Female Labor Force Participation and Gross Value Added: Long-run Analysis for OECD Sample

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Abstract: This study is an attempt to find the role of female labor force participation on the economic performance indicated as gross value added (GVA). Female labor force participation rate (FLPR) is used as the indicator for women's role in the economy. For this aim, a period spanning the years between 1990 and 2017 is investigated for 36 OECD countries. First, panel unit root tests and cointegration tests are conducted to check stationarity and cointegration. Panel dynamic OLS (PDOLS) estimates give the long-run coefficients. LFPR has a positive effect on most of the OECD countries' GVA. Results are robust even if women aged over 15 or between 15 and 64 are considered.

Key Words: Gross value added, Female labor force participation rate, PDOLS, Panel cointegration, Panel unit root

1. INTRODUCTION

Female labor force participation is crucial on the formation and the structure of the entire labor force. It directly related to civil rights, working conditions of the female workers. More desirable working environments attract more workers in the labor force. But it has substantial importance for especially female workers compared to their male counterparts because a significant part of the female laborers work at home. That is, they already engage in a job. So, if the conditions of the working environment outside home is more convenient for them, they may choose to work outside home. They may choose to participate in white-collar jobs more. Education policies targeting to increase women's education level can increase the participation rate as well. Focus needs to be on female workers because we think FLPR has a close relationship with the economic performance overall.

Goldin (1986) studies the female labor force and economic growth in the US economy focusing on a long time period covering the years between 1890 and 1980. Although the data collection techniques have evolved through time and the definitions of the variables has changed, more participation of woman into workforce is associated with rise in the national income. In addition, earnings of female labor force were relatively increased compared to male counterparts for the time period examined.

Tam (2011), on the other hand, tries to test U-shaped relation between female labor force participation rate (FLPR) and economic development based on the data for 134 countries in 1950, 1960, 1970, and 1980. And he reveals the U-shaped relationship between FLPR and economic development through time. Tansel (2002) tests the same U-shaped relation hypothesis by utilizing data on Turkish economy for 1980, 1985, and 1990. Tansel asserts that a sharp decline is followed by a slowdown in the decreasing rate. Then, the recovery takes place in the following decades. In addition, unemployment is found to be a negative factor on the FLPR, while education has a positive impact.

Aziz and Azmi (2017) study the relationship between economic growth and the variables such as FLPR, FDI and inflation in Malaysia. The focus is on the period between 1982 and 2013. Although FLPR has a positive effect on the GDP growth, it is not statistically significant. But FLPR directly raise the average household income which in turn increases GDP growth. Verick (2014) sheds light on the dynamics of female labor force participation in developing countries. With the migration of workers from rural to urban areas, and movement of workers from other sectors of production to manufacturing sector, role of women in the society has evolved. Education level rises, fertility rates decrease, and the formation of labor force changes concurrently. Hence, rising female labor force has become not only the result of development but also the reason of development. Economic growth gains momentum by rising labor input due to that more women take part in the labor force because constraints that deter women to work outside are eliminated.

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Olivetti (2013) shows the U-shaped association between female labor supply and economic development based on a period between 1890 and 2005. U-shape is muted if the OECD countries are excluded from sample. But the main finding is still persistent. As stated by Goldin (1994), in the early stages of economic development, policy is to increase education level of men rather than female workers. So, female labor force is not adequately represented in the working life comparatively. But, after secondary level of education, social constraints restricting female labor force to participate in white-collar jobs weaken. And, starting from a certain level of economic development, female labor force participation increase. The more this economic development increases, the greater the weight of service-oriented sectors in the economy. And, educated female workforce can be involved in such kind of jobs. This is the logic lying behind the U-shaped curve of female labor supply function.

There are studies claiming that the region, and development level of the economy is critical on the effect of female labor force participation on economic growth such as Robinson (2005). According to Robinson, women's participation into working life will have a substantial impact on the production and GDP growth only if there is an excess demand for labor overall. In addition, there has to be an opportunity for female workers to put their labor into use in a more productive way. But, in the Middle East and North Africa, total factor productivity is low meaning that the current production structure does not create enough employment so that women can engage in working force. But Koyuncu et al. (2016) show that labor productivity increases as female labor force participation improves. Hence, total factor productivity can be increased by creating more attractive labor market policies for women to participate more in the workforce.

In poor countries, such as African countries, female labor force participation is in positive association with poverty (Özen & Koyuncu, 2018a). Empirical evidence suggests that results are robust even the sample is larger (Koyuncu & Özen, 2017a). Hence the association with poverty is not related to wealth of the economy. But overall economic development of the country sample may lie at the right of the bottom point of the U-curved graph. Therefore, movement along the curve towards bottom point from right results in a decline in the female participation in the workforce while the economy gets poorer. Lechman and Kaur (2015) states that U-shaped association between female labor force participation and economic growth is supported by empirical findings based on the data from 162 countries from 1990 to 2012. But the hypothesis for U-shaped relationship cannot be affirmed in low-income countries. On the other hand, relationship is verified for high-income, upper-middle-income, and lower-middle-income countries. So, the initial level of economic performance is important for the effect of LFPR on the economic indicators.

U-shaped relationship is verified by 1965 and 1970 data of 70 countries as well (Pampel & Tanaka, 1986). Yet, Gaddis and Klasen (2014) approach such a relationship with suspicion. U-shape explains the historical economic development of the developed economies. However, developing countries do not seem to be compatible with this theory. They claim that country- specific factors, cross-country differences and structural dissimilarities between economies are the most important features that affect the composition of labor force and the sectoral distribution in the economy. These determine the pattern of economic development. The shape of the association between economic development and FLPR has secondary importance.

Lahoti and Swaminathan's (2013) study shows that economic development and FLPR do not display a U-shaped relationship. State-level data of India for the period between 1983 to 2012 are evidence for that the leading sector is the service sector in which men are engaged more than female workers. For, women are not educated enough compared to male counterparts to fulfill the requirements of service sector jobs. They work mostly in the agriculture or manufacturing sector. However, these labor-intensive sectors do not have enough weight to direct economic growth. That is, not only the initial development level of the economy, but also the structure of the workforce and the features of socio-economic conditions of labor market are important.

Determinants of FLPR vary from country to country. So, how FLPR affects economic development depends on these factors explaining the formation of female labor force. Thus, diversity in ethnic structure, language, and religious beliefs has a positive impact on the level of FLPR (Koyuncu & Özen, 2017b). So conscious diversification of religious, linguistic, and ethnic features of a society may result in an increase in women's participation into workforce. On the other hand, developing countries sample shows that only religious and ethnic diversity are positively related to FLPR whereas linguistic or cultural variety are not significantly related to women's participation into labor force (Özen & Koyuncu, 2018b).

Besides the social institutions, freedom is expected to have a positive effect on the FLPR. But empirical findings show that among thirteen freedom indicators, only four of them are statistically significant. While women political rights have a positive impact on FLPR, women social rights do not have any significant effect (Koyuncu & Özen, 2017c). Not only the political institutions at individual level, but also country level political institutions such as political stability is an important factor causing FLPR to boost especially in Asian and Muslim societies (Özen & Koyuncu, 2018c). But liberties, in general, have tendency to increase women's participation in the workforce. For instance, civil freedom, and freedom of press are the factors leading FLPR to increase (Koyuncu & Özen, 2018a), while freedom of speech does not play its role in the same way for all countries. According to Koyuncu and Özen (2018b), freedom of speech encourages women to participate in the workforce in Asian and Muslim countries, it is not the case in Africa.

Besides the freedom and freedom related indicators, globalization is another institutional factor that can be thought to increase FLPR. Okşak and Koyuncu (2017) states that economic, social and overall globalization are in a positive association with women's involvement in workforce.

Hence, according to literature, female labor force participation is closely related to education level, socio-economic features of the economy. Institutional characteristics such as the freedom and the level of globalization are just a few of the factors that affect women's participation in the labor force. Thus, to increase GDP level via increasing FLPR, determinants of the FLPR needs to be improved.

This study tries to find long-term association between FLPR and GVA. For this aim, the second part describes the material and methods. Details about the data utilized in the study are explained as well. In the third part, empirical findings are reported, and results are discussed. The last par concludes the study.

2. MATERIAL AND METHODS

2.1. Data

Data for gross value added at factor cost measured in current US$ are retrieved from the DataBank of World Bank (2021). The variable is obtained by adding the value added in all three sectors of the economy, namely the industry, agriculture, and the service sector. The former name of the series is GDP at factor cost (World Bank, 2020a). This variable is included in the analysis to show the economic performance of the country.

Data for female labor force participation rate are also retrieved from the DataBank of World Bank (2021). There are two FLPR being used in the analyses. The first is "the proportion of the population ages 15 and older that is economically active" (World Bank, 2020b). The second is "the proportion of the population ages 15-64 that is economically active" (World Bank, 2020c). By economically active, it is meant that people supply their labor to produce goods and services in the given period. Annual data utilized in the statistical analysis cover the period between 1990 and 2017 for 36 OECD countries. Log transformation of the series are used for the convenience in the interpretation.

2.2. Method

To analyze the long-run association between FLPR and GVA, we use the following panel regression model:

$$\boldsymbol{GVA_{it} = \alpha_{0i} + \alpha_{1i} FLPR_{it} + \varepsilon_{it}} \qquad (1)$$

where $\boldsymbol{\varepsilon_{it}}$ refers to the error term of the panel regression model having classical properties. "i" subscript refers to each OECD country in the sample.

The first step of the analyses is panel unit root tests. To this end, panel unit root tests are conducted for all series. And, stationarity is checked at level. After, the first differences are taken. Fisher type Augmented Dickey-Fuller (ADF) panel unit root test is used. This process tests the null hypothesis stating that the panel series is non-stationary while the alternative hypothesis is that the panel series is stationary. The tests are estimated by assuming different autoregressive structures in all series. That is, individual unit root processes are assumed during Fisher type ADF panel unit root tests. In addition, Levin-Lin-Chu panel unit root test, Breitung test for panel unit root, and Im-Pesaran-Shin panel unit root test results are reported to show the robustness of the Fisher type ADF panel unit root test.

After it is detected that both series have panel unit root, a potential long-run equilibrium association between the series is checked. Westerlund's (2005) test is utilized to examine the panel cointegration. The null hypothesis is that there is no cointegration. Alternative hypothesis states that all panels are cointegrated. If a long-run relationship is found

between the series, then Pedroni's PDOLS estimation method is conducted to estimate the long-run effects of FLPR on GVA.

3. RESULTS AND DISCUSSION

As a prerequisite of Westerlund panel cointegration test, whether the two series contain panel unit root or not has to be checked. Table 1 lists four different types of panel unit root test results for all three series.

Table 1: Panel Unit Root Test Results

		Level		First-Difference	
Variable		**Test Statistic**	**P-value**	**Test Statistic**	**P-value**
logFLFPR(+15)	Levin, Lin & Chu t*	1.49231	0.9322	-20.4479***	0.0000
	Breitung t-stat	5.49769	1.0000	-12.4993***	0.0000
	Im, Pesaran and Shin W-stat	2.94443	0.9984	-19.6836***	0.0000
	ADF - Fisher Chi-square	61.8694	0.7971	455.995***	0.0000
logFLFPR(15-64)	Levin, Lin & Chu t*	4.51389	1.0000	-15.2329***	0.0000
	Breitung t-stat	1.30494	0.9040	-14.4235***	0.0000
	Im, Pesaran and Shin W-stat	5.19397	1.0000	-12.4173***	0.0000
	ADF - Fisher Chi-square	24.2702	1.0000	265.654***	0.0000
logGVA	Levin, Lin & Chu t*	1.50512	0.9339	-20.2343***	0.0000
	Breitung t-stat	6.01829	1.0000	-12.736***	0.0000
	Im, Pesaran and Shin W-stat	2.99047	0.9986	-19.8638***	0.0000
	ADF - Fisher Chi-square	54.2570	0.9411	449.544***	0.0000

*** indicate statistical significance at 1% level.

All four panel unit root test results show that logFLFPR(+15), logFLFPR(15-64), and logGVA series contain a panel unit root at levels at 1% significance level. But the series are stationary in first differences. That is, all three series are I(1).

Because the variables have a panel unit root, we can proceed to test if there is long-run cointegrating relationship between series. Table 2 reports that logFLFPR(+15) and logGVA are cointegrated at 1% level of significance. logFLFPR(15-64) and logGVA are cointegrated at 1% level of significance.

Table 2: Cointegration Test Result

Ho: No cointegration

Ha: All panels are cointegrated

Variables	**Test Statistic**	**P-value**
logGVA & logFLFPR(+15)	2.4513***	0.0071
logGVA & logFLFPR(15-64)	2.5354***	0.0056

*** indicate statistical significance at 1% level.

Found that there exists two cointegration relationships, we can estimate long-run coefficients of logFLPR for each OECD country and for the overall panel. This process is conducted twice both for the women ages 15 and older, and prime-aged women (15-64). PDOLS estimation results are listed in Table

3 and Table 4. Table 3 reports the logFLFPR(+15) coefficient estimates when the dependent variable is logGVA. Table 4 reports the logFLFPR(15-64) coefficient estimates when the dependent variable is logGVA as well.

Table 3 shows that the long-run coefficient of logFLFPR(+15) variable for the full panel of OECD countries is positive. And it is statistically significant at 1% significance level. If the results are checked one-by-one, there are only six countries having statistically insignificant long-run coefficient estimates out of 36 OECD countries. Out of remaining 30 countries, there are only three countries that have negative relationship between FLPR and GVA. These are Czech Republic, Poland, and Slovak Republic.

Table 3: Long-run Coefficient Estimates for logFLFPR(+15)

	Country	Coefficients	t-statistics		Country	Coefficients	t-statistics
1	Australia	11.98***	13.15	19	Israel	7.651***	11.93
2	Austria	5.573***	10.8	20	Italy	4.223***	6.532
3	Belgium	4.54***	8.599	21	Japan	-1.992	-1.112
4	Canada	12.54***	12.41	22	Korea, Rep.	16.28***	7.479
5	Switzerland	10.61***	6.869	23	Lithuania	-11.77	-1.625
6	Chile	4.606***	31.98	24	Luxembourg	3.742***	16.29
7	Czech Republic	-28.93***	-6.94	25	Latvia	13.93***	3.349
8	Germany	4.314***	6.362	26	Mexico	5.077***	9.078
9	Denmark	0.645	0.07683	27	Netherlands	2.686***	3.575
10	Spain	2.622***	11.3	28	Norway	8.972***	2.772
11	Estonia	18.09***	3.571	29	New Zealand	9.125***	9.971
12	Finland	7.82	0.8671	30	Poland	-10.1***	-3.15
13	France	10.21***	9.74	31	Portugal	6.176***	8.266
14	United Kingdom	10.02***	9.466	32	Slovak Republic	-22.91***	-3.928
15	Greece	4.147***	3.95	33	Slovenia	22.07***	3.286
16	Hungary	5.015**	2.208	34	Sweden	16.02***	3.95
17	Ireland	4.599***	10.46	35	Turkey	-1.743	-1.234
18	Iceland	14.22**	2.079	36	United States	-3.595	-0.9777
					PANEL	4.625***	35.23

***, **, * indicate statistical significance at 1%, 5%, and 10% levels respectively.

Table 4 shows that the long-run coefficient of logFLFPR(15-64) variable for the full panel of OECD countries is positive again. And, it is statistically significant at 1% significance level. If the results are checked one-by-one, there are only five countries having statistically insignificant long-run coefficient estimates out of 36 OECD countries. Out of remaining 31 countries, there are only two countries that have negative relationship between FLPR and GVA. These are Czech Republic and the United States.

Table 4: Long-run Coefficient Estimates for logFLFPR(15-64)

	Country	Coefficients	t-statistics		Country	Coefficients	t-statistics
1	Australia	11.54***	11.32	19	Israel	7.606***	9.871
2	Austria	5.009***	11.46	20	Italy	2.889***	7.108
3	Belgium	4.069***	7.106	21	Japan	1.598	1.509
4	Canada	11.21***	15.05	22	Korea, Rep.	10.63***	11.66
5	Switzerland	8.146***	6.782	23	Lithuania	9.519	1.565
6	Chile	4.253***	29.95	24	Luxembourg	3.909***	16.61
7	Czech Republic	-16.32**	-2.1	25	Latvia	9.194***	7.063
8	Germany	3.253***	7.215	26	Mexico	4.698***	9.487
9	Denmark	13.99**	1.99	27	Netherlands	2.666***	3.741
10	Spain	2.417***	9.539	28	Norway	10.97**	1.999
11	Estonia	13.37***	6.094	29	New Zealand	10.3***	9.279
12	Finland	14.63***	5.879	30	Poland	-0.7338	-0.1503
13	France	7***	6.441	31	Portugal	4.808***	9.516
14	United Kingdom	12.41***	5.609	32	Slovak Republic	-7.351	-0.9794
15	Greece	2.776***	3.764	33	Slovenia	11.03***	12.48
16	Hungary	4.813**	2.525	34	Sweden	6.315*	1.681
17	Ireland	4.995***	12.75	35	Turkey	-1.082	-0.7912
18	Iceland	10.5***	2.718	36	United States	-10.02***	-3.134
					PANEL	5.417***	40.43

***, **, * indicate statistical significance at 1%, 5%, and 10% levels respectively.

As a result, there is strong evidence that the long-run relationship between FLPR and GVA is positive for the entire panel composed of 36 OECD countries. And the inference for the entire panel applies to most of the OECD countries individually. That is, in the long-run, women's encouragement to participate in the workforce positively affect economic performance.

4. CONCLUSION

This study tests if there is a long-run relationship between FLPR and GVA. Long-run coefficients created by PDOLS estimation method reveal a statistically significant positive long-run impact of logFLPR on logGVA. Findings are robust for both the entire panel and most of the countries in the data set.

So, besides other things countries targeting to improve economic performance need to find a way to make working environment more attractive for women to involve in the workforce. Then FLPR would contribute to national income automatically.

The relationship is valid only for OECD countries. External validity of the findings of the study could be checked by extending the analyses to different country samples. For instance, developing country sample and transition economies sample would be interesting to check the validity of the results. For instance, the only three economies having negative long-run coefficients in Table 3 are Czech Republic, Poland, and Slovak Republic which belong to transition economies group. This may be caused by the discrepancy between the initial GDP levels of these three economies and the rest of the sample. So, country-specific characteristics have a potential to affect the association between variables.

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