid family workers among the total female population. Jütting and Morrison (2009) analyzed the data from Latin American, North African, and Middle Eastern countries and highlighted that women mostly had to work in rural areas and in very bad conditions. Around the world, many jobs and fields have been created specifically for women, allowing them to work in qualified jobs; however, the situation is quite the opposite in underdeveloped or developing countries.

Kızılgöl (2012) aimed to reveal the factors that affect the labor force participation of married and single women living in urban and rural areas throughout Turkey between 2002-2008 using logit analyses. The author found that education level, household income, dependency rate, residence ownership, and age were the most important factors on the decision to participate in the labor force among married and single women. Also, the number of children decreases labor force participation in urban areas and increases it in rural areas. Er (2013) analyzed the factors that affect female labor force participation in Turkey by regions using spatial dependence tests. The author concluded that fertility rate and population growth rate affected labor force participation negatively. Del Boca (2002) investigated the impact of fertility on female labor force participation in Italy and found that access to nursery facilities and working part-time positively affected female labor force participation. Psacharopoulos and Tzannatos (1993) also examined the effects of fertility on female labor force participation in Latin America and highlighted that having children over the age of 6 increased the probability of participating in the labor force. Yeşilkaya (2022) examined the relationship between the female employment rate and the birth rate on the 1991-2020 data for Sweden and the USA. It is seen that there is a positive relationship between the birth rate and the female employment rate for Sweden and the USA.

Özalp (2021) used two different measures, the Gini index and the Theil index, to observe the effects of female labor force participation on inequality. For this purpose, the researcher used time series data for 1988-2015 and ARDL Bounds Testing. The estimation results indicated that women's labor force participation reduced inequality in Turkey in the long term. Kutlar et al. (2012) found that higher labor force participation by women increased divorce rates. Lee et al. (2008) reported that married women participated in the labor force at a lower rate than unmarried women and that this was a negative factor for economic growth. Albanesi and Prados (2017) argued that persistent gender gaps in compensation and career opportunities have caused slowdown of labor female participant of prime-aged married women.

3.PANEL VECTOR AUTOREGRESSION (PANEL VAR) MODEL

Developed by Sims (1980), the VAR model is an econometric model that allows to explain interrelationships between variables. Sims criticized the determination problem in systems of simultaneous equations, stating that there is no difference between endogenous and exogenous variables. He considered all the variables in the model as endogenous and suggested that, instead of using the descriptive constraints in least squares for predicting systems of two or three stages, system dynamics should be released (Sims, 1980: 1-49). The panel VAR method is the adaptation of the traditional VAR model to panel datasets. Panel VAR models are particularly fit for analyzing the transmission of unique shocks across units and time (Canova and Ciccarelli, 2013: 10). Early studies have used the panel VAR model for micro-level predictions (Holtz Eakin et al., 1988; Polat, 2019:215). The panel VAR model is used to determine the correlations between variables and the degree of explanation of lagged values in cases where it is not fully known whether the variables in macroeconomic models are exogenous (Alpağut, 2021: 10). Panel VAR models have other application areas as well (Agiralioglu and Demirci, 2021:5).

The VAR model examines all selected variables together in a system. There is no clear distinction between internal and external variables (Özgen & Güloğlu, 2004: 95). Each variable in the model is explained with their own lagged values and the lagged values of other variables (Güriş, 2018:397). In panel VAR models, all variables are considered endogenous and interdependent, and a cross-sectional dimension is added. The VAR model reveals the dynamic effects of random shocks on variables, so it makes no distinction between internal and external variables. This way, it allows for determination of the percentage of explanation of variables both by their own lagged values and by the lagged values of other variables (Bagci, 2019:607). When applying VAR models prepared for time series to Panel Data models, cross-section data should be added to the mathematical pattern. Because this combined model also allows to represent individual differences, adjustments can be made by adding fixed or random effects to the equations. The panel VAR model is shown as below.

$$Y_{i,t} = \alpha_{0t} + \sum_{j=1}^m \alpha_{jt} Y_{i,t-j} + \sum_{j=1}^m \beta_{jt} X_{i,t-j} + \phi_i \mu_i + u_{i,t} \quad (1)$$

$$X_{i,t} = \alpha'_{0t} + \sum_{j=1}^m \theta_{jt} Y_{i,t-j} + \sum_{j=1}^m \lambda_{jt} X_{i,t-j} + \Psi_i \mu_i + u'_{i,t} \quad (2)$$

In these equations, j stands for the maximum lag length (Tatoğlu, 2013:257). Given the nature of microeconomic research, panel VAR models focus on analysis with a large N and a small t of 10 or less periods (Binder, Hisao & Peseran, 2005:769).

Panel VAR models have three basic characteristics. The first is the inclusion of the internal variables of all units in the model constructed for an i unit. The second is that the unit values are correlated across all units. Third, the variances of the shocks of the constant, the slope, and the unit values are unit-specific, which means cross-sectional heterogeneity. This distinguishes panel VAR models used in macroeconomics from sectoral models used in microeconomics that deal with homogeneous groups. Macroeconomic research on samples with cross-sectional heterogeneity ignore this characteristic in their analyses, assuming homogeneity (Canova & Ciccarelli, 2013:8; Çuhadar, 2020:354).

Another key point for this model is to determine the lag length. When lags are set as longer than needed, the variables may differ from their actual values. The most common tests that are used to determine the lag length are Likelihood Ratio (LR), Akaike Information Criterion (AIC), and Schwarz Information Criterion (SIC) (Bozdağlıoğlu and Özpınar, 2011:47-48).

4. DATASET AND RESULTS

According to the literature, the variables that affect female labor force participation are inflation rate, growth rate, gross national product per capita, crude divorce rate, the number of women with higher education degrees, urbanization rate, labor force participation of married women, and the share of female population in the total population. In this study, the variables in the literature and the accessibility of the data were considered to investigate the effect of crude divorce rate (per thousand, $lncdr$), crude birth rate (per thousand, $lncbr$), the share of female population in the total population ($lnsfp$), and the Gini index ($lngini$) on female labor force participation rate (15+, $lnflfp$) in Turkey. In this context, the panel dataset using annual data for the level 2 regions in Turkey in the 2014-2020 period was created and obtained from the website of the Turkish Statistical Institute (TUIK). The panel VAR analysis method was used as the econometric method. The panel VAR approach is an adaptation of the traditional VAR method to panel datasets. VAR models accept all variables in the model as endogenous, making it possible to observe the effect of the lagged values of each variable on the dependent variable. Here, logarithmic transformation was applied to the series of the variables and used the logarithmic forms of the series in the analysis. The necessary tests and predictions were made for panel VAR analysis using the Stata 13 software. Below are the panel VAR model equations established here.

$$lnflfp_{i,t} = \alpha_0 + \beta_1 lnflfp_{i,t-1} + \beta_2 lncdr_{i,t-1} + \beta_3 lncbr_{i,t-1} + \beta_4 lnsfp_{i,t-1} + \beta_5 lngini_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

$$lncdr_{i,t} = \alpha_0 + \beta_1 lncdr_{i,t-1} + \beta_2 lnflfp_{i,t-1} + \beta_3 lncbr_{i,t-1} + \beta_4 lnsfp_{i,t-1} + \beta_5 lngini_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

First tests were performed for the correlations between the variables and determined a cross-sectional dependence between the units. In the second step, it was investigated whether the variables were stationary using the extended Dickey Fuller (Cross-Sectional Augmented Dickey Fuller-CADF) unit root test, which considers cross-sectional dependence. Third, the causality relationships between the variables were examined by Granger causality and finally established the panel VAR (Vector Autoregression) model.

For an analysis that explain the relationships between variables to yield consistent and significant results in economic research, it was needed to take into account cross-sectional independence when choosing unit roots and conducting other analyses (Sever & İğdeli, 2018:6). The relationships between the countries, households, or companies in the model are explained by the concept of cross-sectional dependence. Hence, examining cross-sectional dependency before starting the panel data analysis is crucial to obtain consistent results and to determine the unit root tests for the next step. In the absence of cross-sectional dependence, first-generation unit root tests need to be used, and in the presence of cross-sectional dependence, second-generation unit root tests are needed (Polat, 2021:74). For variables with cross-sectional dependence, the second-generation unit root tests will be the stationarity tests to avoid the spurious correlation (Altiner, 2019:134). Here, to find whether there was a cross-sectional dependence in the series, Pesaran's CD test, Friedman's FR test, and Frees' FRE test were used, which help look for correlations between units in a fixed effects model. Our findings are given in Table 3.

Table 3. Cross-Sectional Dependence Test Results

Tests	Statistical Values	Probability Values
Pesaran (CD)	15.335	0.0000
Friedman (FR)	47.835	0.0039
Frees (FRE)	3.358	alpha = 0.10 : 0.3583 alpha = 0.05 : 0.4923 alpha = 0.01 : 0.7678

According to Table 3, the null hypothesis of “there is no correlation between the units,” which expresses cross-sectional independence according to all three test results, is rejected. Pesaran and Friedman tests yielded probability values smaller than the significance levels of 0.05 and 0.01. According to Frees test, the test statistic (3.358) was greater than the confidence levels of 0.05 (0.4923) and 0.01 (0.7678). Hence, H₀ hypothesis is rejected, indicating cross-sectional dependence in the panel units.

To apply the panel VAR model, the model variables must be stationary, so the stationarity of the variables needs to be tested. It is more realistic for the units to be affected at different levels by one shock to one of the cross-sectional units. Therefore, second-generation unit root tests were developed to analyze stationarity, considering cross-sectional dependence (Selim et al., 2014:17). As a second-generation unit root test, Pesaran (2007) panel unit root test is widely used. Pesaran (2007) proposed an easier method than estimating factor loads to eliminate cross-sectional dependence, which was based on expanding the general ADF test that includes lagged cross-sectional means and the first difference of these means. Developed by Pesaran (2007), this method is called the Cross-Sectional Augmented Dickey Fuller (CADF) test (Alasgarlı and Sekmen, 2021:29). Here, it was determined cross-sectional dependence in the variables between the regions that constituted the panel. For this reason, the stationarity of the series was examined using the CADF test, which is the second generation unit root test developed by Pesaran (2007) and can be used in the presence of cross-section dependence. With the CADF, perform unit root tests on each cross-sectional unit (for each region) is performed. This way, the stationarity of the series can be calculated both as a whole and separately for each cross-section. Assuming that each unit is affected differently by time effects and considering the spatial autocorrelation, the CADF test is used in cases of T>N and N>T (Altıntaş and Mercan, 2015:361). Table 4 gives the unit root test results.

Table 4. CADF unit root test results

	I(0)	I(1)
lnflfp	p: 0.000	-
lncdr	p: 0.127	P:0.000
lncbr	p: 0.125	P:0.000
lnsfp	p: 0.698	P:0.000
lngini	p: 0.895	P:0.921

Providing stationarity is one of the most significant assumptions of the panel VAR approach. According to Table 4, none of the variables except for female labor force participation rate (lnflfp) was stationary (they contain unit roots). According to results of panel unit root test, the first differences of the nonstationary variables were taken and the panel unit root test was performed again. Taking the first differences, all variables except for the Gini index (lngini) become stationary: I(1).

To determine the appropriate model, the pooled model against the random effects model was tested with the LR test and according to the 1-degree-of-freedom chi-squared test, the hypothesis of “standard errors of the unit effects equal to zero” was rejected at the 5% significance level (chibar2(01)=125.75; Prob>=chibar2=0.000). Moreover, with the Score test, which has better characteristics for small samples, the standard error of the residual error was found to be equal to zero (chi2(1)=7133.60; Probe>=chi2=0.000) and the H₀ hypothesis was rejected. With both test results, it was understood that the pooled model was not suitable and that there were unit effects. The Hausman (1978) and Breusch-Pagan (1980) tests can be performed to determine whether the unit effects in the model are fixed or random. Here, using the Hausman test, it was determined whether the error components were related to the independent variables in the model (Gujarati and Porter, 2009: 602-603; Maddala, 2001:578-579). According to the Hausman test (chi2(5) = 22.93

Prob>chi2=0.0001), the H0 hypothesis of “the random effects model is more efficient than the fixed-effects model” was rejected at the 5% significance level. The appropriate model was determined to be a fixed effects model. Also, regression estimates cannot show true values if the model has autocorrelation or heteroscedasticity problems. To determine the model’s fit with econometric assumptions, it was investigated the autocorrelation problem using the Durbin-Watson test developed by Bhargava, Franzini, and Narendranathan (1982) and the LBI test developed by Baltagi and Wu (1999), and investigated the heteroscedasticity problem using the modified Wald test. According to the test results for autocorrelation problem (chi2(23) =1495.12; Prob>chi2 =0.0000), the test statistics were less than 2, so it was concluded that there was autocorrelation. According to the result of the modified Wald test (modified Bhargava et al. Durbin-Watson=0.83193837; Baltagi-Wu LBI=1.2923152) for heteroscedasticity problem, the H0 hypothesis of “no heteroscedasticity” was rejected, so there was heteroscedasticity in the model.

In estimation with a panel VAR analysis, the Granger causality is used to put variables in order from external to internal (Polat, 2021:78). Granger causality was developed by Granger (1969) to determine whether a cause-effect relationship between two variables is bidirectional or unidirectional. In the Granger causality, the null hypothesis is that “the excluded variable is not the Granger cause of the variable.” The alternative hypothesis states that “the excluded variable is the Granger cause of the variable” (Kesbic and Çevik, 2021:1635). Table 5 gives the Granger causality results between the variables.

Table 5. Panel VAR granger causality results

Equation	Excluded	Chi2	df	P
Inflfp	lncdr	0.009	1	0.924
	lncbr	14.460	1	0.000*
	lngini	0.001	1	0.971
	lnsfp	0.014	1	0.905
	All	41.995	4	0.000
lncdr	lnflfp	0.076	1	0.783
	lncbr	0.052	1	0.820
	lngini	0.124	1	0.725
	lnsfp	0.108	1	0.743
	All	0.204	4	0.995

According to the results of the panel Granger causality, the null hypothesis from the crude birth rate variable (lncbr) to female labor force participation rate (lnflfp) was rejected at the 5% significance level and a Granger causality was determined. There was no Granger causality between any of the other variables.

According to the panel unit root results, the difference between crude divorce rate (lncdr), crude birth rate (lncbr), and the share of female population in the total population (lnsfp) was stationary, but female labor force participation rate (lnflfp) was stationary. Accordingly, when creating the panel VAR model, divorce rate, birth rate, and the share of female population in the total population were added to the model with their first differences (D), while female labor force participation rate was added with its stationary state. Considering that the fixed effects model was the most appropriate for the dataset, the forecast results of the panel VAR model are given in Table 6.

Table 6. Estimation of the panel VAR model with fixed effects assumption

Inflfp	Coef.	Std. Err.	t	P> t 	[95% Conf. Interval]	
InflfpL1	0.4066223	0.0882083	4.61	0.000*	0.2315979	0.5816468
lncdrLD	0.0375135	0.0683617	0.55	0.584	-0.098131	0.173158
lncbrLD	1.240928	0.2888874	4.30	0.000*	.6677129	1.814143
lnginiLD	0.1902817	0.1175663	1.62	0.109	-0.0429954	0.4235587
lnsfplD	-3.722225	2.96822	-1.25	0.213	-9.611819	2.167368
_cons	2.092467	.3031883	6.90	0.000*	1.490876	2.694059
Dlncdr	Coef.	Std. Err.	t	P> t 	[95% Conf. Interval]	
InflfpL1	0.4015812	0.1692367	2.37	0.020*	0.0657788	0.7373836
lncdrLD	-0.1390286	0.1311589	-1.06	0.292	-0.3992764	0.1212192
lncbrLD	1.727968	0.5542601	3.12	0.002*	0.6281959	2.82774
lnginiLD	0.3311359	0.225563	1.47	0.145	-.1164301	.7787018
lnsfplD	-13.84096	5.694835	-2.43	0.017*	-25.14075	-2.541174
_cons	-1.312956	.5816977	-2.26	0.026*	-2.46717	-.1587411

According to the panel VAR model in Table 6, one lag of women's labor force participation rate (InflfpL1) and one lag of crude birth rate (lncbrLD) were statistically significant in explaining female labor force participation rate (Inflfp) for Model 1. One lag of crude divorce rate (lncdrLD), Gini index (lnginiLD), and the female population ratio (lnsfplD) had no significant effect on female labor force participation rate (Inflfp). For Model 2, one lag of female labor force participation rate (InflfpL1), one lag of crude birth rate (lncbrLD), and one lag of female population ratio (lnsfplD) were found significant to explain the female divorce rate (Dlncdr). Also, one lag of crude divorce rate (lncdrLD) and one lag of Gini index (lnginiLD) had no statistically significant effect on the crude divorce rate (Dlncdr). With these findings, Model 1 and Model 2 are given as follows.

$$lnflfp_{i,t} = 2.092 + 0.406lnflfp_{i,t-1} + 1.240lncbr_{i,t-1} \quad (5)$$

$$lncdr_{i,t} = -1.312 + 0.401lnflfp_{i,t-1} + 1.727lncbr_{i,t-1} - 13.840lnsfpl_{i,t-1} \quad (6)$$

5. CONCLUSION

Female participation in the labor force is very crucial for manifesting their skills, increasing their welfare, and for countries' development. Despite the many factors that affect female participation in the labor force, some socio-cultural factors also impact their participation or employment in Turkey, which is a bridge between the east and the west. Due to the social structure of the country, factors like early marriage, mothership, and taking responsibilities for family life are some facts that women accept, sometimes even independently of their choice. Indeed, these factors can also provide good feelings to women when it is their choice and when it does not restrict their economic and social freedom. Although, women who want to have a balance between family life and work life cannot find a middle ground, often having to make a forced decision. This makes women – thus their families and the society – unhappy and powerless. Both scientists, policy makers, and relevant state institutions highlight that women face serious obstacles in business life and that these reasons lower female labor force participation rates in Turkey. Strengthening women's financial status, finding a middle ground between the work life and family life, and supporting female participation in the labor force as priority policy areas is key for economic growth.

In this study, in which the factors affecting female labor force participation in Turkey were determined, the variables in the literature and the accessibility of the data was taken into account. For this reason, it was examined the effects of crude divorce rate, crude birth rate, the share of female population in the total population, and the Gini index on women's labor force participation rate in Turkey. Findings suggested that one lag of women's labor force participation rate and one

lag of crude birth rate were statistically significant in explaining female labor force participation rate. Several studies in the literature reported that crude birth rate affected female labor force participation negatively, while others reported a positive effect. The most important reason for this difference is that, as the number of children increases, women feel the need to participate in the labor force to increase household income and avoid experiencing financial difficulty, especially in low-income households. Female participation in the labor force increases particularly when the elder members of the family support the care of children at home. Kızılgöl (2012) highlighted that as the number of children increased, female labor force participation rate increased in rural areas. Del Boca (2002) found that access to nursery facilities positively affected female labor force participation in Italy. Psacharopoulos and Tzannatos (1993) reported that the probability of participating in the labor force was higher among Latin American women with children over 6 years of age.

Moreover, one lag of female labor force participation rate, one lag of crude birth rate and one lag of female population ratio were found significant to explain the female divorce rate. Thus, it was observed that an increase female labor force participation rate increased divorce rates, similar to the findings of Kutlar et al. (2012). For women, achieving financial independence but having to carry a greater burden on life and being unable to find a balance between family life and the work life often leads to negative outcomes. To have a more balanced and energetic family life and to have lower divorce rates, it is very important for the woman to do the job she loves, to have an equal distribution of responsibilities at home, and for the spouses to support each other.

In conclusion, women should be provided with more flexible work rights, like home care support, nursery support, insurance premium support, childcare leave, breastfeeding leave, and part-time work opportunities, as well as policies specially designed for women. These measures would prevent women from being stuck between family life and the work life. Starting from a young age, the importance of education should be explained to women, their entrepreneurial skills should be supported, and they should be given more motivational support. Also, there should be more options for employment for women who could not receive education but want to take an active role in the work life. These measures will make valuable contributions to social and humanitarian development in Turkey and around the world.

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